

**NATURAL RESOURCES CONSERVATION AND
DEVELOPMENT LEVEL II**

Learning Guide -21

Unit of Competence: Assist Nursery Work

Module Title: - Assisting Nursery Work

LG Code: AGRNRC2 M05 0919 LO1-LG-21

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LO 04: Transplant the seedling

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

- Constructing Shade
- Filling polythene tubes
- Arranging the polythene tubes on transplanting beds or blocks
- Watering polythene tubes
- Carrying out transplanting tasks

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

- construct Shading structures and temporary working shads according organizational specification
- fill Polythene tubes with appropriate soil mixture according to organizational work manual
- arrange Polythene tubes in transplanting beds or blocks according to work manual
- Water Polythene tubes before transplanting according organizational work schedules

The transplanting tasks are carried out according to work schedules

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 2, Self-check 3, Self-check 4 and Self-check 5” in **page -4, 7, 8, 14 and 15** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, in **page -18**.”
6. Do the “LAP test” in **page – 20** (if you are ready).

Information Sheet-1	Constructing Shade
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4.1. Construct Shading:

Refresh your mind with the definitions of shading and how it was constructed

Germinating seeds need no light but only warmth and moisture. Of course, seedlings need protection from drought, cold wind, heavy rain and burning sunshine. For these reasons, shades must be provided especially when the seedlings are young.

Shades are kept above the seedbeds until the seedlings are transplanted. If the seedbed is covered with grass, the shades are not put on the bed until the time when the grass is removed. The grass is removed after germination has started.

The adverse effects of excessive shade can often be clearly seen in MOA nurseries because the healthiest seedlings are evident at the edges of pot beds where they receive relatively more light than the central part of the bed (the edge effect). There is often a consistent gradient from thicker-stemmed, taller, healthy green seedlings at the edges of pot beds to thinner, shorter, chlorate seedlings at the centre of the bed. In many instances this is the result of excessive shade application. The central seedlings also have a poorer root system, which is an inevitable result of high shading intensity. Consequently the root/shoot ratio will be low and field survival can be expected to be lower than for seedlings raised with plenty of sunshine.

In spite of the above negative consequences of shading, there are situations in the nursery when the use of shade is appropriate. Shade is beneficial during germination, just after pricking- out and, of course, for protection from frost, hail and heavy rain.

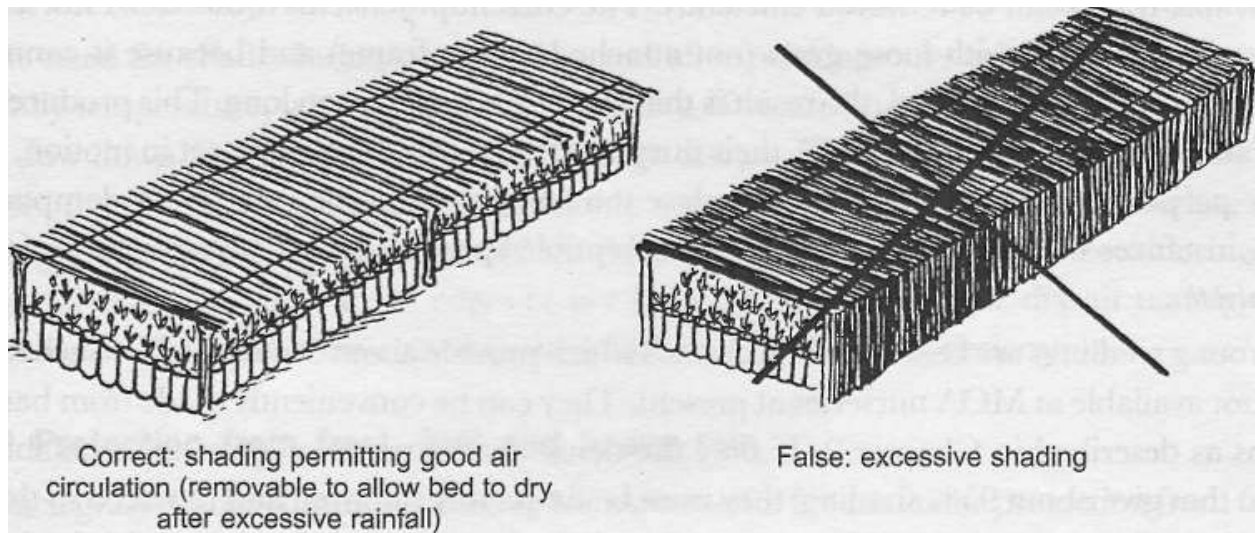


Figure 1. Shading.

Simple shades for private peasant nurseries can be constructed with any available material. Forked sticks can be used for support shades, which is 60-100 cm from the ground. Too low shades make watering difficult. Depending on the direction of aspect, the shade facing the strongest sunshine is usually shorter than the one facing relatively less baking sun.

Benefit of shade:

- ✓ Reduce soil temperature
- ✓ Shades reduce the day-time temperature and the rate of evaporation from soil and plants beneath them.

The need for shading /shade intensity /differs according to

- ✓ Species
- ✓ Stage of seedling development,
- ✓ Weather condition &
- ✓ location of the nursery

Orientation of shades

In order to obtain the maximum effect of the shade, the beds should be oriented east to west. During the period from April to September, when the sun is north of the equator, the shades should be sloping down to the north. During the rest of the year, which is the

main nursery period with most species in Ethiopia, the shades should slope down towards the south;

Sloping shades have an advantage over horizontal shades in cases that sowing and transplanting take place during the time of the year when there are rain showers. Pools of rainwater are easily formed on top of horizontal shades, and when these begin to leak, they cause some erosion in the bed below washing away both seedlings and soil.

The framework supporting the shades can be erected as follows:

Uprights:

sound durable poles, 3-5 cm in diameter or sawn timber 5 cm section, 120 cm long in front of the and 90 cm long for the rear. These should be sunken 20 cm in the soil at intervals of 2-3 m along the length of the bed just outside the reverting boards. If forked round sticks are used, they will have to be spaced 1.5 – 2m distance. The length pieces rest on the forks.

Length pieces:

Poles about 3 cm in diameter or sawn timber 3 cm x 3 cm is nailed on top of the up rights along the length of the bed. For forked up rights, the length pieces could be tied with the forks by using nylon rope.

Cross pieces:

Sawn timber, about 4cmx 2 cm section, 1.35 m long is nailed to the length pieces at intervals of 0.6-1.00 m to support the shades. Alternatively, poles 2-3 cm in diameter can be used for this purpose. These may be tied or nailed depending on the nature of the uprights

Self-Check	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write benefit of shade at least five. (6)

Note: Satisfactory rating - 3points

Unsatisfactory - below 3 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions

1 _____

2 _____

4.2. Filling polythene tubes

Use of poly bags/pots for raising seedlings has become very common with a large number of species, because this entails minimum disturbances to the root system, avoids the problem of digging, ease in transportation and gives higher survival.

The sizes of containers are determined mainly by site characteristics of planting area (rainfall, soil fertility) and species characteristics such as seedling vigor. Research result shows that optimum container volume is dependent on *mainly length than diameter (i.e. for the same volume length has greater effect than the diameter)*.

In general,

- ◆ for dry areas, we can use $L \approx 20-25\text{cm}$
- ◆ for areas with abundant rainfall $L \approx 15\text{cm}$
- ◆ The smaller the container, the bigger the likelihood of root cutting.

Quantity of potting soil:

$V = \pi r^2 l n$; Where: r = radius, l = length, n = number of seedlings to be produce

So if the soil mixture is 60% top soil, 30% sand and 10% compost hence, V_1 (top soil) = $0.6V$, V_2 (sand) = $0.3V$, V_3 (compost) = $0.1V$.

Method of potting operation

- ◆ by machines designed for potting (for large scale nursery stock production)
- ◆ manually operated

Filling soil mixes in pots /Containers

- ➔ sieve the soil mixture through 2mm mesh to remove clods/stones
- ➔ mix the ingredients and turn with shovel
- ➔ fill the bag by firmly compacting the lower third of container
- ➔ avoid air pockets in containers during the bag fill
- ➔ keep the soil mix moist while filling

Placing pots in blocks

The objectives are:

- to reduce bad growth of nursery
- to enhance good root growth
- to create sufficient space for drainage

Placing pots in blocks/ beds

- place pots in an upright position
- leave spaces between pots for rain and excess water drainage
- place pots in straight rows in blocks/ beds

Improper placing will result in:

- deformity of pots
- insufficient space for drainage
- distortion of root growth
- distorted growth of the nursery stock

Self-Check	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is Method of potting operation? (5)

2. Write benefit of pot. (5)

Note: Satisfactory rating - 18points

Unsatisfactory - below 18 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions

1 _____

2 _____

4.3. Arranging the polythene tubes on transplanting beds or blocks

The filled tubes can conveniently be stacked and carried to pot beds in robust planting trays. The tubes must remain in a vertical position all the time, in contrast to the compacted soil tubes which are stacked horizontally for convenience of nursery workers. (The best methods for producing vigorous healthy seedlings must take precedence over the convenience of the labor force when it comes to how things are done in the nursery.) Pots should be placed into pot beds exactly vertically to prevent roots growing unevenly within the pot. Pots should be packed tightly, but without deformation. This will leave spaces for drainage of any excess water between pots.

Proper placing of pot

- Pots are placed in upright position

- Pots space is to be left for rain and excessive water drained off easily

- Placed in a straight row

Improper placing of pot

- Deformity of pots

- Insufficient space for drainage

Self-Check	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the advantage of proper placing of pot? (5)

2. Write Improper placing of pot. (5)

Note: Satisfactory rating - 18points

Unsatisfactory - below 18 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions

1 _____

2 _____

4.4. Watering polythene tubes

The main objective of watering seedlings is to maintain enough moisture to the rooting zone to enable the seedlings grow satisfactorily. The frequency and amount of watering depends on the rate at which water is absorbed by the roots and the water holding capacity of the soil. The rate of absorption depends on species, size of seedlings density of seedlings and weather conditions. For this reasons, it is impossible to establish very general rules about watering. Every nursery manager should find the best possible watering regime himself/ herself.

The requiems of water for plants are:

- ❖ Mineral salt absorption important for proper growth of the plant
- ❖ Growth and fruit formation
- ❖ Transpiration by leave

Identifying the amount of water and frequency of watering

To mention some examples of watering quantity: in some Kenyan highland nurseries *Pinus patula* seedlings receive 15-20mm/ day. Watering trials in the same nursery indicated that as low quantity as 6mm/ day would give satisfactory growth. In Zambian nurseries, average watering for eucalyptus is 7-10mm/day (1mm of rainfall is equivalent to 1 liter of water per square meter)

Watering methods

- ✓ Use various irrigation methods
- ✓ A regular even application of water
- ✓ Watering at right time

Cares to be taken during watering

- ❖ Avoiding damaging the plant
- ❖ Avoiding damaging beds
- ❖ Avoiding over watering

Self-Check	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the requiems of water for plants? (5)

2. Describe *Watering methods* (5)

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

❖ **Short Answer Questions**

1 _____

2 _____

4.5. Carrying out transplanting tasks

Any plant that is growing in the seedbed is called **seedlings**. A plant, which is raised in a traditional bed where it was grown directly as well as from direct sowing into pot are also called seedlings. If a seedling is lifted from its bed and planted to another bed or pot in the nursery it is thereafter called “transplant”/**pricking out**

Transplanting is a crucial stage in the life of a plant. It always causes a shock to the seedling, even when carefully done and bad transplanting easily kills the seedling.

Size of seedlings: Conifers can be transplanted immediately after the seed coat appears above the soil surface at the “match stick” stage.

Broad-leaved seedlings should also be transplanted soon after germination. Some foresters claim that Eucalyptus must be transplanted until they have developed 4 leaves. Acacia and other legumes are transplanted when the first leaves appear after the complete unfolding of cotyledons.

Preparation for transplanting: For a couple of weeks before the intended transplanting day, the empty pots or beds should be watered lightly for some days. This encourages germination of weeds. As soon as the weeds have emerged they should be removed.

A good watering should be given if it is too dry while exposure to sun should be done if it is too wet. The pots/ beds should be moist but not too wet at the time of transplanting.

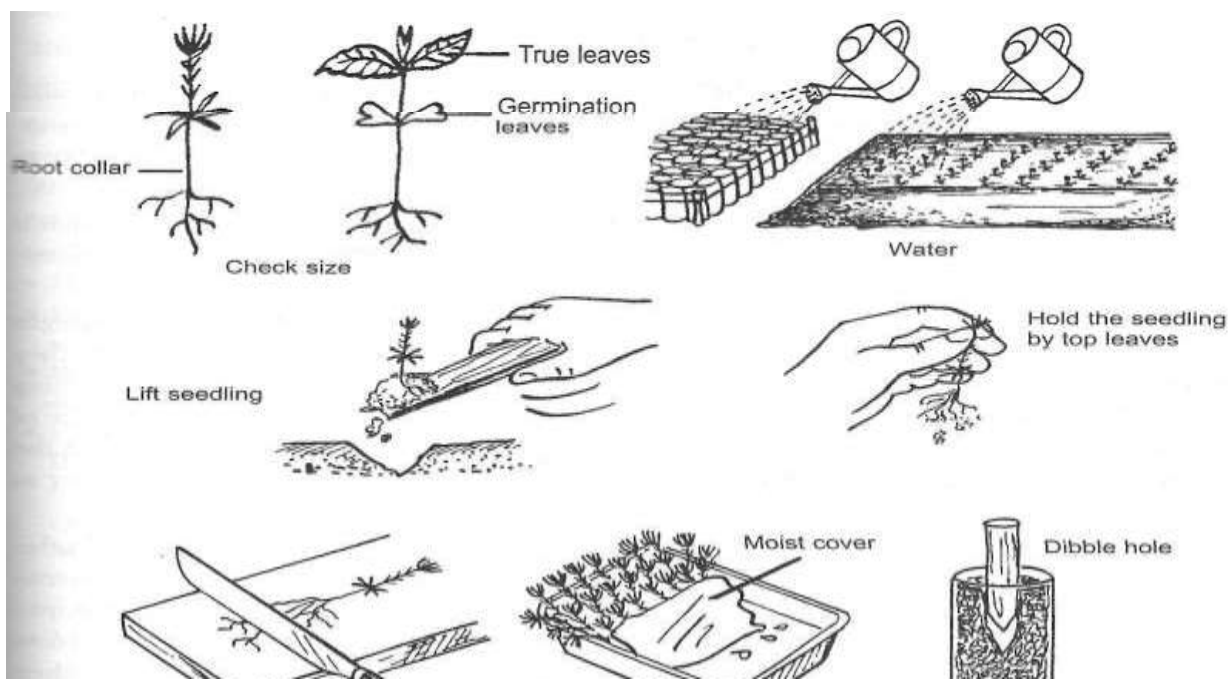
Lifting seedlings: small tins (cans) filled with a mixture of soil and water, or moist material and a dibble wooden sharpened stick about the size and shape of a pencil are the main tools used for transplanting. The seedlings are lifted under shade and placed immediately in the tin

Steps of transplanting process

1. The day before transplanting, water the beds (propagation)
2. Hold the leaves of the seedlings and insert a dibble underneath the root system to loosen soil.
3. Pull out seedlings gently; immediately put them into a water can (make vessels full of water)
4. Water the pots. (To moist the soil ;)
5. Make a hole with a dibble. (Tools made of wood for making holes)
6. Hold the seedlings leaves, and insert root system in.
7. Hold the dibble in a slanting position; insert it in the soil about 1/2 inches away from seedling to the same depth as the whole.
8. Replace the soil, slightly compact it.

Ways of planting seedlings in pots:

1. Take care not to break the roots of seedlings when you lift them
2. Choose seedlings that grow best (avoid stunted and poor looking seedlings)
3. Prepare the seedlings by trimming off part of the roots and leaves
4. Moist the soil to be worked upon enough (not wet enough to be sticky)
5. Make holes with a dibbler.
6. Plant the seedlings into holes and bury the roots up to the crown
7. Pack the soil down well around the plant
8. Take care not to disturb the roots
9. Water the planted seedlings thoroughly



- Pulling seedlings out of the soil without the use of a dibble stick to help remove roots intact. If seedlings are pulled out, it is common for this to result in the seedlings having only a taproot and no lateral roots. In addition, the force required to pull the seedling frequently causes mechanical stem damage, which in turn predisposes the plant to disease.
- Making a planting hole that is too shallow so the seedling is not planted deep enough. If roots are exposed to air they dry out rapidly and the seedling dies. Shallow holes also promote root deformation.
- Making a planting hole that is too deep, resulting in the plant stem being partly buried, with consequent greater chance of stem disease, especially if soils become too wet.
- Extremely hot, sunny or windy weather. This is especially important if shading is ineffective.
- Too little or too much watering. Excessive watering is especially a problem in heavy-textured soils where root-rot disease is also likely to become important.

Self-Check	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. **What is transplanting? (5)**
2. Write the **Steps of transplanting process. (5)**

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

❖ **Short Answer Questions**

1 _____

2 _____

Materials:

- Very young seedlings
- Seedling root covering cloth
- Small shovel
- Root pruning knife/pruning shear
- Wedge shaped flat pieces of wood
- Dibble
- Polythene bags filled with required soil mixtures
- Watering can

Procedures

1. Erect a large portable shade above the bed.
 1. The Tran planters should work in pairs on opposite side of bed. They can sit on low small stools.
 2. A hole is made with the dibble in the center of each pot.
 3. The root of seedling is placed carefully in the hole, and the soil is pushed toward the root with dibble to make sure no air is left around the root.
 4. If the seedlings has left too long in the seed bed the root should be trimmed back to 2-3 cm
 6. The soil around the seedlings must be firmed gently and smoothed with the fingers so that no depression is left around the stem.

Common causes of mortality following pricking-out are:

- Drying out of the roots in the time between lifting and replanting.
- Leaving air pockets around the roots instead of ensuring that the roots are in close contact with the soil.
- Waiting until seedlings are too large before transplanting. Then it is difficult to remove sufficient roots to maintain a satisfactory root/shoot ratio.

- Pulling seedlings out of the soil without the use of a dibble stick to help remove roots intact. If seedlings are pulled out, it is common for this to result in the seedlings having only a taproot and no lateral roots. In addition, the force required to pull the seedling frequently causes mechanical stem damage, which in turn predisposes the plant to disease.
- Making a planting hole that is too shallow so the seedling is not planted deep enough. If roots are exposed to air they dry out rapidly and the seedling dies. Shallow holes also promote root deformation.
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- Extremely hot, sunny or windy weather. This is especially important if shading is ineffective.
- Too little or too much watering. Excessive watering is especially a problem in heavy-textured soils where root-rot disease is also likely to become important. Too little watering is more likely when the potting mix is very well drained due to a sandy texture.

LAP Test -3	Practical Demonstration
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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 1 hour.

- Task 1. shape wedge flat as pieces of wood