Horticultural Crops Production

Level III

Learning Guide-34

Unit of Competence: Establish nursery

Module Title: Establishing nursery

LG Code: AGR HCP3M08LO1-LG34

TTLM Code: AGRHCP3TTLM0120v1

LO 1: Select nursery site

Instruction Sheet	Learning Guide #34

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

- Selecting site
- Selecting fertile areas with gentle slope
- Conducting survey & nursery plot design

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**:

- Select site
- Select fertile areas with gentle slope
- Conduct survey & nursery plot design

Learning Instructions

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 4,6 and 9 -.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio

Information Sheet-1	Selecting site

1.1 Introduction

Nursery is an area where the plants are propagated and maintained in the initial years. Most of the horticultural crops are raised in nurseries and then transplanted in the field. The nursery ensures better germination and establishment and also ensures saving of time, area and labour and makes easy maintenance.

1.1.1 Types of nursery

A nursery can be classified into different categories based on time duration. In general, we have two types of nurseries. These are:

A. Permanent nurseries:

- Large centrally located nurseries that are established where there is a demand for a large number of seedlings for long period of time (more than five years).
- Usually it has permanent workers including trained foreman or foresters.
- It has a better control in most activities and produces quality seedlings.
- Annual plant production exceeds 500,000 and requires bigger capital to establish and run them.

B. Temporary/flying/satellite nurseries:

- Annual plant production is less than 500,000
- Establish for a short period (<5 years).
- Require lesser capital to establish and run them.

E.g. Ethiopian Farmers Nurseries

1.1.2 Importance of nursery

1. To apply optimum growing conditions to the various plants during their very early stages.
2. To economize on seed, especially expensive hybrid seeds, ex 0.9_1.0 kg tomato seeds are needed for direct sowing in the field, which is much higher when compared with o.22 to 0.5 kg seed required for some of one hectare of land .it also saves spaces and time.

3. To eliminate or discard weak and diseased plants in order to obtain uneven stand on the field.
4. To give the seeds better conditions for germination.
5. Large number of plants can be obtained from small area
6. Sowing seeds in the nursery allows additional time for doing preparatory tillage in the main plot harvesting of the previous crop can also be prolonged if needed
7. Multiple cropping systems can be followed easily.

1.2. Basic requirements for selecting nursery site

The major factors to be considered in nursery site selection are:

1. The availability of water supply
2. The proximity of nursery to the plantation site
3. Favorable climatic, soil and land features
4. Land availability
5. Legal framework

Legal requirement for a commercial production employment practices, land ownership

Self-Check 1	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define nursery? (3 points)
2. Mention and discuss types of nursery? (3 points)
3. Discuss benefits of nursery for horticultural crops (4 points)
4. Mention major factors in nursery site selection? (5 points)

Answer

Score = _____

Rating: _____

Note: Satisfactory rating – 15 points Unsatisfactory - below 15 points

You can ask your teacher for the copy of the correct answer

Information Sheet-2	Selecting fertile areas with gentle slope

2.1 Selecting fertile areas

Soil fertility refers to the ability of soil to sustain agricultural plant growth, i.e. to provide plant habitat and result in sustained and consistent yields of high quality. A fertile soil has the following properties:

- The ability to supply essential plant nutrients and water in adequate amounts and proportions for plant growth and reproduction; and
- The absence of toxic substances which may inhibit plant growth.

The following properties contribute to soil fertility in most situations:

- Sufficient soil depth for adequate root growth and water retention;
- Good internal drainage, allowing sufficient aeration for optimal root growth (although some plants, such as rice, tolerate waterlogging)
- Topsoil with sufficient soil organic matter for healthy soil structure and soil moisture retention
- Soil pH in the range 5.5 to 7.0 (suitable for most plants but some prefer or tolerate more acid or alkaline conditions)
- Adequate concentrations of essential plant nutrients in plant-available forms;
- Presence of a range of microorganisms that support plant growth.

The chosen nursery site should have appropriate soil texture, depth, soil PH value
The texture of the soil should be neither sandy nor clay. The best soil for planting is loam**.** The PH of the soil should be between 5~7.

2.2. Topography

The area for nursery beds should be level, or nearly so. A slight slope (2% maximum) is beneficial for better surface drainage, but slopes greater than 2% can cause erosion, necessitating expensive control measures, and may cause undesirable translocation of soluble fertilizer salts.

Self-Check 2	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define Soil fertility? (5 points)
2. Write characters of fertile soil? (5 points)
3. Mention the topography used for nursery area (5 points)

Answer

Score = _____

Rating: _____

Note: Satisfactory rating – 15 points **Unsatisfactory - below 15 points**

You can ask your teacher for the copy of the correct answer

Information Sheet-3	Conducting survey & nursery plot design

3.1 Planning a nursery

1. There should be adequate store and tool shade.
2. Hardening off sheds should be near the propagation area.
3. Potting benches should be well positioned.
4. Every nursery should have a media preparation area.
5. Fencing is required to protect the nursery from animals and to minimize unauthorized entry.
6. High quality material should be used in constructing nursery structures.
7. Footbath should be placed at the entrance to all propagation site and facilities.

3.2 Nursery Design and Layout

In the design of a commercial nursery, all the nursery structures and other facilities are arranged to ensure a constant flow of activities. The layout of the nursery depends on:

- Climatic and environmental conditions.
- The type of scheme in operation.
- The type of propagation structure in use.
- The resources available.
- Other factors unique to each individual situation.

The figure below is a ground plan of a simple commercial nursery showing some of the major structures and facilities.

Figure 1 Nursery design and lay out

The size of land to be selected for nursery depends on –

1) Morphological characteristics of the plant species.
2) Size of the stock to be planted
3) The annual production target
4) Method of raising the seedlings
5) The degree of permanence of the site.

For intermediate nursery, the area actually occupied by the seedlings plus the access roads and storage sheds constitute the nursery area. In a permanent nursery, additional room has to be provided for crop rotation in order to maintain the organic matter and nutrient status of the soil. Where mechanical equipment is to be used, equipment maintenance and storage centers have to be provided for in the nursery.

Self-Check 3	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Mention how to design nursery plots? (5 points)
2. Write the difference between design and layout (5 points)

Answer

Score = _____

Rating: _____

Note: Satisfactory rating – 10 points Unsatisfactory - below 10 points

You can ask your teacher for the copy of the correct answer

Operation Sheet 1	Select the site for nursery

Objectives

- To select site for nursery purpose

Materials and tools

- Meter
- String
- Note book
- Bags
- pegs
- Spade
- Plastic bottles

Procedures of nursery site selection

1. Survey the topography of the land whether undulating, slopping or plain
2. Locate suitable spot for digging pits at 2-3 places in one hectare
3. Collect the soil samples layer wise from 0-60,60-120cm,120-2 meter
4. Put samples in bags, label individual bags indicating location of pits and depth
5. Indicate the source of water(such as well or irrigation canals)
6. Take the water sample in plastic bottles from 4-5 places for testing its suitability for irrigation purposes
7. Have the soil and water sample analyze in soil testing laboratory
8. Collect the metrological data from the nearest metrological observatory for the least 5 years.
9. Depending on the metrological data and soil and water test results, select the site for crop planned to be grown.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instruction: You are required to perform any of the following:

Task1. Identify site selection criteria for nursery

Task2. Select the proper site for nursery

Horticultural Crops Production

Level III

Learning Guide-35

Unit of Competence: Establish nursery

Module Title: Establishing nursery

LG Code: AGR HCP3M08LO2-LG35

TTLM Code: AGRHCP3TTLM0120v1

LO 2: Prepare nursery beds

Instruction Sheet	Learning Guide #35

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

- Clearing land from any vegetation
- .Ploughing land
- .Pulverizing and leveling soil
- .preparing seed beds

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**:

- Clear land from any vegetation
- .Plough land
- . Pulverize and level soil
- . prepare seed beds

Learning Instructions

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 16, 19, 22 and 28 -.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio

Information Sheet-1	Clearing land from any vegetation

1.1 Clearing

Site clearing describes the removal of native vegetation and deforestation. Land clearing involves the removal of native vegetation and habitats, including the bulldozing of native bush lands, forests, savannah, woodlands and native grasslands and the draining of natural wetlands for replacement with agriculture, urban and other land uses.

Figure 2 land clearing

The Contractor shall submit a site clearing method for all areas where the Contractor is required to, or intends to, clear vegetation, either within the road reserve or at the other designated construction areas outside the road reserve. The method statement shall clearly indicate chain age or land references and shall detail any search and rescue and/or seed collection to take place, what is to be cleared and how this will be done, where and how cleared material would be stored or disposed of, etc.

1.1.1 Vegetation clearing

No vegetation clearing shall take place without written approval of the method statement by the organization. No vegetation clearing shall take place until a search and rescue of conservation-worthy plants has been under taken. Vegetation clearing

shall take place in a phase manner in order to retain vegetation cover for as long as possible. All indigenous plant material removed from cleared areas shall be stockpiled for mulching. All remaining vegetation shall be removed and disposed of at an approved landfill site.

1.1.2 Topsoil

“

The Contractor shall remove topsoil from all areas where topsoil will be impacted on by construction activities, including temporary activities such as storage and stockpiling, etc. Stripped topsoil shall be stockpiled in areas agreed with the organization for later use in re-vegetation and shall be adequately protected.

1.2 Purpose of clearing

- Removal of vegetation
- Uprooting of weeds and vegetation
- Removal of unwanted materials
- Removal of pest and disease host

Self-Check -1	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is land clearing? (5 points)
2. Describe the purpose of land clearing? (5 points)
3. Mention types of land clearing? (5 points)

Answer Sheet

Score = _____
Rating: _____

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**
You can ask your teacher for the copy of the correct answers.

Information Sheet-2	Ploughing land

2.1 Introduction

The basic procedure for the mechanical working of soil with moldboard plows. In plowing, there is the simultaneous turning over, loosening, and intermingling of the soil. Turning over the soil buries the sod, fertilizers, weed seeds, many agricultural pests, and the causative agents of diseases. In the lower portion of the topsoil that is brought to the surface by plowing, the content of nutrients accessible for the plants increases under the effect of aeration, repeated moistening, and the rapidly activating useful soil microflora. Plowing makes it possible to maintain a small-clot composition of the topsoil. The degree of turning depends upon the shape of the moldboards and the ratio of the depth of working to the width of the furrow. Plows with helical moldboards (used on heavy clay and heavily grassed earths) turn the furrow most completely but break up the soil little. With cylindrical moldboards, the soil is broken up well, but the furrow is not turned over satisfactorily. With a cultivation form of the moldboard, the furrow is turned over well and broken up on soils of medium cohesiveness (with skim-colters and on grassed soils).

Figure 1. ploughing

2.2 Purpose of plowing

The primary purpose of plowing is to turn over the upper layer of the soil, bringing fresh nutrients to the surface, while burying weeds and the remains of previous crops and allowing them to break down.

As the plough is drawn through the soil, it creates long trenches of fertile soil called furrows. In modern use, a ploughed field is typically left to dry out, and is then harrowed before planting. Ploughing and cultivating a soil homogenises and modifies the upper 12 to 25 centimetres (5 to 10 in) to form a plough layer, where the majority of fine plant feeder roots grow

Self-Check -2	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the importance of plowing land? (5 points)
2. Describe methods of plowing? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**
You can ask your teacher for the copy of the correct answers.

Information Sheet -3	Pulverizing and leveling soil

3.1 Soil Preparation

Nursery bed preparation is an important step in crop management because it largely affects crop stand and its performance at field level.

Therefore, soil should be worked to a fine tilth by repeated ploughing and spading.

Raising of vegetable seedlings requires fertile and healthy soil. Preferably, the soil for nursery should be loam to sandy loam, loose and friable, rich in organic matter and well drained. The soil p^H should be close to the neutral i.e. about 7.0.

3.2 Soil treatment & amendment

Soil treatment is an essential step in a successful nursery management because it is the base for seedlings stand, source of nutrition and pathogens. In humid areas damping-off caused by soil borne fungi like Pythium, Rhizoctonia, Phytophthora etc, is a common disease in the nursery beds. Besides, pests like snails, cutworms and termite and mites are also damages young seedlings.

There are various measures for soil treatment like soil solarization, chemical treatment, biocontrol treatment etc. Soil solarization can be done with transparent polythene of 25-100 mm thickness during the hot and dry periods. For this soil should be moist before mulching because it increases latent heat and thermal sensitivity for resting of soil borne pathogens, harmful pests and weeds which can be reduced to a sustainable level. Chemical treatment of nursery beds can be done by Formalin solution (1:100; Farmaline: water) at a rate of 5 lt/sqm. The treated area should be covered with polythene sheets for 7-8 days and after that it should be remained open for next 7-10 days for facilitation of formalin emission

A soil test is a test which is used to gather information about the composition of the soil in a particular area. In a classic soil test, multiple samples are taken from the region of interest and tested before being averaged, ensuring that a random area of contaminated soil does not skew the sample.

Purpose

A soil conditioner, also called a soil amendment, is a material added to soil to improve plant growth and health. A conditioner or a combination of conditioners corrects the soil's deficiencies in structure and-or nutrients.

The type of conditioner added depends on:-

- ✓ The current soil composition
- ✓ Climate and
- ✓ The type of plant.

Some soils lack nutrients necessary for proper plant growth. Some hold too much or too little water, with water conservation aided in the latter. They can be incorporated into the soil or applied to the surface.

3.3 soils leveling

A nursery bed is leveled as a measure used in surface irrigation, such as basin and furrow irrigation. It consists of: preparing the irrigation plot in a way that no high and/or low spots disturb the uniform distribution of irrigation water on the field**.**

Self-Check -2	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is soil amendment? (5 points)
2. Mention types of soil problem? (5 points)
3. Write the importance of soil leveling (5points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**
You can ask your teacher for the copy of the correct answers.

Information Sheet -4	Prepare nursery beds

4.1 Definition of seed bed

A seedbed or seedling bed is the local soil environment in which seeds are planted.
A seedling bed is used to increase the number of seeds that germinate.

Nursery Site preparation

When to start raising seedlings: The time to start work in the nursery depends on when field planting is planned. It is important to allow sufficient time for seedlings to grow to a size where they will survive well in the field (normally 30 to 45 cm, though this depends on the species, where seedlings will be planted in farms, and how they will be managed). The initial labor needed to establish a nursery – in bed construction, soil collection, fencing, the procurement of tools, etc. – can take considerable effort but can be done some time in advance of raising seedlings. The sourcing of seeds or rootstocks that will be used to establish nursery plants will also often need to be done in advance.

Soil collection: The soil used to raise seedlings should be

- Fertile and should drain well.
- Clear the surface of weeds, leaves and other litter,
- Dig out the topsoil to a depth of about 10 cm deep.
- Remove any stones and roots,
- Then mix 2 parts of soil with 1 part of manure or compost and 1 part of sand

Nursery operations

Nursery operations involves various activities such as,

- Seed sourcing
- Seed bed preparation
- Sowing seeds
- Potting
- Pricking Out

- Shading
- Watering
- Weeding
- Root pruning
- Application of additional fertilizers or manure.

4.2 Preparing seed bed based on the types of crops and environmental conditions.

Before sowing seeds the beds should be leveled and pressed gently to make it firm. Nearly 15-20 cm raised beds of 45-50 cm width are always preferred for raising nursery. However, its length should be made according to the requirements or size of plots but should not exceed 5-6 m. In between beds, drains of about 30-45 cm width are prepared and connected to the main drain for removal of excess water during heavy pour. This space facilitates easy movement during intercultural operations and acts as physical barrier for inoculums spread. The drains are flooded during dry period to modify microclimate of nursery beds in favor of seedlings. In recent years various advancements have been made in nursery management for bed preparation to avoid possibilities of pathogen spread like use of soil less media, plug tray technique, perforated poly trays etc.

4.3 Types of nursery bed

There are 3 types of beds: flat bed, raised bed and hot bed.

i) Flat bed:

- The width of the bed is adjusted to approach its centre conveniently.
- Popular in areas where rainfall is not so heavy and field is well leveled and drained, flat bed is preferred.

Advantage of flat bed

- Flat bed is easy to produce or prepare
- Cost for preparation is less

Disadvantage of flat bed

- More chances of getting excess irrigation

- Soil becomes more compact

ii) Raised bed:

- This is the most common type of nursery bed which has been widely accepted by the vegetable growers.
- The height of the bed is kept to 20 cm and width from 80-100 cm with the convenient length as the requirement of the main field and 50-60 cm between two beds.

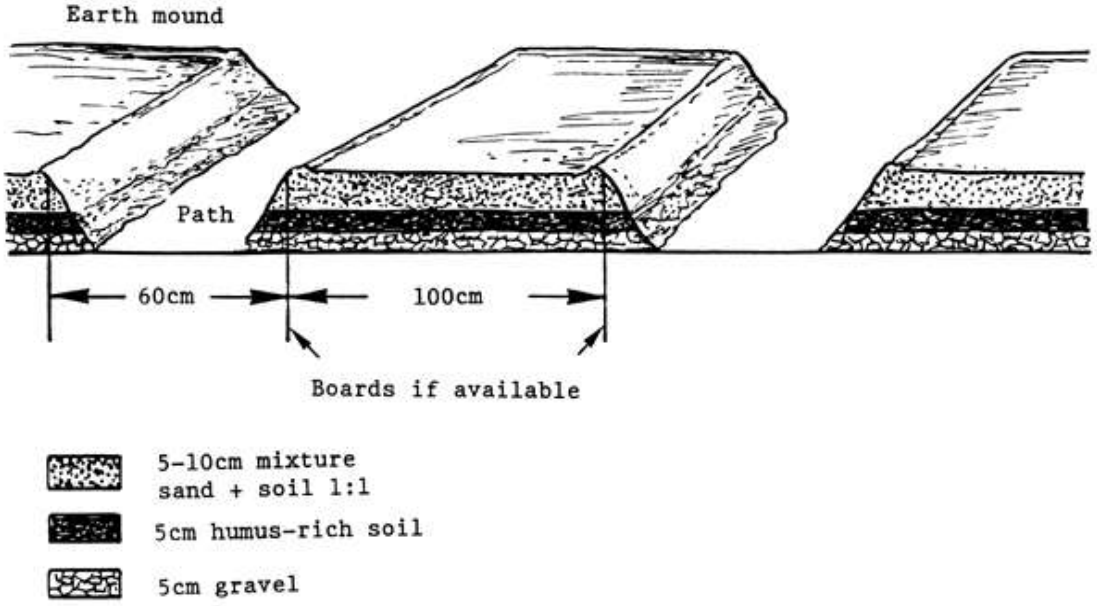


Figure 3 raised bed

Advantage of raised bed

- Facilitates proper drainage of excess H_2O
- Watering of seedlings can be done as per their needs
- Used for conducting essential operation like, weeding, watering, spraying insecticides
- Surface of bed becomes soft

Disadvantage of raised bed

- Require labor and additional cost

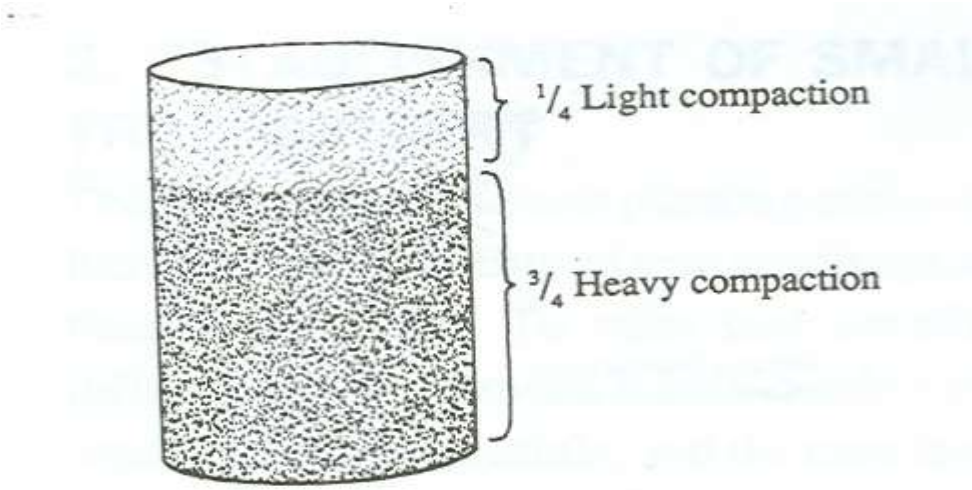
iii. Hot/sunken bed:

Usually constructed in areas where there is low rain fall and soil moisture.

4.4. Filling poly pots

When the mixture of soil/ sand/ compost is ready you can fill the poly pots by hand. A scoop made from an old half-liter plastic bottle will help speed up the process. Make the mixture very slightly moist, but keep it loose so that you can easily pour it. Fill the pot in three or four stages, firming down the mixture after each stage. Do not fill the whole pot and then try to firm all the soil at once, because this leaves air pockets. Fill the pot completely. Allow the mixture to settle for about four weeks. Do not allow the pots to dry out during this period. Water them periodically to permit the development of micro-organisms. This is especially important if the soil has been stored dry for some time. The pots are then ready to take seeds or transplants.

Heavy compaction should be avoided at the top of pots because it will inhibit root penetration.



Before planting seed, containers should be watered lightly. Sometimes, more than one seed can be planted in a pot and then, if more than one germinates, seedlings can be removed to leave a single individual. This approach might be used if germination rate is expected to be quite low

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 -4	Written Test

Name: _____ Date: _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers

1. Define seed bed? (3 points)
2. Mention types of nursery? (3 points)
3. Discuss advantages and disadvantages of raised seedbed? (5 points)
4. Discus the characteristics of flat bed? (4 points)

Answer Sheet

Score = _____

Rating: _____

Note: Satisfactory rating - 15 points Unsatisfactory - below 15 points

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

Operation sheet -1	Constructing seed bed

Objectives

To prepare nursery bed

Materials required

- Meter
- Pegs
- String
- Rake
- Wheel barrow
- Pickaxe
- Overall
- Safety shoes
- First aid kit
- Watering can
- Spade/ shovel

Procedures

1. Select site based on pre-set criteria's for seed bed construction
2. Clear land
3. Avoid unwanted vegetations and materials like stones, debris etc.
4. Perform digging of the selected land
5. Perform pulverizing and leveling of the soil
6. Perform proper mixing of soil and nutrient ratio or add organic matter to the soil if needed
7. Perform the lay out using triangular method
8. Measure the land using your meter based on your availability of seed
9. Construct seed bed and make it ready for seed sowing

Operation sheet -2	Filling pots

Objectives:

To fill Pot is help growing of seedlings in containers as standard method in most tree nursery projects.

Materials required

- Humus-rich soil
- Ordinary agricultural soil
- Sand
- Polyethylene bag
- Funnel/ scoop
- Pot cutting roll
- Sieve
- Water
- Overall
- Safety shoes
- Sharp knife
- First aid kit
- Watering can
- Spade/ shovel

Procedures

1. sieve the soil mixture through 2mm mesh to remove clods/stones
2. mix the ingredients and turn with shovel
3. keep the soil mix moist while filling
4. Fill the bag and firmly compact the lower third of container. You can use scoop/ funnel to fill the bag
5. avoid air pockets in containers during the bag fill
6. place pots in an upright position
7. place pots in straight rows in blocks/ beds in an upright position

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instruction: You are required to perform any of the following:

Task 1. Show how to select the site for nursery

Task 2. Clear the site

Task 3. Design and construct seed bed

Task 4. Prepare and fill the pots

Horticultural Crops Production

Level III

Learning Guide-36

Unit of Competence: Establish nursery

Module Title: Establishing nursery

LG Code: AGR HCP3M08LO3-LG36

TTLM Code: AGRHCP3TTLM0120v1

LO 3: Prepare materials, tools and equipment for nursery activities

Instruction Sheet	Learning Guide #36

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

- Identifying required materials, tools and equipment
- Conducting and reporting checks on all materials, tools and equipment
- Demonstrating and handling Techniques of loading and unloading materials
- Selecting suitable personal protective equipment (PPE)
- Identifying and reporting OHS hazards

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 required materials, tools and equipment
- Conduct and report checks on all materials, tools and equipment
- Demonstrate and handle Techniques of loading and unloading materials
- Select suitable personal protective equipment (PPE)
- Identify and report OHS hazards

Learning Instructions

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 36, 38, 41, 43 and 46 -.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio

Information Sheet -1	Identifying Required materials, tools and equipment

1.1 Definition:

Materials: are substances that things can be made from such as building materials, bricks, sand, glass, and planting materials

- Plastic sheeting, Hardwood poles, Bamboo poles, Wire mesh, Assorted hails, Thatching grasses, Cement, gravel, sand, Corrugated sheeting's, etc

Tools- that hold in your hand and use for making things or repair things e.g. is an instrument such as auger, hoe, rake, axes, shovel, saw, spade, scissors, sickle, fork, pruning sheared,

Equipment's and machineries: things that are needed for particular purpose or activity such as knapsack, motor pump etc.

1. Sprayers
2. Moisture meter
3. Motor pump
4. Tractor
5. Combine harvester
6. Seed cum fertilizer drill
7. Wheel barrow
8. PH meter

Nursery tools and equipment

1. Cutlass or Machete
2. Spade hoe
3. Local hand hoe
4. Spade
5. Shove
6. Rake
7. Digging fork
8. Trowel
9. Wheel barrows
10. Watering cans
11. Penknife
12. Pruning knife
13. Budding knife
14. Secateurs
15. Head Pan and buckets
16. Garden line or tape measure of 50m length
17. Budding tape

Nursery Materials

⇨ The following materials are some of those often used in a nursery.

1. Polythene bags
2. Insecticides and Fungicides
3. Herbicides
4. Fertile topsoil
5. Sawdust
6. Manures and fertilizers
7. Plants

Self-Check 1	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Define the word materials, tools and equipment's? (5 points)
2. List out materials, tools and equipment's used for nursery work? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10points**

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

Information Sheet -2	Conducting and reporting checks on all materials, tools and equipment

- Any maintenance problems will be reported to the handy man that works at our setting.
- Before purchase or loan, equipment and resources are checked to ensure that they are safe for the ages and the stages of the children currently attending the setting.
- The layout of play equipment allows adults and children to move freely and safely between activities.
- All equipment is regularly checked for cleanliness and safety and any dangerous items are repaired or discarded.
- All materials, including paint and glue are non toxic.
- Physical play is constantly supervised.
- Children are taught to handle and store toys and tools safely.
- Any person should learn about health and safety and personal hygiene through the activities we provide and the routines we follow.
- Large pieces of equipment are discarded only with the consent of the manager.

Self-Check 2	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Write ways of Conducting and reporting checks on all materials, tools and equipment (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

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

Information Sheet -3	Demonstrating and handling Techniques of loading and unloading materials

3.1. Proper handling of the items or materials during loading and unloading

We already separated faulty materials not to be transported to working area, however while loading and unloading we should take the necessary care not to break, holing, etc. and not to make any of these materials faulty for the next time work, by properly handling materials we can prolong the time of service they can give and also minimize the cost of buying new materials in replacement to faulty once. Therefore the care we should take during loading and unloading includes the following dos and undoes.

- Do not through materials from ground on to the vehicle
- Do not through materials from vehicle on to ground
- Hold and place materials one by one rather than making more than one or two
- When placing materials on the vehicle place them in stable position
- Place materials on ground in stable position
- Place similar materials together on the vehicle while loading and on ground when unloading

Figure 1. Correct manual handling

3.2. Taking care of vehicle (any transporting system) during loading and unloading

As already mentioned in the above topic, if materials will not be loaded properly, it is not only the materials that will be affected but also the vehicle as well. If we through materials from ground on vehicle we could break the glasses of the vehicle, we might hurt the loading surface and lead to fast depreciation of the vehicle. We might also create a problem when unloading materials improperly.

The first principle in loading and unloading materials is hold the material properly in both hands, keeping balance and safely placing the materials on vehicles or on ground, for these purpose at least two or more people are necessary one or more on the vehicle and one or more on ground.

Self-Check 3	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Write Proper handling of the items or materials during loading and unloading (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5points**

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

Information Sheet -4	Selecting suitable personal protective equipment (PPE)

4.1 Selecting and checking personal protective equipment's

Selecting implies the process of ensuring that the personal protective equipment is directly related in protecting the person as related to the job performed. Select boot, hats, lotions, googles, mask and gloves. In similar manner you need to identify the likely risks that might occur on your body or sense organs from specific agricultural crop works, then once you identify the risks it is necessary to select the necessary personal protective equipment that fit the body or the sense organ involved.

Figure 1. Personal protective equipment

3.2. Checking suitability of personal protective equipment

Checking involves many things such as the checking in faultiness of the personal protective equipment, checking the size, and checking the sufficiency in number of the materials for the available work force. If one of these is missing based on the level of the risk that occurs the expected risk could occur. Therefore don't precede a job until the problems with the PPE will be solved. The size of PPE should be fit with your size, if the PPE is faulty it should be maintained or a new one should be provided, and if the number is not sufficient only people with the PPE should work the job.

Self-Check 4	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Write the importance of checking personal protective equipment's (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5points**

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

Information Sheet -5	Identifying and reporting OHS hazards

5.1. Identifying and reporting OHS hazards

Definition: Occupational health and safety is concerned with health and safety in its relation to work the working environment.

Aims of occupational health

Occupational health should aim at:-

- ✪ The promotion and maintenance of the highest degree of physical, mental and social well being of workers in all occupation
- ✪ The prevention amongst workers of departures from health caused by their working conditions.
- ✪ The protection of workers in their employment from risks resulting from factors adverse to health.
- ✪ The placing and maintenance of workers in an occupational environment adapted to his physiological and psychological capabilities and
- ✪ To summarize the adaptation of worker to man and of each man to his job.

5.2. Work place hazards

The various work place environmental factors or stresses that may cause sickness, impaired health, or significant discomfort or inefficiency in works may be classified as chemical, physical, biological and ergonomic.

1. **Chemical hazards**

Chemical hazards include the followings;

- Dusts
- Mist
- Gases
- Fumes
- vapors

2. Physical hazards

All work places encounter some agents of the physical environment which have potential to present health hazards at work.

The physical hazards can be:

- Noise
- Vibration

- Heat

3. Biological hazards

Some workers are subject to specific health hazards relating to the nature of their work with biological

Some biological hazards of work place include: bacteria, fungal, virus etc.

5.3. Identifying Environmental Implications

Fruit nursery is a place where various operations are performed to produce superior planting materials/ seedlings so as to yield high quality and quantity fruit production. The site where it is established will be the most important factor in considering the ecological, social and political conditions. In any nursery management, one needs to include in his plan the environmental implications that can result serious danger to the nursery.

For example, if the nursery is established at the bottom of a hill or at a steeply topography, there will be an excess water or flood water. So you need to construct a drainage system and do some conservation practices in side and out side the nursery.

If there is also a high temperature, you need to construct a shade and/or green house; as well wind breaks for high, fast and dry winds etc.

Self-Check 5	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Explain OHS? (5 points)
2. Mention work place hazards? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10points**

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

Horticultural Crops Production

Level III

Learning Guide-37

Unit of Competence: Establish nursery

Module Title: Establishing nursery

LG Code: AGR HCP3M08LO4-LG37

TTLM Code: AGRHCP3TTLM0120v1

LO 4: Undertake nursery work

Instruction Sheet	Learning Guide #37

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

- Providing instructions and directions
- Undertaking nursery work
- Carrying out Interactions with other staff and customers
- Nursery policy, procedures and OHS requirements
- handling and disposal of materials
- Reporting problems

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**:

- Providing instructions and directions
- Undertaking nursery work
- Carrying out Interactions with other staff and customers
- Nursery policy, procedures and OHS
- handling and disposal of materials
- Reporting problems

Learning Instructions

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 55, 56, 59 and 61 -.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio

Information Sheet -1	Providing instructions and directions

1.1. Following instructions and direction

Following instructions is important to make tasks simpler, to ensure things are done effectively, to eliminate confusion and to save time. When instructions are properly followed, things work well. People who follow instructions show that they are cooperative, intelligent and dependable, while not following instructions can lead to life and death situations that may end tragically. When people do not follow instructions properly, it can cause chaos and great frustration in any type of environment.

In order to follow instructions, a person must listen well, read carefully and ask questions if necessary.

When a person does not follow instructions, he/she finds that finishing tasks is much more difficult. If a single person on a team does not adhere to instructions, then the entire team suffers on some level. Tasks that are done properly the first time do not have to be redone, so one saves time and effort by following instructions each time a task is tackled.

Following instructions can preserve one's health and wellbeing, and it is a necessary skill for a quality life. Rules are necessary for every well-functioning society.

Professionals that do not follow instructions place themselves and other people at a greater risk for injury and death. Opportunities for advancement are limited, and clashing with others becomes inevitable when a person does not care to heed instructions.

Self-Check-1	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

Name: _____ Date: _____

1. Why you need to have work instruction and direction (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

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

Information Sheet -2	Undertaking nursery work

2.1. Undertaking nursery operations

Activities in nursery establishment

Fence:

Prior to the establishment of a nursery, a good fence with barbed wire must be erected all around the nursery to prevent tress pass of animals and theft.

Roads and paths:

- A proper planning for roads and paths inside the nursery will not only add beauty, but also make the nursery operations easy and economical.
- This could be achieved by dividing the nursery into different blocks and various sections.

Office cum stores:

- An office-cum-stores is needed for effective management of the nursery.
- A store room of suitable size is needed for storing poly bags, tools and implements, packaging material, labels, pesticides, fertilizers etc.

Seed beds:

- In a nursery, this component is essential to raise the seedlings and rootstocks.
- These are to be laid out near the water source, since they require frequent watering and irrigation. Irrigation channels are to be laid out.
- Alternatively, sprinkler irrigation system may be provided for watering the beds, which offers uniform germination and seedling growth.

Successful nursery operation depends on many factors:

- selection and development of a suitable site
- efficient supervision and administration, adequate planning, forecasting and control procedures, orderly timing of operations;
- use of appropriate production methods and
- Protection from pests, diseases and other damage.

The main operations in a nursery include:

- planning, controlling and recording all stages from receipt of seed to consignment of plants to the forest
- seed storage and pre-treatment or preparation of cuttings
- soil preparation in the seed bed container or medium for inserting cuttings
- basal fertilizer production and top dressing to control nutrition
- sowing seed and/or rooting cuttings
- operations of pricking out, standing out, undercutting, lifting, transplanting, stumping, or preparing seedlings, etc.
- ensuring mycorrhizal or nodule inoculation if necessary for the chosen species
- weed and pest control (e.g. fungi, bacteria, insects and rodents);
- protection against climatic damage (by means of irrigation, shading and frost protection) and
- Staking.

2.2. Performing nursery activities

- Cultivate, pulverize and level the field after bringing soil to a good tilth.
- Raise 1m wide, 15-20 cm high beds and any convenient length (5-10m).
- Proper leveling of field and beds is important for water and disease management
- Raised bed and drainage is important
- Treat seeds
- Sow seeds about 1-2 cm deep in lines at cm apart.

2.3. Seed selection

Some of the seed selection criteria's are:

- High yielding
- Resistance to drought
- Resistance to diseases and pests
- Well mature
- Physiological fitness
- True to name
- True to type

- Widely adaptable
- Tolerant to stress
- Vigorous

2.2.1 Pre-treating seed:

it is important to treat seed before it is planted, in order to improve on the level, speed and uniformity of germination.

The most common methods for pre-treatment are:

- **Soaking seed in hot water** until the seeds look swollen.
- **Soaking seed in cold/cool water**.
- **Cracking** the seed shell method. This method is used for tree species with a hard coat .The cracking is done to allow water penetration for easy germination Cracking is done using a sharp knife, a stone or a cracking machine

2.4. Watering

Watering is a nursery maintenance activity that is frequently performed improperly. One of the causes is that for many growers, watering simply means wetting the soil surface. Effective watering, however, requires that water be delivered in adequate amounts to the root zone of the plants (recharging the root zone). It is important to note that the depth of rooting is influenced by moisture supply. Roots grow toward water. So if a plant is watered lightly, the roots stay near the soil surface as opposed to growing down when an area is soaked deeply.

Time of watering

The watering should do early the morning, before 10.00 a.m. & in the afternoon after 4:00 p.m.

2.5. Mulching

Mulching is any artificial modification of the soil surface.

- Mulching means covering the bed surface with a 0.5 - 0.2 cm layer of organic materials Germinating seeds need warmth, moisture, light is not necessary in most cases.

Picture 1. mulching

Materials

- Grass
- Rice straw
- Rice husk
- Compost, and
- Partly decomposed forest litters or saw dust is commonly utilized.
- Avoid the use of mulch to beds in rainy areas as this can reduce aeration and risk of damping off would be increased

- Plant stock material from other nurseries (seed, cuttings, scion wood and rootstock) can harbor nursery pests.
- Diseased plants in a nursery should be culled rigorously and burnt rather than composted.

2.6. Removing weeds

The chemicals used to kill weeds are referred to as Herbicides.

Weed Elimination techniques (The principal methods of weed control):

Weeds can be eliminated by

- Manually by hand
- mechanically - weed control by motor cultivators, tillers, & rotary hoes attached to a tractor
- Chemically- Herbicides like 2.4.D and 2.4.5.T

2.7. Apply fertilizer

- Developing and maintaining high levels of fertility in nurseries are essential for producing good quality nursery stocks.

2.8. Root Pruning

Root pruning is a standard in most Ethiopian nurseries. Root pruning involves cutting of the taproot, in some cases also of lateral roots

2.9. Thinning

Thinning in nursery refers to the way of reducing the density of seedlings for different purposes.

- To strengthen the vigor and health of plants.
- To reduce completion (water, air and nutrients).
- To minimize disease transmissions.
- To avoid deformed plants.
- To use nursery stock (cuttings and rooting) for duplication

Self-Check-2	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

Name: _____ Date: _____

1. Explain the most common methods for seed pre-treatment? (5 points)
2. Mention seed selection criteria? (5 points)
3. Elaborate the purpose of thinning? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 15 points Unsatisfactory - below 15 points**

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

Information Sheet -3	Carrying out Interactions with other staff and customers

Positive interactions increase good feelings, increase morale and improve work satisfaction. Take the time and energy to help everyone in the organization develop the skills for positive interactions, whenever possible. There are many benefits to having effective working relationships.

The importance of interacting with customers. A key area of social responsibility is customer interaction. It's about identifying a player who is at risk of harm and interacting with them to reduce that risk.

Best ways of interaction with staff and customers

- Schedule regular open meetings.
- Use appropriate body language.
- Speak simply.
- Utilize visuals.
- Value every team member's ideas.
- Establish ground rules for the team.
- Encourage debate.
- Show appreciation.

Self-Check-3	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

Name: _____ Date: _____

1. Explain the importance of positive interaction with customers? (5 points)
2. Write the best ways of interaction with staff and customers? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 10 points Unsatisfactory - below 10 points**
You can ask your teacher for the copy of the correct answers.

Information Sheet -4	Nursery policy, procedures and OHS requirements

4.1. Nursery policy, procedures and OHS requirements

1. Identify the potential for planting material production and to set realistic production targets based on the resource availability.

2. Location of targeted planting material production as selection of an ideal location can also serve to improve Production quality considerably.

3. The major considerations would be propagation method and its seasonal variations for success and quality of the final produce, rootstock to be used, and specifications for the scion / bud wood including its genuineness and seasonality of availability.

4. Identify the inputs necessary for each stage of production and develop specifications and requirements for each input.

5. An appropriate procedure might call for periodic measurement of microbial load, soluble salts and pH of the water and media prior to use in production while container label of fertilizers and pesticides may be checked for content and active ingredient concentration while procuring and the composition of the fertilizer / pesticide solution should be verified prior to use.

6. Proper nursery records may be maintained incorporating all the above information either in the registers and / or in the computer for monitoring.

Self-Check-4	Written Test

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

Name: _____ Date: _____

1. Explain the most common nursery OHS requirements? (5 points)
2. Mention Nursery policy, procedures and OHS requirements? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating – 10 points Unsatisfactory - below 10 points**

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

Information Sheet -5	Reporting problems or difficulties

5.1. Reporting problems or difficulties

Reporting is informing all information related to the work to a person who concerns about. It helps to the supervisor and other concerned persons' to know the standard of the work and at what level the work activities are found and also help to supply solution by concerned people if problems are there.

There are a number of problems occurred during nursery work, of which some of them are as follows:

a. Faultiness of the tools and equipments
b. Lack of materials for maintaining tools and equipments
c. Lack of personal protective closes
d. Unsuitability of personal protective closes
e. Lack of materials, tools and equipments during the work
f. Lack of agricultural inputs
g. Loss of tools and equipments during the work
h. Damage to the vehicle etc

The problems occurred during undertaking nursery should be reported to the supervisor so that there will be solution for the coming work cycle.

Self-Check-5	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Explain the importance of Reporting problems or difficulties? (5points)

2. Mention some of the problems occurred during nursery work (5points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**
You can ask your teacher for the copy of the correct answers.

Operation sheet -1	Establish nursery

Objectives

- To establish nursery for horticultural crops production

Material required

- Meter
- String
- Overall
- Seed bed preparation tools (water cane, spade or shovel, rake, pegs etc)
- Safety shoes
- Growing media (loamy soil, sand and manure)

Procedures:

- Select the nursery site near to the production site
- Lay out propagation structures, buildings, windbreaks
- Prepare raised seed beds of 5m long, 1m wide and 0.20m high from the ground level to permit drainage.
- Prepare the seedling raising media as per the following;
  A, potting mix container grown seedlings:
  - ✓ 2 part loamy soil + 1 part coarse sand + 1 part leaf mould + 1 part well rotten manure.
- Sprinkle some coarse sand to prevent fine soil from clogging the drainage hole.
- Produce fresh seeds from healthy and vigorous trees.
- Wash the extracted seeds in cold water and dry in shade after they are treated with wood ash.
- Make shallow furrows in the seedbed and sow with the help of roe maker.
- Sow the seeds in furrows at a depth two to three times of their diameter.
- Cover the seeds firmly with fine sand and soil or leaf mould.
- Compact the seedbed by hand or seed leveler.
- Water the seedbed with watering can.
- Mulch with grass or other available materials

Lap test	Practical demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instruction: You are required to perform any of the following:

Task 1. Prepare seed bed and sow the seed

Task 2. Manage nursery beds

Horticultural Crops Production

Level III

Learning Guide-38

Unit of Competence: Establish nursery

Module Title: Establishing nursery

LG Code: AGR HCP3M08LO5-LG38

TTLM Code: AGRHCP3TTLM0120v1

LO 5: Store and stockpile Materials

Instruction Sheet	Learning Guide #38

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

- Storing plant debris and waste material produced during nursery activities
- Preparing and processing plant debris and waste materials
- Stockpiling surplus materials
- Maintaining a clean and safe work site

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 –

- Store plant debris and waste material produced during nursery activities
- Prepare and process plant debris and waste materials
- Stockpile surplus materials
- Maintain clean and safe work site

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 67, 71, 73 and 75 -.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio

Information Sheet -1	Store and stockpile Materials

When working in nursery there is range of un wanted waste materials left over that needs to be dealt with things such as old or broken pots/tubs un used root bound plants, un wanted cutting materials , surplus potting media, soil, fertilizer, bags, tags ,packing materials ,mulches, plant debris and faulty irrigation parts. It is best practice when finished to leave completely clean working areas free of rubbish all materials should be disposed of according to local council guidelines and the waste management and pollution control act.

Self-Check -1	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Write why we Store and stockpile Materials? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**
You can ask your teacher for the copy of the correct answers.

Information Sheet -2	Preparing and processing Plant debris and waste materials

Plant debris: Litter fall is characterized as fresh, undecomposed, and easily recognizable (by species and type) plant debris. This can be anything from leaves, cones, needles, twigs, bark, seeds/nuts, logs, or reproductive organs (e.g. the stamen of flowering plants). *Plant debris* (bracts, leaves, twigs from mechanical gathering) decompose during storage because, if there is an excess of moisture in seeds, there is fermentation and overheating. Storage must then be ventilated (wheat, cotton). Metallic *debris* could lead to sparks that may generate fires and even an explosion

Waste management is the collection, transport, processing, recycling or disposal, managing and monitoring of waste materials.

The term usually relates to materials produced by human activity, and is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management is also carried out to recover resources from it. Waste management can involve solid, liquid, gaseous or radioactive substances, with different methods and fields of expertise for each.

Waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers. Management for non-hazardous waste residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities, while management for non-hazardous commercial and industrial waste is usually the responsibility of the generator.

Waste management concepts

- There are a number of concepts about waste management which vary in their usage between countries or regions. Some of the most general, widely used concepts include:

Methods of waste management

1. Re-use: the direct re-use of the waste as is, without further processing

E.g. polythene tube

2. Landfill

Disposing of waste in a landfill involves burying the waste, and this remains a common practice in most countries. Landfills were often established in abandoned or unused quarries, mining voids or borrow pits. A properly-designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Older, poorly-designed or poorly-managed landfills can create a number of adverse environmental impacts such as wind-blown litter, attraction of vermin, and generation of liquid leachate. Another common byproduct of landfills is gas (mostly composed of methane and carbon dioxide), which is produced as organic waste breaks down an aerobically. This gas can create odor problems, kill surface vegetation, and is a greenhouse gas.

3. Incineration

Incineration is a disposal method that involves combustion of waste material. Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". Incinerators convert waste materials into heat, gas, steam, and ash.

Incineration is carried out both on a small scale by individuals and on a large scale by industry. It is used to dispose of solid, liquid and gaseous waste. It is recognized as a practical method of disposing of certain hazardous waste materials (such as biological medical waste). Incineration is a controversial method of waste disposal, due to issues such as emission of gaseous pollutants.

4. Recycling

The popular meaning of ‘recycling’ in most developed countries refers to the widespread collection and reuse of everyday waste materials such as empty beverage containers. These are collected and sorted into common types so that the raw materials from which the items are made can be reprocessed into new products. Material for recycling may be collected separately from general waste using dedicated bins and collection vehicles, or sorted directly from mixed waste streams.

5. Biological reprocessing/ composting

Waste materials that are organic in nature, such as plant material, food scraps, and paper products, can be recycled using biological composting and digestion processes to decompose the organic matter. The resulting organic material is then recycled as mulch or compost for agricultural or landscaping purposes. In addition, waste gas from the process (such as methane) can be captured and used for generating electricity and heat (CHP/cogeneration) maximizing efficiencies. The intention of biological processing in waste management is to control and accelerate the natural process of decomposition of organic matter.

Self-Check -2	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Define plant debris? (5 points)
2. What is waste management? (5 points)
3. Mention Methods of waste management (5points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 15 points Unsatisfactory - below 15 points**
You can ask your teacher for the copy of the correct answers.

Information Sheet -3	Stockpiling surplus materials

Stockpiling waste

To responsibly stockpile waste or waste derived products you need to:

- receive, store, treat, process or dispose of the waste (including waste for reuse) in an appropriate manner
- only store waste temporarily
- have an immediate market for the waste derived product
- implement appropriate environmental controls and waste segregation
- dispose of residual wastes
- Comply with legal obligations.

A stockpile is a pile or storage location for bulk materials, forming part of the bulk material handling process. Stockpiles are used in many different areas, such as in a port, refinery or manufacturing facility. The stockpile is normally created by a stacker. A reclaimed is used to recover the material. Materials may be accidentally dropped and not put in the bin. A perimeter fence will help to keep this material from being carried off site by wind or water. A perimeter fence can also prevent unauthorised persons gaining access to a site

Self-Check -3	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Explain the importance of stockpile? (5 points)
2. Write nursery surplus materials? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating - 10 points Unsatisfactory - below 10 points**
You can ask your teacher for the copy of the correct answers.

Information Sheet -4	Maintaining a clean and safe work site

Maintenance involves keeping the workplace, its structures, equipment, machines, furniture and facilities in good repair and operating efficiently and safely. It includes many tasks including repairing, replacing, servicing, inspecting and testing. The term could also be used in relation to the importance of keeping your staff safe, fit and healthy.

Site maintenance

1) The job site shall be kept in a neat, clean, and orderly condition at all times.

2) All scrap and excess materials are to be regularly removed from the site.

Next to tidiness, cleanliness is one of the most essential elements in maintaining a healthy and safe work environment. Not only does a clean workplace reflect the professionalism of a business or facility and help motivate employees, it also promotes a healthy workforce as a clean environment prevents accidents and the spread of germs.

Like Health & Safety, maintaining a clean work environment is the responsibility of everyone.. However, there is only so much cleaning the team can do during each shift and in such cost conscious times it makes sense for employees to adopt some simple good housekeeping practices and allow the cleaning team to concentrate on hygiene and deep cleaning tasks.

Self-Check -4	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Write the nursery areas which need maintenance? (5 points)
2. What is the importance maintaining nursery work area? (5points)

Answer Sheet

Score = _____

Rating: _____

Note: **Satisfactory rating – 10 points Unsatisfactory - below 10 points**
You can ask your teacher for the copy of the correct answers.

Horticultural Crops Production

Level III

Learning Guide-39

Unit of Competence: Establish nursery

Module Title: Establishing nursery

LG Code: AGR HCP3M08LO6-LG39

TTLM Code: AGRHCP3TTLM0120v1

LO 6: Clean up on completion of nursery work

Instruction Sheet	Learning Guide #39

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

- Storing plants and materials
- .Cleaning, maintaining and storing tools and equipment
- Reporting work outcomes

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 –

- Store plants and materials
- .Clean, maintain and store tools and equipment
- Report work outcomes

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 80, 82 and 84 -.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio

Information Sheet-1	Storing plants and materials

After completion of activities, all tools and equipment must be cleaned. The nursery working environment should be kept clean of any west materials and plant debris.
If there is any broken tools and equipment, it should be maintained. Broken handles and blunted tools should be checked on time, maintained and made ready for work.
All tools and equipment should be well organized and stored in groups of similarity after maintenance

Pay extra care and attention to items made from plant materials because of their inherent fragility. The decomposition of items made from plant materials is often initiated by the fragility of the materials themselves, the construction techniques, normal use, inadequate storage, and mishandling. They are particularly susceptible to the three leading types of deterioration.

Physical Deterioration: Swelling and shrinkage due to an excessively humid or dry environment, and fragility due to excessive light exposure; also includes tears, breaks, misshapen structures, abrasion, and soiling.

Chemical Deterioration: Reaction between the item and other materials causing a chemical change that leads to such problems as embritlement.

Biological Deterioration*:* Mold, bacteria, fungi, soiling, or infestation of insects or rodents.

Deterioration, whether it is physical, chemical, mechanical, or biological, will likely result in very fragile items that are prone to embrittlement, distortion, and areas of loss. Items constructed of plant materials, including three-dimensional items, such as baskets and hats, and two-dimensional or flat items, such as mats, should not be flexed, scraped, or abraded.

Plant materials are susceptible to damage from both humid and dry environments. A basket constructed of woven reeds, leaves, grasses, or bundles of pine needles that becomes saturated with moisture from high humidity may become too heavy to support

itself. Swelling due to humidity can cause stress on many traditional construction techniques. Items made of birch bark can swell or warp. This swelling leads to breaks within woven or tied fiber bundles, allowing the bundles to splay out of position. Warping or fractures can also occur on a microscopic level within the plant materials. The risk is also greater for older, more fragile items stored within humid environments.

Self-Check 1	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. What can you do after completion of nursery activities? (5 points)
2. What is the advantage of storing plants and materials? (5 points)
3. How we can reduce the impacts of deterioration of tools? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: Satisfactory rating – 15 points and above Unsatisfactory - below 15 points

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

Information Sheet-2	Cleaning, maintaining and storing tools and equipment

2.1 Cleaning

Cleaning is the removal of dirt and organic substances from surfaces of tools and equipments. Through the cleaning procedures, high numbers of microorganisms (90% and more) present on the mentioned objects will be removed.

Inactivation of those microorganisms requires antimicrobial treatments, carried out through hot water or steam or through the application of disinfectants. Disinfectants are chemical substances, which kill microorganisms but should not affect human health through hazardous residues and not cause corrosion of equipment.

Figure 4 cleaning

2.2 Storing or disposing materials

Tools and equipment should be stored and disposed according to the manufacturer's specifications, enterprise procedures and regulations. This is used to increases life span of tools and equipments and avoids scarcity of tools and equipments at critical periods.

After completion of all field establishment activities all containers, leftover fluids, waste and debris should be disposed safely and appropriately. Waste materials which may be toxic to human beings or pollutants environmental conditions should be properly disposed to minimize hazards.

Self-Check 2	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. What is the advantage of cleaning and storing tools? (5 points)
2. Specify materials which can be Stored or disposed? (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: Satisfactory rating – 10 points and above Unsatisfactory - below 10 points

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

Information Sheet-3	Reporting work outcomes

3.1. Report work outcomes

Once you have finished your nursery work activities, you have to report the result that what you are done the entire nursery activities must be record daily what, when, how, why the nursery is step by step and must be report the work out comes to the supervisor as well as to the enterprise and concerning body.

When you report work out comes to the concerning bodies/enterprise you should be fill full:

- ✓ Both success and failures
- ✓ Reason of success and failures
- ✓ Tools, materials and equipment you used
- ✓ Those who are involved in the nursery work
- ✓ Feed back of the nursery work
- ✓ Comment/suggestion if you need to arrange for further improvements

Self-Check 3	Written Test

Name: _____ Date: _____

Directions: **Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers**

1. Which outcomes can be reported during nursery work? (5 points)
2. When you report work out comes to the concerning bodies/enterprise write what you should be fill full (5 points)

Answer Sheet

Score = _____

Rating: _____

Note: Satisfactory rating – 10 points and above Unsatisfactory - below 10 points

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

Reference

- Forest Nursery Manual: Production of Bareroot Seedlings. Martinus Nijhoff/Dr
- https://en.wikipedia.org/wiki/Plough.
- https://en.wikipedia.org/wiki/Seedbed
- Good Nursery Practices: A Simple Guide. Nairobi. The World Agroforestry Centre.
- Resource Book on Horticulture Nursery Management
- The World Agroforestry Centre, United Nations Avenue,
- www.worldagroforestry.org

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