# Basic Agricultural Production and Natural Resources Conservation level I

# Learning Guide-1

**Unit of Competence:-Support Nursery Establishment and Basic Nursery Work Module Title: Supporting Nursery Establishment and Basic Nursery Work**

**LG Code: AGR BAN1 M05 LO1-LG-01**

**TTLM Code: AGR BAN1 M05 TTLM 0919v1**

## LO 1: Prepare materials, tools and equipment for nursery establishment & basic nursery work.

| Instruction Sheet | Learning Guide #1 |
|---|---|

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

- Identification of tools and equipments.
- proper handling of materials and equipments
- Techniques of loading and unloading of materials and tools.
- Selection of appropriate personal protective equipments(PPE)
- Providing support and workplace information.
- Identification of 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 of tools and equipments.
- proper handle of materials and equipments
- Techniques of loading and unloading of materials and tools.
- Select of appropriate personal protective equipments(PPE)
- Provide support and workplace information
- Identification of OHS hazards

**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 and Sheet 4 Sheet 5”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4 Self-check 5” **in page -8, 10, 13, 17 and 20** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1,” **in page -20.**
6. Do the “LAP test” **in page – 20** (if you are ready).

| Information Sheet-1 | Identification of tools and equipments |
|---|---|

## 1.1. Identifying materials, tools and equipment.

Different kinds of tools are required in the nursery to carry out various kinds of operations:

Essential operations in the nursery are:

| | |
|---|---|
| Digging | Pruning |
| Hoeing | Watering |
| Raking | Spraying |
| Site Clearing | Seed collection etc |

### A. Tools required for working on the soil

- **Pickaxe** --- used to break up hard and stony ground
- **Traditional hoe** --- for loosen the soil
- **Shovel** --- for moving earth, sieving soil and soil mixing
- **Flat pronged fork** --- for loosening the soil and to lift bare-roofed seedlings and to turn over compost
- **Rake** --- break up and level the soil; and it has a row of 10-16 teeth and is kitted up with a 1.80 m handle

### B. For layout

**Tracing line** --- thin hemp or nylon cord 10 cm long (with knots at 1m intervals), attached to 30~50 cm long pegs at each end, and used to trace straight lines. e.g. boards of seed beds or pot beds to measure distance.

*Figure 2 Tracing line*

### C. For preparation of putting soiled pot filling

- ✓ **Sieve**—soil for seed beds and for potting should not contain large-size particles, stones, pieces of weed or something alike.
  - sieve size approx 1.5m

- Dimension 1×1.5m

- ✓ **Funnel**: for speeding up pot filling if inserted in the polythene tube
- ✓ **Scoop** - made of metal sheet, it is an efficient tool for filling and compacting soils in pots.

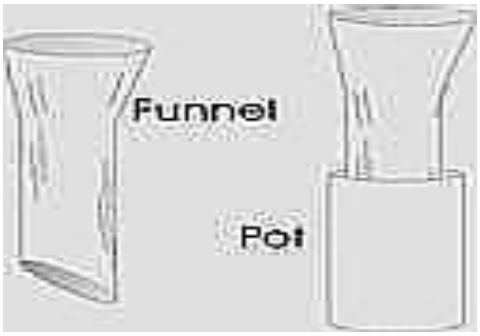



*Figure 3 Potting funnel*

- ✓ **Pot cutting roll**---- a simple cutting gauge which permits rapid cutting of the tube into pots of standard length (15, 20 or 30cm).It can be made locally.

  To obtain pots in 20cmlength, the piece of rounded tube has to have diameter of 6.5cm and of 9.5cm for 30cm long.

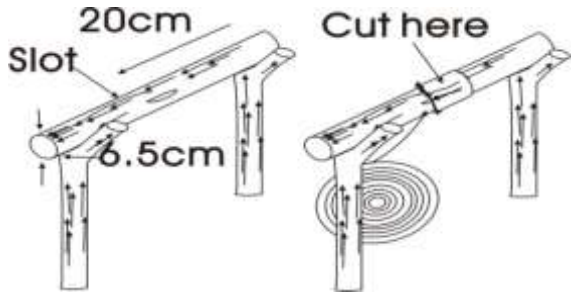



*Figure 4 Pot cutting roll*

**D) For watering**

**Watering can-**---it can be made of metal or plastic; and it should have a capacity of 10-12L; kitted up with fined-perforated sprinkler to avoid damage to young plants and dentations of root from splashing water.

**E) For transport within Nursery**

**Wheel barrel-** for transferring all kinds of materials in the nursery; potting soil, seedling ready for delivery…etc.

**F) For tending seedlings**

- ✓ **pruning knives, shears**:
  - Used to prune the roots that grow out of pot/root zone
- ✓ **Trowels** : pots into the ground of the pot bed
- ✓ **Flexible steel wire** Used to prune the roots that grow out of pot/ root zone

- ✓ **Machete ----** long knife which can be used for many purpose such as cutting fence posts

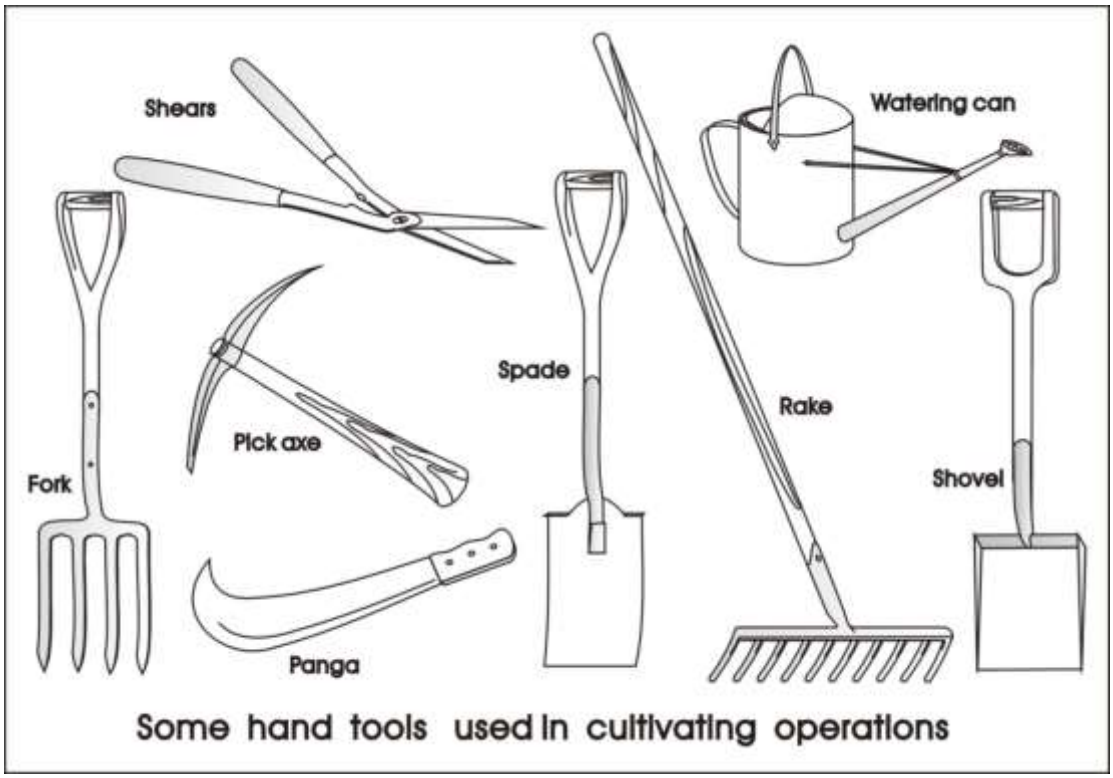
  - Removing weedy fences
  - Trimming living fences
  - Chopping left-over seedlings for composing…etc

**G) Tools for weeding**

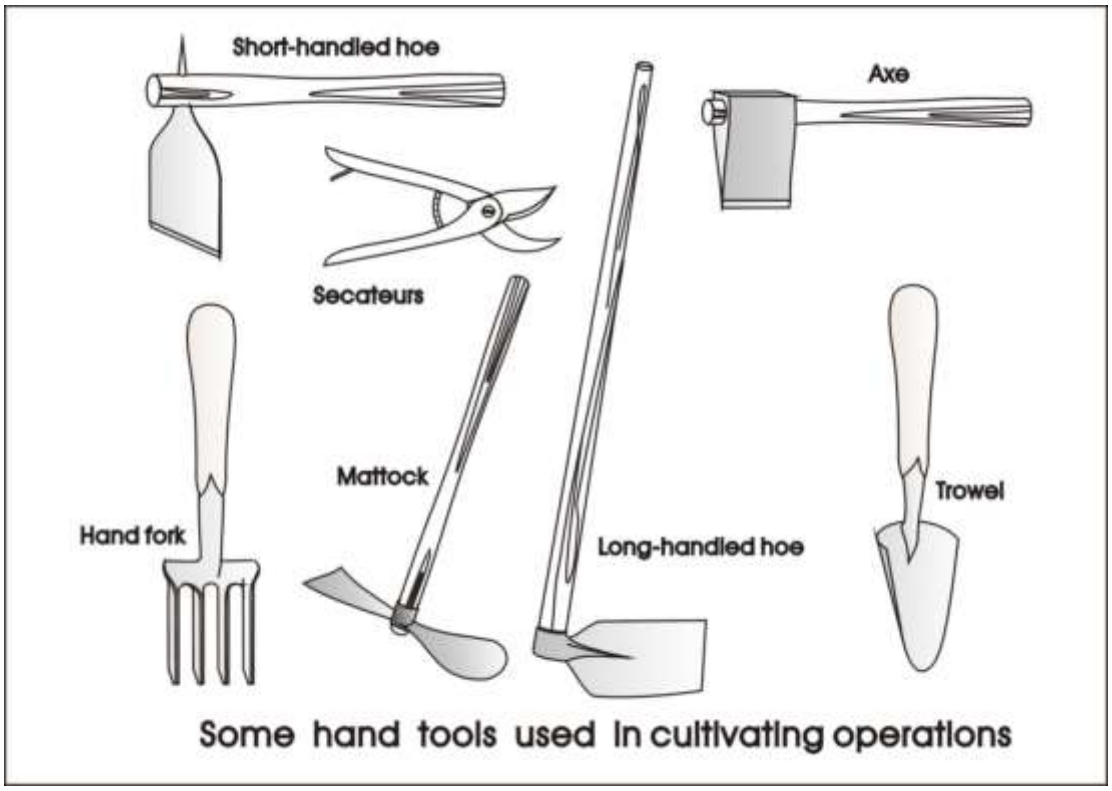
- ✓ Simple tools like a pointed piece of stick, with strong hammered flat at one end and a handle at the other, are useful for weeding on seed beds & potted stock

**H) Tool for pricking out**

- ✓ A small shovel, a flat piece of wood, or simply a spoon is useful to lift germinated seedlings for pots transplanting without damaging their roots.



Some hand tools used in cultivating operations

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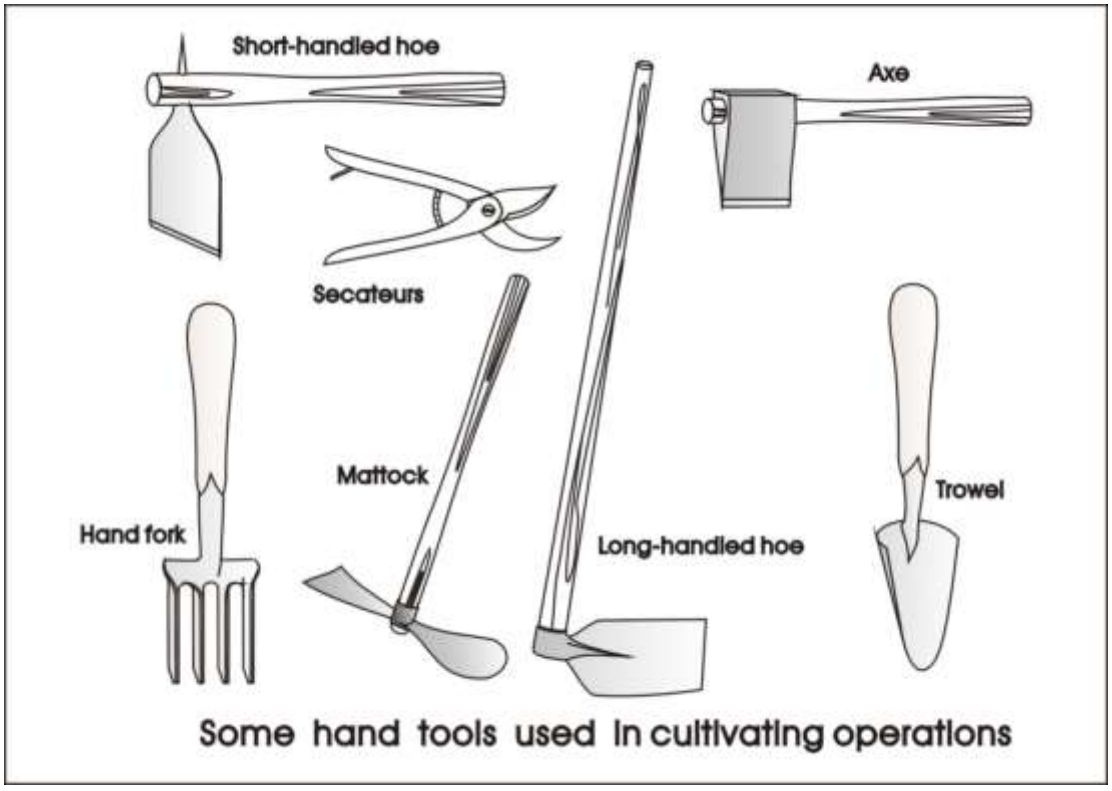


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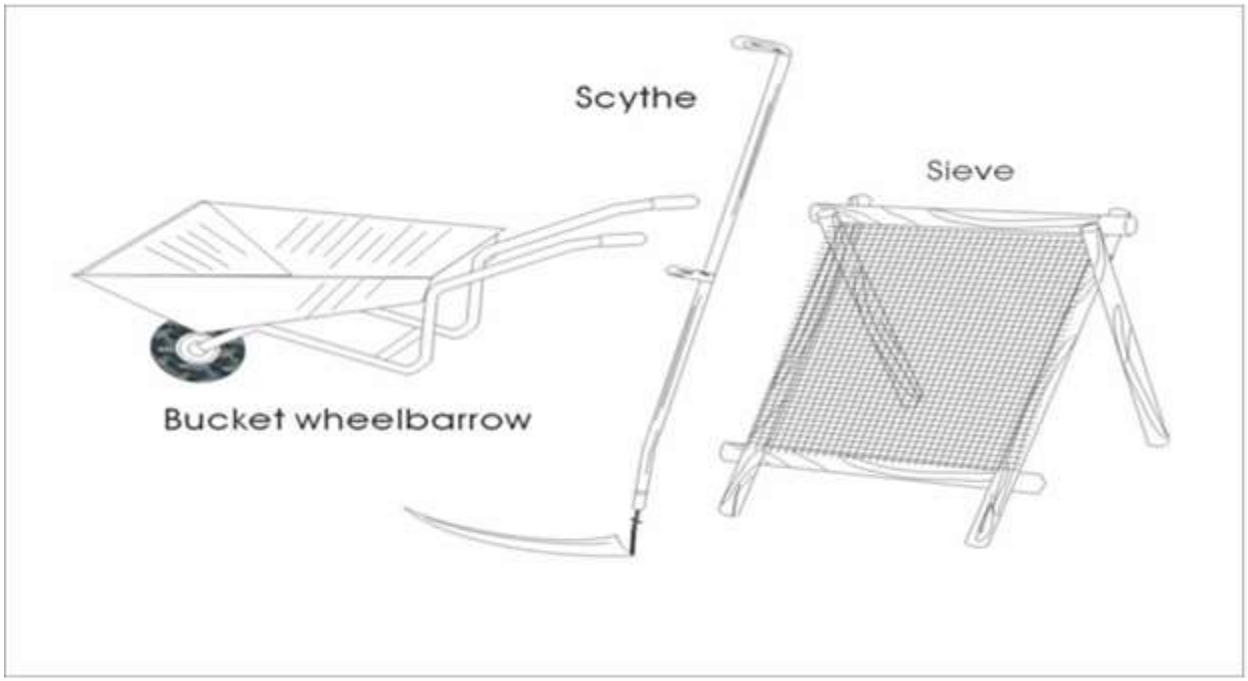



*Figure 6 some hand tools used in cultivation operation.*

### 1.2. Checking the materials, tools and equipment.

Before and after using the different materials in the nursery it is very important to check the equipment. This makes the equipment free from some things unpleasant, undesirable, damaging that happen unexpected during work operation in the work place. If the materials are damaged it is possible to report to the supervisor immediately. Every nursery should have a sufficient supply of tools for different operations. A good care should be taken of the tools, which would then have a long life. It is not wise to keep workers sitting idle at critical periods of work because of shortage of tools. All tools should be hung or otherwise stored in fixed place in the nursery where they can be readily found. They should be stored in-groups of similar articles so that checking to ensure that all have been returned after work done at a glance.

| Self-Check -1 | Written Test |
|---|---|

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

1. What are the tools For tending seedlings.(5points)
2. What are the tools For preparation of putting soiled pot filling(2points)
3. List the Tools required for working on the soil(5points)

***Note:*** **Satisfactory rating - 6 and above points** **Unsatisfactory - below 6points. points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet- 2 | proper handling of materials and equipments |
|---|---|

## 2.1 Techniques of correct manual handling

Manual handling refers to any activity that requires the use of force to lift, lower, push, pull, carry or move a person, animal or object. By observing simple, safe manual handling methods, you can avoid manual handling injuries.

Since manual handling is intensively used in nursery the work site practically cannot be free from harms and injuries on the job condition at work place. Through training and risk assessment we aim to eliminate hazardous manual handling activities as far as it is reasonably practicable.

**Manual Handling Procedure**

In order to reduce the risk of injury from manual handling operations, Nursery will ensure them:-

- Assess the risks associated with those manual handling activities that cannot be avoided.
- Eliminate hazardous manual handling activities, so far as is reasonable practicable.

**Employee's duties**

Employees should ensure that they:-

• Comply with any instruction and training provided in safe manual handlingtechniques

• Don't put their own health and safety or that of others at risk by carrying outunsafe manual handling activity

• Report problems including physical and medical conditions (e.g. pregnancy, back problems), which may affect their ability to undertake manual handling activitiesto their line manager

| Self-Check -2 | Written Test |
|---|---|

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

1. Write the Manual Handling Procedure (6points)

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-3 | Techniques of loading and unloading of materials and tools |
|---|---|

## 3.1. Techniques for loading and unloading materials

- *Demonstrate correct manual handling*

✓ Be sure to bend your knees and lift with your legs as you loading material, be careful not to twist with heavy load.

✓ When using a shovel to move large quantities of material, position your body and your work. So you don't have to turn or twist.

✓ For example, if you're shoveling top soil into a wheel barrow facing your target, and in a position relative to the pile that allows you to scoop, lift and dump without twisting.

Minimize damage to the load, to the worker and the vehicle by following the following lifting and handling procedures:

★ Check the load to ensure it is within lifting capacity and can safely be handled without causing injury from strain, sharp edges, splinters or other conditions.
★ Ensure the work area is clear of obstructions if the load is to be carried from one place to another.
★ Stand close to the load with the feet apart, one foot behind and the other beside the load.
★ Bend knees, grasp the load and lift by straightening the legs.
★ Avoid reaching, bending forward to lift, twisting the back or bending sideways.
★ Be able to see over or around the load before moving. Face the spot where the load is to be placed, bend the knees to lower the load, keeping the back as straight as possible and the load close to the body. Protect fingers from pinching before release of load.
★ Do not try and lift or move objects beyond your capacity—ask for help. Co-ordinate lifting, moving and lowering by pre-arranged signals.

Safety is just as important during loading and unloading materials, as it is during actual transportation. The loading and unloading safety procedures contained in the Hazardous Material Regulations (HMR)

**Basic Safety Procedures**

***The following rules apply for loading and unloading hazardous materials***

- Secure packages, including palletized loads, against shifting within a vehicle during transportation. Securing can be accomplished through tying, blocking and bracing the load. Secure bottles of compressed gases to prevent damage to their valves.
- Load packages with orientation marks (up arrows) so that the marks remain pointed up.
- Do not allow any smoking or any source of ignition on or near the vehicle when loading/unloading flammable materials.
- Set the handbrake on the vehicle before loading/unloading

***Note:*** Avoid lifting from the floor whenever possible. If you must lift from the floor, do not bend at the waist.

## 3.2. Identifying Project Hazards and Risks

By following a hazard identification and risk control process, employers can anticipate the types of health of safety problems that might affect workers, and take action to prevent problems from occurring, or at least minimize the risk.

The process of managing risks is a three-step process:

I. Find the hazards (hazard identification).

II. Check them out and consider how likely it is that problems will occur, and how serious the consequences might be (risk assessment).

III. Do what can reasonably be done to prevent accidents or injuries (risk control). Measures put in place to control health and safety risks must be checked to see if they are actually working – that is, if they are successfully controlling the risks they were intended to control *monitoring and evaluation of risk controls*. The process of hazard identification and risk control can be applied to any type of work or risk.

| Self-Check -3 | Written Test |
|---|---|

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

1. what are the three step process of managing risks(10points)

***Note:*** **Satisfactory rating – 5 and above points** **Unsatisfactory - below 5points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-4 | Selection of appropriate personal protective equipments(PPE) |
|---|---|

### 4.1. Selecting suitable personal protective equipment (PPE)

PPE is defined in the Regulations as ‘all equipment (including clothing affording protection against the weather) which is intended to be work or held by a person at work and which protects him against one or more risks to his health or safety.eg. Safety helmets, gloves, eye protection, high visibility clothing, safety footwear and safety harnesses.

Hearing protection and respiratory protective equipment provided for most work situations are not covered by these Regulations because other regulations apply to them. However, these items need to be compatible with any other PPE provided

**Protective equipment that must be available**

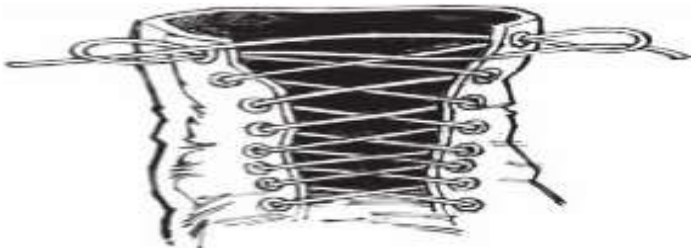
These include:

- Rubber gloves or leather gloves
- Overalls.
- Face shields.
- Face mask and ear protectors
- Steel capped boots/shoes
- sunscreen lotion
    - Head protection

Hard hat

- Foot protection

Wear leather boots with ankle protection. *for utility line clearance work*

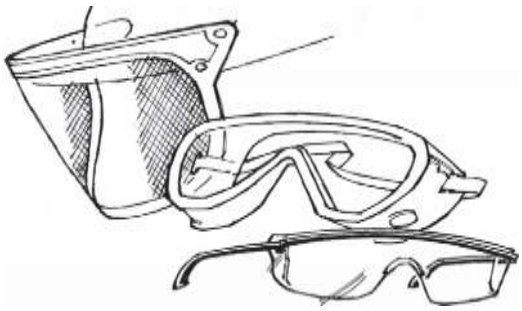


Hand protection

Wear gloves to protect against cuts, vibration, cold, harmful vegetation (thorn)

Eye and face protection

Wear -approved eye and face protection *for utility line clearance work*

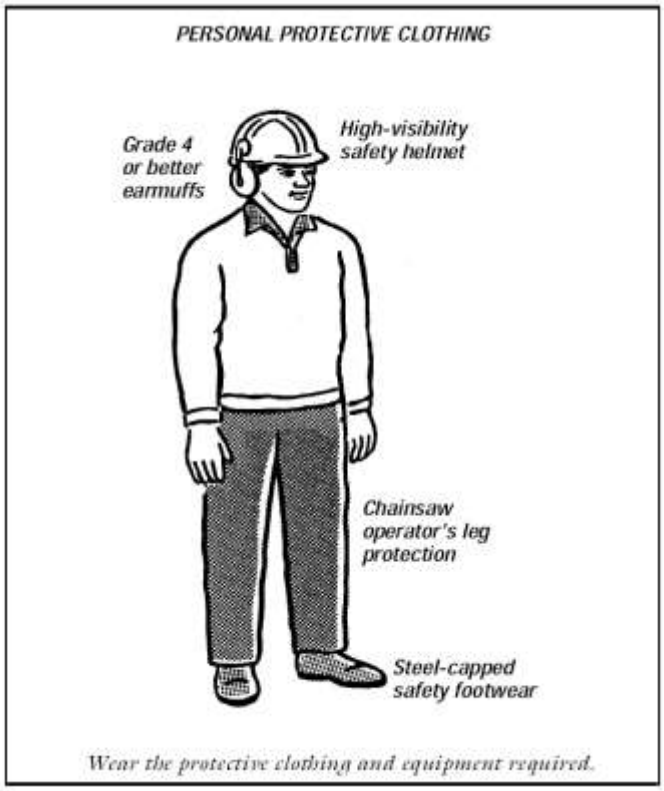


Clothing As a general rule, wear

Brightly coloured,

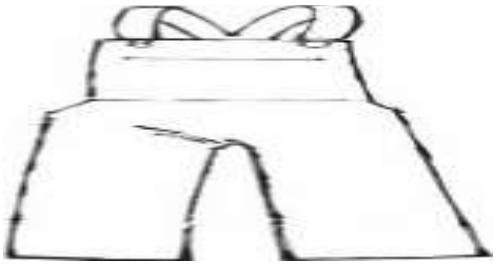
Fire-resistant clothing.

When working near roadways or mobile equipment, wear high-visibility clothing




Leg protection

Wear chainsaw pants that meet the current standard to prevent cuts when using a chainsaw



Communications equipment

Mobile

| Self-Check -4 | Written Test |
|---|---|

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

1. What are the main common personal protective that used in the nursery (4pt)
2. define personal protective equipments.(2points)

***Note:*** **Satisfactory rating – 3 points** **Unsatisfactory - below 3 and 4 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-5 | OHS requirements, hazards and workplace information. |
|---|---|

## 5.1. OHS requirements, hazards and workplace information

During the operation of conservation work the workers use different tools, which are sharpen. To keep their health the workers are expected to fulfill the following requirements;

- Provide first aid kit
- Before starting their work, the workers check the arrangement of the tools
- Pickup the tools with great care
- Take care of sharpen tools
- Use these tools properly
- Identify rusted tools
- If they are reusable use them for other purpose

Before beginning their activities the workers be aware about the work place. This awareness may help the workers about what they will do, which instruments they will use, and what type of conservation mechanism they will apply and so on.

During these activities different occupational health hazards may occur. From these hazards some of them may be; erosion, slip, injury and others damages are expected.

## 5.2. **Hazard identification**

The first step in the hazard identification and risk control process is known as hazard identification. A hazard is anything with the potential to harm life, health or property. All the types of potential hazards present in a particular job or task need to be considered and the risks presented by these hazards need to be assessed to work out how likely they are to cause harm, and how serious the harm might be.

Hazards arise from

- ✓ The work environment
- ✓ The use of machinery and substances
- ✓ Poor work design
- ✓ Inappropriate systems and procedures

**Types of hazards**

Many kinds of hazards are found in workplaces.

- **Chemical hazards** are substances that can harm people's health when they are breathed in or absorbed through the skin, or when they irritate the skin.

- **Physical hazards** include electricity, noise, temperature, lighting, radiation and vibration.
- **Biological hazards** such as infectious diseases can also be present in workplaces
- **Lifting and moving loads** can cause back injuries and other strain or sprain injuries.
- **Psychological stress** can result from workplace violence, bullying, threats or intimidation.
- **Ergonomic hazard** such as the heat of work bench, the shape of a vehicle seat and the length of a control lever,

**Radiation hazard** radio actives materials

| Self-Check -4 | Written Test |
|---|---|

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

1. list types of hazard(10points)
2. where do hazard arises from.(5points)

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Operation Sheet 1 | Techniques of Identifying nursery tools and equipments. |
|---|---|

**Procedures**

- preparing tools and equipment for identification
- displaying
- Exercising how to handle and use in the field.

| LAP Test | Practical Demonstration |
|---|---|

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instructions:** Given necessary templates, tools and materials you are required to perform the following tasks within 8-12 hours.

**Task 1:** identifying material, tools and equipment of **Nursery** n team.

Task 2: Make sure if all materials are available/present and check if they need maintenance or work properly. Show your output to your teacher for evaluation

Task 3: Identify the type of personal protective equipment used in **Nursery** activates

**BASIC AGRICULTURAL PRODUCTION AND NATURAL RESOURCES CONSERVATION**

**Level I**

# Learning Guide-2

**Unit of Competence: Support Nursery Establishment and Basic Nursery Work**

**Module Title: Support Nursery Establishment and Basic Nursery Work**

**LG Code: AGR BAN1 M08 LO2-LG-02**

**TTLM Code: AGR BAN1 M08 TTLM 0919v1**

## LO 2: Assess for an appropriate site for the nursery to establish

| Instruction Sheet | Learning Guide # 2 |
|---|---|

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

- Confirmation of the availability of water supply
- Considering the proximity of the nursery to plantation site.
- Reviewing favorable climate and land features
- Identify the depth and fertility of the soil
- Requesting plot of land and obtaining permission

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:

- Confirm of the availability of water supply
- Consider the proximity of the nursery to plantation site.
- Review favorable climate and land features
- Identify the depth and fertility of the soil
- Request plot of land and obtaining permission

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3, Self-check 4 and Self-check 5” **in page -24, 27, 28, 31 and 32** respectively.

| Information Sheet-1 | Confirmation of the availability of water supply |
|---|---|

## 1.1. General concept of water availability.

Water: - is the liquid that has no color taste or smell, that falls from clouds as rain, that forms stream, lakes, and seas that is used for drinking ,washing etc.

Water is one of the best criteria for choosing nursery site

The nursery site should be next to the area where water is available all the year.

Near ponds: springs, rivers; lakes.

1.2. Nursery water supply

Two aspects should be emphasized: (a) water quality; and (b) daily water requirement.

Water quality: It must be slightly acidic with a pH less than 7, with dissolved salts less than 550 parts/million, and with conductivity less than 0.8 mho/cm.

Generally fairly sweet and clear.

Water quantity: Adequate water of the above description should be supplied daily to the nursery.

The amount of water applied (at any one time) will vary with the weather conditions, the soil infiltration rate, and the size of the plant. During the period of germination, frequent light" watering is required to keep the seedbeds moist, but not saturated. As plants become larger, the total quantity of water applied is increased and the frequency of application is reduced

As a guide to estimate the quantity of water to apply in one month, the following calculation can be made:

Water quantity = water loss factor x E x area of seedbed where: water loss factor = values between 1.2 and 1.4, averaging 1.3

E = monthly evaporation

For example, assuming a water loss factor of 1.3, for a monthly evapotranspiration (E) of 0.2 meter and a seedbed area of 10,000 square meters, the water requirement for one month is:

Water quantity = 1.3 x 0.2 x 10,000 = 2,600 cubic meters

Watering can is either by hand or through irrigation. Hand watering with cans, hoses fitted with spray-nozzles, or knapsack mist sprayers are methods used by small nurseries. For watering containers or seedbeds in which seeds have been sown, a fine droplet size is essential. Otherwise, the seeds can be washed out of the ground or the seed covering material can be washed away and the soil surface will be consolidated. Therefore, hand watering of the seedbeds is commonly done with a gardener's watering can or a knapsack pressure sprayer fitted with a fine mist-producing nozzle

| Self-Check -1 | Written Test |
|---|---|

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

1. what does water mean(5pts)
2. write the sources water(5pts)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions.**

| Information Sheet-2 | Considering the proximity of the nursery to plantation site. |
|---|---|

➪ **The proximity of nursery to the plantation site**

Location of the nurseries should be situated at the ***nearest*** possible site to the plantation or market it serves. Good transportation facilities, good communication (roads, telephone lines), electric supply, housing for staff and laborers is important if a large permanent nursery is established

- If we are establishing a permanent nursery especially, the site selected should be near the **main road** and should be connected to the main road by any means.
- These should have **transport facilities** (also), **electricity supply** and **housing facilities** for the workers near the nursery (if possible).

➪ **Favorable climatic, soil and land features**

➪ **Climate:** includes climatic factors mainly ***rainfalls, temperature, and wind***

- **Select** a nursery site with similar climatic condition as that of the planting site.

➪ **Select** a nursery site with similar temperature and rainfall condition as that of the planting site.

**Avoid** areas with extremes of climatic condition: High temperature; High rainfall; High ice, storms

➪ **Topography: Select** an area with gentle slope (**2~3% slope**).If hilly, it's very hard for management. Earth & fertilizer or manure will be easily flow away. In the long run, the hilly place is hard for mechanized farming.

**Avoid** areas with ***rocky and stony areas***; hill tops (because hill tops are exposed to wind and would be too dry); valley foot areas (because water logging may be problems); flooding areas (where flooding is supposed to occur at any time of the year).

➪ **Soil** Is one of the most important factors for selecting nursery site (especially for the production of bare rooted seedlings using the native soil. But if seedlings are to be raised using pots, adequate source of soil mixture should be available in the near areas (helps to reduce transport distance and saves cost).

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** for broad-leaved plant (most indigenous) and between 4.5~6 for conifers (most exotic species).

A valuable guide in selecting a potential productive site is to look at the past agronomic history and **native vegetation.**

➪ **Land availability:**

- The site selected should be **large enough** to allow the production of intense number of seedlings. If possible, try to avoid selecting the land, which has been claimed by many individuals.

➪ **Legal framework**

Legal requirement for a commercial production employment practices, ***land ownership***

**Land/growing media preparation**

**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**

Tree 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

| Self-Check -2 | Written Test |
|---|---|

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

1. List the Nursery operations activities (10pts)

***Note:*** **Satisfactory rating - 5 points Unsatisfactory – 5below 10 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-3 | Reviewing favorable climate and land features |
|---|---|

INTRODUCTION

Reviewing:-an act of carefully looking at or examining the quality or conditions of something.

**Climate**

Growing-season requirements will vary with stock type. A long growing season (150 days or more) provides an adequate period to produce 1+0, 2+0, 3+0 [for slow-growing species
Such as Pacific silver fir ( *Abies amabilis* Dougl. ex Forbes) and
some sources of western white pine ( *Pinus monticola* Doug]. ex
Don)], and transplant stock. A growing season of less than 150 days would reduce the chances of consistently growing shippable 1 +0 seedlings but would be adequate for other age classes.

**Temperature.**-Possible nursery sites whose daily temperatures consistently exceed 105°F for extended periods (3 weeks or more) should be avoided: extremely hot periods reduce growth and may cause burning of foliage. Short periods of daytime temperatures of 110°F or more can tax irrigation systems, but properly designed irrigation systems can protect seedlings from burning during those periods (see chapters 11 and 12, this volume). Growth of most species is greatly impeded by ambient temperatures of 90°F and above.

Field-planting periods must be discussed with customers. Seedlings to be out planted from December through early March cannot be lifted and processed when cold daytime temperatures keep soil frozen.

**Precipitation:-**Proposed nursery sites that have a record of frequent heavy snows persisting into the normal seedling.

| Self-Check -2 | Written Test |
|---|---|

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

1. **Precipitation:-**Proposed nursery sites that have a record of frequent heavy snows persisting into the normal seedling. (10pts)

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory – 5below 10 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions.**

| Information Sheet-4 | Identify the depth and fertility of the soil. |
|---|---|

### 4.1 selecting available slope and soil fertility for nursery site

### 4.1.2. Aspect of slope

A poorly sited vegetable garden may produce inferior crops even though sound methods of cultivation are used. This is because the microclimate of a site is greatly influenced by its slope. Lands which slope steeply can be difficult to cultivate and erosion of the top soil can become a series problem in regions with heavy rainfall. A level site is generally suitable, but slight slop can be an advantage because it assists drainage and hence prevents water logging.

### 4.2. Soil

Soil fertility - Agricultural production in arid zones is frequently hindered by poor soil fertility. However, the importance of soil fertility is often overlooked; water shortage is considered the principal constraint. Whereas the conventional method to improve soil fertility commonly consists of repeated application of mineral fertilizers, this problem may also be solved through the systematic use of soil-improving species

Deep, fertile, light to medium loamy soils are the most suitable for vegetable production. Therefore, before buying or renting land for establishment of a vegetable garden, it is essential that the soil should be inspected in order to estimate its suitability. Information on the structure and physico-chemical content will enable the grower to take any necessary steps to improve the fertility and will serve as a guide for further cultivation.

Although most vegetable crops can in practice be grown on a much wider range of soil types, it is as well to be aware of particular crop requirements when selecting a site for specialized production. For example, root crops are more suited to sandy soils and the presence of stones is particularly disadvantageous.

Tropical soils vary widely as regards texture, organic and mineral content and general fertility , but a great deal can be done to improve land if intensive methods of cultivation are practiced .These includes the regular application of organic fertilizer s, crop rotation and conservation measures. Other routine practices such as mulching, irrigation and disease and pest control will contribute to an increase in soil fertility. Generally, it is possible to correct nutrient levels and PH to suit particular crops but soil texture is more difficult to modify..

**PREPARE THE SOIL**

The ideal soil should be deep, well-drained, fertile, contain plenty of organic matter, and retain moisture well. It should also be friable (easily worked) and reasonably free of stones. Soils vary in texture (size of soil particle) from sandy (course particles) to clay (fine particles). Silts fall between sandy and clay textures, while loams are mixtures of all the above. Sandy soils tend to be low in fertility and do not hold water well. Clay soils often drain poorly, crack severely when dry, and become very sticky when wet. Sandy loam soils are ideal for producing most vegetables. Adding organic matter to almost any Southwestern soil will improve its structure. Most soils in New Mexico are low in organic matter.

Adding organic matter to a sandy soil improves both its water-holding capacity and its cation exchange capacity, or the ability of the soil to retain nutrients for plant uptake. Adding organic matter to clay soils aerates these soils and improves their drainage. One of the easiest ways to add organic matter to your garden soil is to apply livestock manure at a

rate of 50-100 lb/100 ft2. Use lighter rates when applying chicken manure, as it tends to be”hotter" manure (higher in nitrogen) than manure from larger livestock like cattle and horses.

Fresh manure should only be applied in the fall so it has the time to break down in the soil. Heat-treated or composted manures are preferred because fresh manure can introduce weed seed into the garden. Fresh manure applied in the spring often burns young seedlings due to the high salt content of the manure. Large amounts of organic matter can be added to the soil using "green manure" crops. A green manure crop is any crop grown specifically as a source of forage that can be incorporated back into the soil as a source of organic matter. The most popular green manure crops are winter wheat, barley, oats, and rye. Seed can be obtained from most local farm feed stores and liberally scattered around the garden in late summer or early fall. Rake the seed

Into the soil around existing vegetables, then water. After first frost, pull up frost-damaged summer vegetables, leaving a "carpet" of green grass to develop in late fall. A little nitrogen fertilizer applied the following spring will speed growth. Approximately one month before planting your garden, the green manure crop should be thoroughly rototilled into the soil. A little extra nitrogen fertilizer will help microorganisms in the soil rapidly break down the organic matter.

Most gardeners find the easiest way to add organic matter to the soil is to apply compost. Compost is often made from leaves, grass clippings, food wastes, and garden vegetable waste from the previous growing season. A 1- to 2-inch layer of well-decomposed compost can be incorporated into the soil before planting. Most New Mexico soils tend to be alkaline, which makes some soil nutrients like phosphorous, iron, and zinc unavailable for plant uptake. Well-decomposed compost (often called humus) contains humic acid, and when added to alkaline soils, helps to make these nutrients more available for plant uptake. Compost and manures also contain a wide variety of nutrients. Because the nutrients are in an organic form, they tend to be more stable in the soil and more available for plant uptake over a relatively long time. They do not, however, occur in large quantities, thus most gardeners rely on commercial fertilizers for optimum plant growth.

| Self-Check -4 | Written Test |
|---|---|

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

1. _____ soil is most suitable for vegetable production(5pts)
2. _____ is often made from leaves, grass clippings, food wastes, and garden vegetable.(5pts)

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-4 | Requesting plot of land and obtaining permission |
|---|---|

INTRODUCTION

Permission:-the right or ability to do something that is given by someone who has the power to decide if it will be allowed or permitted.

- Criteria for the Review of Tree Permit/Permission Application Forestry's review of an application will take into account the species, size, and health of a tree. Consideration will also be given to property limitations, the number of trees on site, the context of the site and the owner's reasons to remove the tree. Approval will typically be issued for dead or dying trees that may be a hazard. Requests to injure or remove trees will be reviewed in conjunction with any related Building Permit, Pool Enclosure Permit, Site Plan, Official Plan Amendment, Rezoning, Subdivision,

Committee of Adjustment and Erosion and Sediment Control applications. The Forestry Section, in conjunction with the Planning and Building Department, may request amendments to a development application in order to preserve a tree

**Conditions on the** Issuance of a Tree Permit/Permission The following are conditions that may be imposed:

a) Hoarding (a protection fence around a tree) may be required to protect those trees being preserved during construction on site;

b) A replacement tree may be required to be planted on the property for every healthy or non hazard tree removed. The replacement tree shall be balled and bur lapped, and has a minimum diameter of 6 cm (2.4 inches). The location on the lot, number and species of the replacement tree(s) shall be to the satisfaction of Forestry. The requirement for a replacement tree may be restricted and vary depending on the size and proposed development of the property. The owner will have to provide four (4) copies of a replanting plan and a written undertaking to ensure that the replacement planning is carried out to City standards.

c) If replacement tree(s) are required, monies or a letter of credit in a form satisfactory to the City of Mississauga may be required to cover the costs of the replacement trees and the maintenance of the trees for a period of up to two (2) years at which time an inspection will be performed and the monies returned.

d) For every replacement tree not provided on site, a payment shall be required to the City’s replacement tree planting fund. The cost for each tree shall be the same as a street tree outlined in the City’s Fees and Charges By-law.

| Self-Check -2 | Written Test |
|---|---|

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

1. Write Conditions on the Issuance of a Tree Permit (10pts)

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory – 5below 10 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

# Basic Agriculture Production and Natural Resources Conservation Level I

# Learning Guide-3

**Unit of Competence: Support Nursery Establishment and Basic Nursery Work**

**Module Title: Supporting Nursery Establishment and Basic Nursery Work**

**LG Code: AGR BAN1 M05 LO3-LG-03**

**TTLM Code: AGR BAN1 M05 TTLM 0919v1**

## LO 3: Demarcate the area and sketch the map.

| Instruction Sheet | Learning Guide # 3 |
|---|---|

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

- surveying of appropriate nursery area
- calculating the nursery site
- fencing the nursery area for security
- developing the sketch map of the nursery area

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:

- surveying of appropriate nursery area
- calculating the nursery site
- fencing the nursery area for security
- developing the sketch map of the nursery area

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page - 38, 42, 44, and 49** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1,” **in page -50.**
6. Do the “LAP test” **in page – 51**(if you are ready).

| Information Sheet-1 | surveying of appropriate nursery area |
|---|---|

### 1.1. Surveying of appropriate nursery area

Surveying is concerned with determining the area of any portion of the earth surface, the lengths and direction of the bounding, and contour of the surface with accurately delineating the whole on paper.

**Appropriate nursery area**

The nursery area must be clear, cultivated and level site.

### 1.2. Site clearing and cultivation

## 1.2.1. Site Clearing

**Objectives of site clearing and cultivation:**

- Increasing the water containing capability of the soil, decreasing soil water evaporations; improving soil's water conditions.
- Enlarging soil porous degree; increasing soil temperature; enhancing micro-organism activities in soil; accelerating soil weathering in order to release the potential nutrients of the soil.
- Destroying weeds and insect pests.

  Effectively improve the relationship of water, fertility, aeration, heat in soil; provide good circumstances for seed-germination and root-growth

**Methods of Site clearing**

a. Manual clearing
b. Burning (fire)
c. Machine clearing
d. Chemical

**The methods depend on**

- The type of vegetation
- Environmental condition (topography, climate, vegetation cover, soil type…)

**a) Manual methods** are applied if:

- Labor is available and cost effective
- The terrain is inaccessible
- Vegetation is very light in terms of density ( like shrub, grasses)

**b) Mechanical clearing**

- Used to clear large shrub and tree
- Site can be cleared with bulldozer, brush cutters.

**c) Chemical methods**

- By applied chemicals (herbicide, Sodium Arsenate)
- After killed the plant through application of chemical, then burning

**Disadvantage**

✓ The application is complex.

✓ Difficulty to remove the plant, which is killed by the chemicals.

**d) Burning**

- The cheapest method, the vegetation removed without any doubt.

**Consideration during burning**

- First, provide fire line (firebreak) perpetually erected to wind direction.
- Calm weather 10~15cm/ hr wind speed.
- The vegetation is simple or only grass.
- The topography cannot be steep, erodible areas.

### 2.1.1 Cultivation

**Methods of cultivation:**

Four major types of cultivations/ploughs:

1. **Shallow plough** to clear weeds (crops) and forages. The depths depend on different land types: for crop field or bed 4~7cm; for deserted land 10~15cm.
   ► Advantage: destroy weeds, diseases, and insect pests, facilitate the coming up plough.
2. **Deep plough**: major step of the land- clearing. Half month late after 1st step.
   Plough depth depends on different materials: seeds bed 20~25cm, cutting beds 25~35cm. The time of plough depends on the water content of the soil: if the soil water content is about 50~60%, the land is more suitable for plough. It can be tested like: taking a handful of soil; making it a dumpling first and then let it fall down at 1m height; if the dumpling is smashed, it is good for plough. The purpose of plough is to loosen the lower layer and turn over the upper layer.
3. **Harrow** to break clod; cover fertilizer; layer soils; keep water and clear away weeds in order to improve soils. (Do not harrow excessively in case of disturbing soil structure)
   **Firm the soil** to improve the **capillary of the soil.** It can be done before or after the sowing. When soil is muddy or soil water content is high, firming may give rise to hardening of the soil.

| Self-Check -1 | Written Test |
|---|---|

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

1. What is surveying.(5pts)
2. Write the method of site clearing(5pts)
3. What are the major purposes of site clearing and cultivation (10pts)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-2 | calculating the nursery site |
|---|---|

### 1.1. Calculating the nursery site.

Calculating is carefully thinking about and planning actions for selfish or improper reasons.

### 2.2 Sowing Methods

**Direct sowing into Pots versus Seed bed sowing**

Formerly seeds of most species used to be sown into seeds beds and seedlings were then transplanted into beds or containers. Nowadays, there is a tendency towards more and more direct sowing into pots, to eliminate the labor consuming operation. However, for expensive seeds that are small in size, direct seeding is not advisable.

**Seedbed sowing should be done when:**

- Seed is expensive or scarce
- Germination percent or germination period is not known
- Seeds takes a long time to germinate (occur over a period of many weeks or months) Therefore, such indigenous species as *Podocarpus*, *Juniperus, Aningeria Olea* species should be sown into seed bed.

In seed beds where seeds and small seedlings are in a limited space it is easier to control watering and shading than in transplant beds. It is always better to sow the seeds of a new or little known species into the seedbed

**Direct sowing onto pots can be done when:**

- Germination percent is known to be fairly high
- Germination period is short
- Transplanting would cause damage or deaths to seedlings, as it sometimes the case in everyday areas.
- The species develops a long sensitive taproot (*Accacia cyanophylla* and some other species)
- There is a shortage of skilled workers to do the transplanting.

Direct sowing leads to wastage of pots if germination takes a long time. The plastic pots start to disintegrate, and the soil in the pots becomes leached of nutrients owing to many weeks of watering. In some nurseries the empty pots, where germination failed, are used for short-duration seedlings such as potting of eucalyptus seedlings.

### 2.3.1 Time of sowing

Sowing should be timed properly so that seedlings can attain the right size (shoot length) which is generally agreed as 25 to 40 cm at the time of planting. In many areas of Ethiopia the rains start in May or June and planting starts in June or July

Recommended sowing dates are given to most important plantation species considering that planting is done in June. The numbers in brackets indicate the numbers of months that the seedlings need to say in the nursery.

A large amount of seed should be sown into seedbeds in several batches at about 7 to 10 days intervals, so that transplanting can be done smoothly when the seedlings are ready for transplanting

### 2.3.2 Density of Sowing

If seedlings are transplanted soon after germination when they are still small (e.g. eucalyptus, pines, and cypresses), it will be possible to get approximately 2000 seedlings from each square meter seedbed. Larger seeds should be sown at a lower density of 800-1500/sq m.

Too low density of sowing means that the seedbed is not fully utilized. This is not economically acceptable. Too dense sowing increases risk of fungus diseases in the nursery.

For optimal sowing density calculation, we need to know the weight of the seed (numbers/kg), germination percent and purity percentage. These are needed to determine the number of viable seeds/kg. We have to keep in mind that germination percentage given by seed dealers are obtained in a well- controlled laboratory conditions and are, therefore, always somewhat higher than what we can expect in nursery bed conditions. This has not been considered in the given below.

*Example 1*

*Pinus patula has 135,000 seeds/kg and a germination rate of 85%. How much should be sown to each square meter to obtain a density of 2000 seedlings/sq m?*

*Solution: each kg of seed produces(85/100)x135,000 seeds = 114,750 seedlings*

*114,750 = 1000 grams*

*2000 = x grams*

*x = 17.4 g*

*Cupressus lusitanica has 220,000 seeds/kg and germination rate of 15%. How much should be sown to each square meter to get 2000 seedlings*

*Solution: each kg produces 15/100x220,000 = 33,000 seedlings*

$$\frac{\text{2000 seedlings x 1000}}{\text{33000 seedlings/kg}} = 60.6 \text{ grams}$$

*Exercise casuarina equisetifolia has 700,000/kg and a germination of 50%. How much seed is needed to raise 2000 seedlings/sq.m?*

**Sowing Techniques**

**2.3.3.1 Broadcast Sowing onto seedbeds**

This is nowadays the most common method of sowing onto seedbeds. It is used to sowing seeds of all sizes, but is best suited to sowing of small seeds.

The seedbed shall be leveled with a rake and/or leveling board during preparation for sowing. The bed should be well watered the day before sowing. The bed moisture is usually checked in the morning of the day of sowing to ensure that the correct moisture condition is maintained. The seeds are then broadcast sown as evenly as possible, either from hand or from a stiff paper packet. To get even distribution of seeds, the person who is sowing could first go across the bed over the allocated area then along the bed. Species with very small

seeds such as Eucalyptus species are difficult to sow evenly. Mixing the seeds with an equal or double amount of fine sand and sowing makes sowing evenly possible. The seeds are then covered with seedbed soil mixture or with sand at a depth of about twice the thickness of the seed. The sand is firmed with a flat board to eliminate any air pockets between the seeds and the soil to void seed being washed by water during watering. On the other hand, failure to germinate may occur if seed is buried too deep

#### 2.3.3.2 Drill method

This method has been practiced mainly with species having larger seeds, but also with smaller seeds such as pines when very even distribution of seeds is desired in sowing.

A wooden battern, 1mx 1cm x 3-5 cm is needed to press drills onto the bed. The depth of drill should be equivalent to the size of the seed (e.g 2-3 mm for Juniperus procera and 2 mm for Pinus patula). The distance between drills is usually about 10 cm. The seeds are placed into the drills at battern. The drills are covered with seedbed soil mixture and the bed soil mixture and the bed is watered.

The drill method has been practiced on traditional beds where seeds have been sown directly. The plants are later thinned so that the distance between the plants is 5-10 cm.

#### 2.3.3.3 Direct sowing onto the polythene tubes

As mentioned earlier, direct showing onto pots has become increasingly popular. It eliminates the time consuming operation of transplanting which causes slowed growth and even seedling mortality. Pines, eucalyptus and other germinating seeds are commonly sewn onto pots. Fertilizers have been observed to prevent or slow down germination, but this is not usually a problem in Ethiopian nurseries where little or no fertilizers are used.

The detrimental influence of the fertilizers can be prevented by putting a few centimeters thick layer of unfertilized soil mixture on top of the top soil mixture as barrier between the fertilizer and seed.

The seeds are placed in the middle of the pot, pressed down and covered with soil so that the covering layer is about the ticks of the seed. For large seeds, a hole is fist pressed in to the soil by a pricking stick. Then the se3ed is put into it and then covered. Again it is important to see that no air pockets are left round the seed. recommendations on the amount of seed that should be placed in one pot are presented in the following table

| | |
|---|---|
| Cuppresus lusitarica | 6-8 seeds per pot |
| Eucaliptus camaldulesis | 10 grams per 1000 pots |
| E.citriodora | 2-3 seeds per pot |
| E.grandis,E.saligna | 10 grams per 1000 pots |
| E.globulus | 2-4 seeds per pot |
| Pinus species | 2-3 seeds per pot |

The aim in direct seeding is to raise at least 2 seedlings per pot initially. The best one from the two seedlings will be retained to grow the whole season. It is a common mistake to plant into the field pots with two seedlings, which then grow more slowly than a single seeding.

| **Self-Check -2** | **Written Test** |
|---|---|

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

1. When should be done Seedbed sowing. (**10 points**)
2. What are the sowing techniques.(10pts)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-3 | fencing the nursery area for security |
|---|---|

**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. The fence could be further strengthened by planting a live hedge with thorny fruit plants (like Koranda).

**a) Fencing:**

A nursery is usually surrounded with a fence or hedge to demarcate and to protect them against animals and some extreme winds.

Fencing may be done in these ways:

- ※ using barked or plain galvanized (zinc) wire
- ※ wire mesh (chi ken net wire)
- ※ wooden materials
- ※ electric fencing
- ※ stone wall

**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. But at the same time, the land should not be wasted by unnecessarily laying out of paths and roads.

| Self-Check -3 | Written Test |
|---|---|

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

1. What is the importance of fencing.(**6 points**)
2. Write the way that fencing can made(6pts)

***Note:*** **Satisfactory rating – 6points** **Unsatisfactory – below 6 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-4 | developing the sketch map of the nursery area |
|---|---|

## 4.1. Design of the nursery

Having decided on the site and size of the nursery, the site is carefully leveled, fenced, and a shelter from the prevailing wind is established.

The nursery must be well designed. The nursery is divided into a suitable number of blocks. These blocks contain adequate roads among them. Blocks are normally labeled by letters, e.g. A, B. C, etc. or by Roman numbers: block I, block II, block III, etc. Roads between the blocks should be wide enough to provide space for on-loading and offloading and contain turning space with a minimum width of 5 meters.

Each block is further divided into 4-8 sections with paths among them. Sections are labeled by their respective block label followed by a small letter, e.g. Section Ia denotes the first section from the left hand corner of block I (Figure 3.3).

Each section is further divided into beds. The bed is the smallest unit in the nursery design. Beds are normally one meter wide and their length may vary from 6-10 meters. Beds may be sunk in the ground at a depth of 30-35 cm below general ground level. In this case they may be laid with concrete, stone or bricks.

Also beds may be designed slightly higher than the general ground surface. In this case, the beds are surrounded by stakes, bricks or stones. In every case drainage in these beds is very important for seedling development and for nursery hygiene.

Beds are labeled by their blocks and section followed by Arabic figures, e.g. bed No. Ia1 denotes the first bed in section (a) of block I. Beds are separated by paths one meter wide to facilitate work and transport of seedlings by hand or wheelbarrow, watering and tending of seedlings.

In addition to these, the nursery design should contain adequate space for soil mixing (at least 5 x 5 meters). It should also contain a separate area for making compost. This is better placed slightly away from the nursery beds.

**Size of the Nursery**

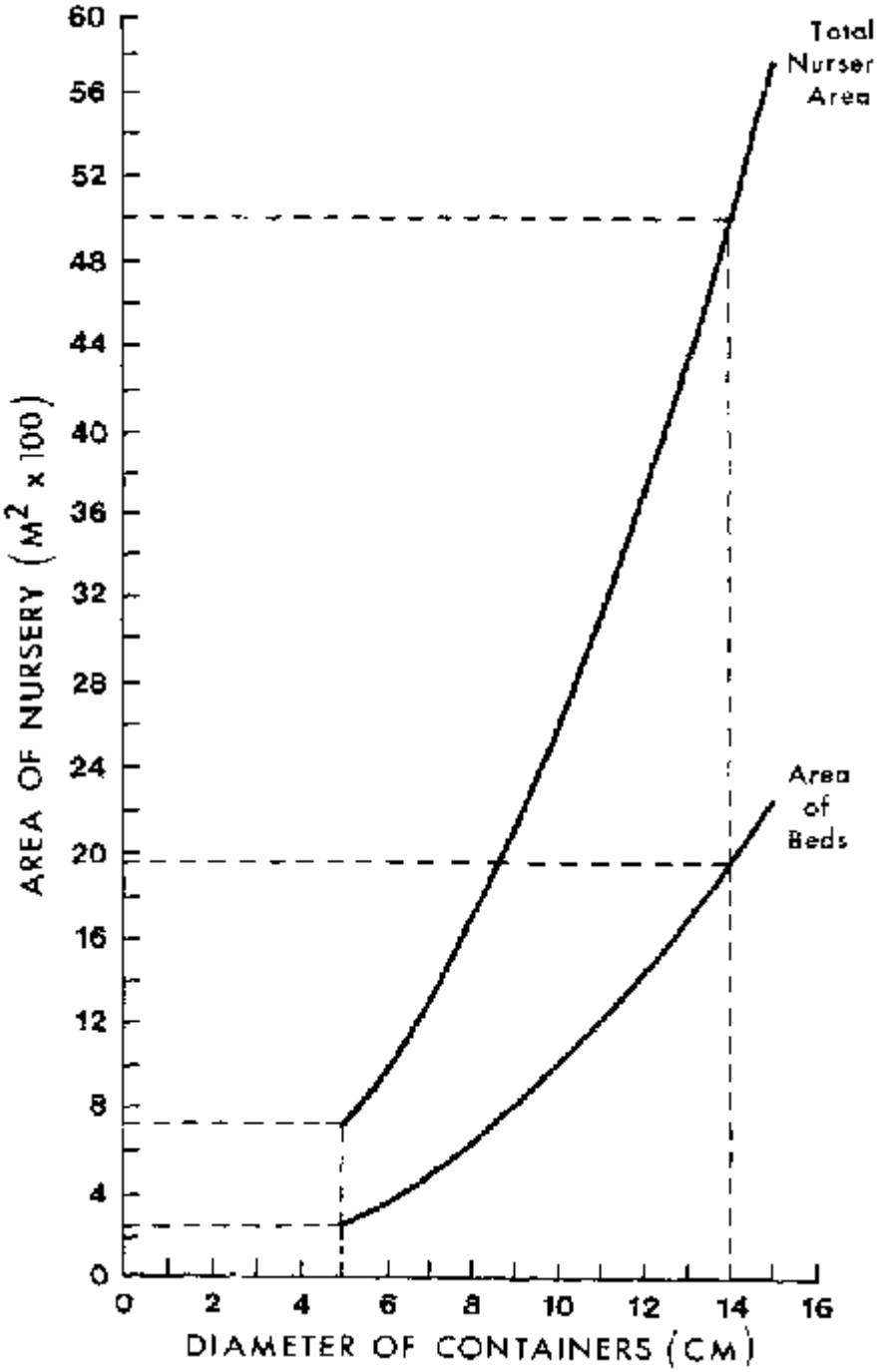
The size of the nursery area stacked with containers (when containers are employed) and the total nursery area will vary with the diameter of the containers. The relationship between

the diameter of containers (from 5 to 15 centimers) and the surface of the nursery area (in square meters) for the production of 100,000 potted plants is illustrated in Figure 3.4.

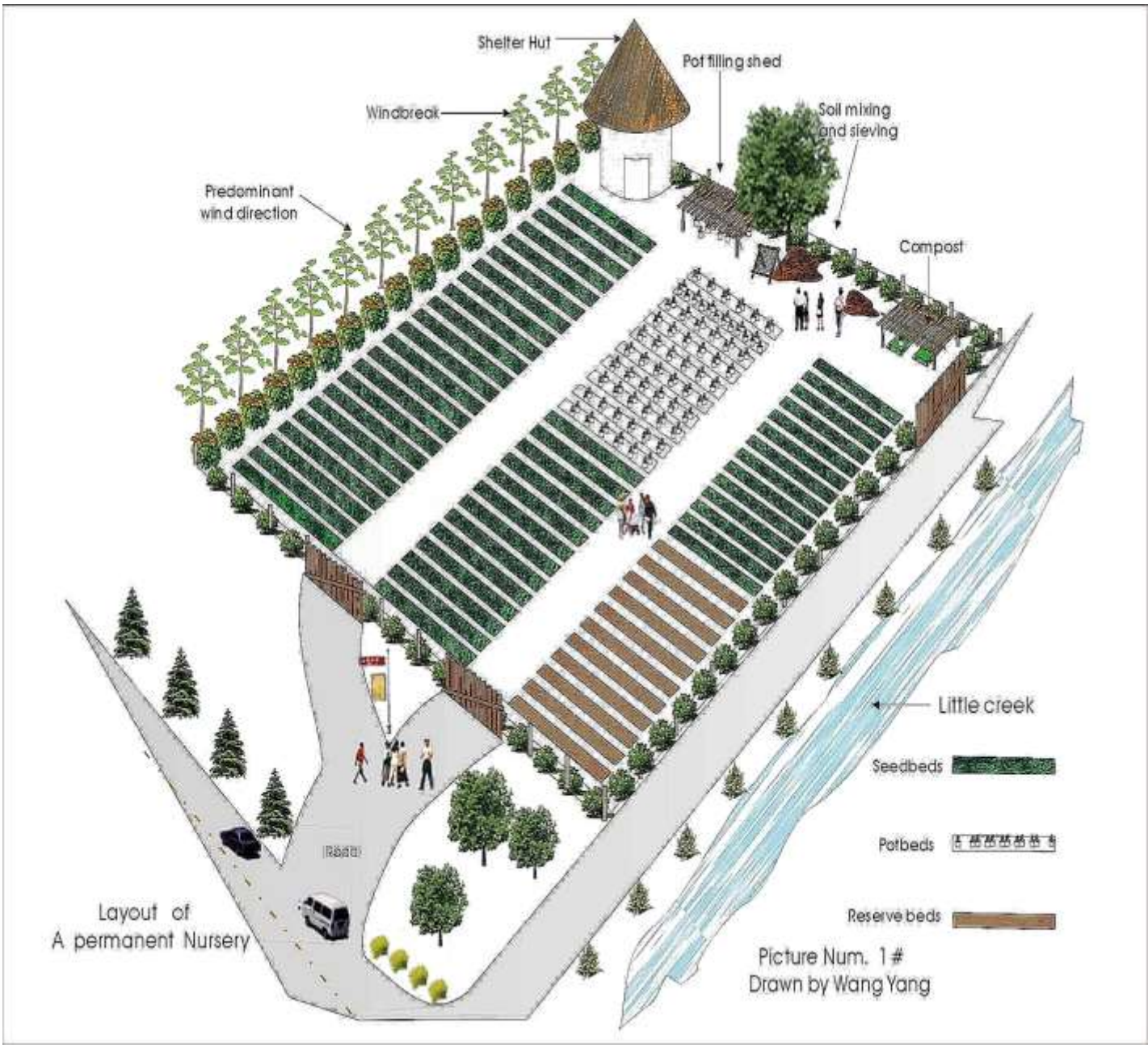
From Figure 3.4, one can see that, for containers with a diameter of 5 centimeters, 240 square meters of beds are required. To estimate the total nursery area, the area of seedbeds is multiplied by 2.5, to include road and service areas, and 100 square meters are added (for paths), based on the production of 2,000 seedlings per square meter of seedbed. Therefore, in general:

The total nursery area = (2.5 x area of seedbed) + 100 square meters and, for this example: the total nursery area = (2.5 x 240) + 100 square meters

**Figure 3.4 Relationship between the diameter of the containers and the surface of the nursery area.**




Not all nursery operations involve the use of containers. When bare-rooted planting stock is produced, the size of a nursery will depend, in large part, upon the "average" size of the planting stock and the level of production to be maintained.


Shelter Hut
Pot filling shed
Windbreak
Soil mixing and sieving
Predominant wind direction
Compost
Little creek
Seedbeds
Potbeds
Reserve beds
Road
Layout of A permanent Nursery
Picture Num. 1#
Drawn by Wang Yang

| Self-Check -4 | Written Test |
|---|---|

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

1. How to design nursery (24**points**)

***Note:*** **Satisfactory rating – 12 points** **Unsatisfactory - below 12 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Operation Sheet-1 | Site clearing and cultivation | T |
|---|---|---|

**Objective*:*** To understand how to prepare ground includes clearing of the indigenous vegetation and cultivating of the ground before planting.

**Materials:**

- Shovel
- Pickaxe
- Meter
- Fork

**Procedure**

1. Use personal protective equipment

2. Fell all the trees on the site and to a distance of about 10 m around the proposed boundary, as these trees might interfere with future operations. Remove any stumps and termite mounds and big stones.
3. Plough the area thoroughly and remove all roots and large stones.(Methods of cultivation)
    - Shallow plough
    - Firm the soil
    - Harrow
    - Deep plough
4. Peg out location of the blocks and roads,
5. Level each block, using a leveling.
    - Minor irregularities can be corrected by adding small of topsoil over the block as necessary or corrected by bringing in topsoil from a nearby area to raise lower part of the block.
    - If a lot of leveling is needed, it is best to scrape off the topsoil, level the subsoil and re-spread the topsoil over the area to retain as far as possible the natural drainage characteristics of the area.
6. Board with rakes

➥ To sum up leveling should be done so that the topsoil layer would be as evenly thick as possible throughout the block. Care should be taken to prevent subsoil from being brought to the surface Manual methods

- Collect removed tree together

Bring them to market area if they have market value

| LAP Test | Practical Demonstration on Site clearing and cultivation |
|---|---|

Name_____ Date: _____

Time started: _____ Time finished:_____

**Instructions:**

**1.** you are required to perform any of the following **:**

- ★ Request your teacher to arrange for you to join in Site clearing and cultivation team. Make sure if all materials are available/present and check if they need maintenance or work properly. Show your output to your teacher for evaluation.
- ★ Identify the type of personal protective equipment used Site clearing and cultivation Show to your teacher how to use in a working place properly and tell him /her their advantage

2. Request your teacher for evaluation and feedback.

# Basic Agriculture Production and Natural Resources Conservation Level I

# Learning Guide-3

**Unit of Competence: Support Nursery Establishment and Basic Nursery Work**

**Module Title: Supporting Nursery Establishment and Basic Nursery Work**

**LG Code: AGR BAN1 M05 LO3-LG-03**

**TTLM Code: AGR BAN1 M05 TTLM 0919v1**

## LO 4: Establish nursery

| Instruction Sheet | Learning Guide # |
|---|---|

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

- Selection of blocks for construction of office and store.
- Identification of blocks for seed bed and transplanting beds.
- Designing blocks for lifting damping material.
- Selection and identification of trial blocks
- Construction and installation of water system
- Construction of access roads
- Construction of wind breaks

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 of blocks for construction of office and store.
- Identify of blocks for seed bed and transplanting beds.
- Design blocks for lifting damping material.
- Select and identification of trial blocks
- Construct and installation of water system
- Construct of access roads
- Construct of wind breaks

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to .
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5”.
4.Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” Self-check 5 and Self-check 6 **in page -54, 57, 59,63,69 and 74** respectively.

| Information Sheet-1 | Selection of blocks for construction of office and store |
|---|---|

**Construction of office and store building**

For permanent forest nursery , it is best to construct a wooden or concrete double storey buildings for an office and store .the upper floor could be used an administrative office and the ground floor as storage and potting areas.

The administrative site

The administrative site includes administrative offices, storage areas for equipments, trees seeds, pesticides, other chemicals, fuels, shops; a fuel dispensing station; an employee center; and seedlings-processing facilities. The type, number and locations of required buildings can be determined with the team approach. Other administrative development could include employee-enrichment areas (in the form of park like surrounding), holding areas for irrigation water or soil amendment, a culled-seedling disposal area, and an area for holding scraps material and used equipments until sale is possible(potential aesthetic conflicts with neighbors may arise in this last case)

Although possible future expansion must always be kept in mind, the administrative complex must optimize the use of space avoid being spread out. The results of poor or inadequate planning will cause the manager and staff considerable anxiety in future year.

**Infrastructure and facilities**

Office and store building should be located the entrance of the forest nursery .however, for a large forest nursery, the office and store be in the centre of the whole area. In planning, consideration should be given to the construction of a double storey building with sufficient floor space that can be taken up as office space, a proper room with good ventilation to store and dry newly collected seeds prior to sowing, and a separate room for storing chemicals and fertilizers.

| Self-Check -4 | Written Test |
|---|---|

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

**Say true if the statement is correct and says false if the statement is incorrect**

1. _____For permanent forest nursery , it is best to construct a wooden or concrete double storey buildings for an office and store .the upper floor could be used an administrative office and the ground floor as storage and potting areas. (4**points**)

***Note:*** **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| **Information Sheet-2** | **Identification of blocks for seed bed and transplanting beds.** |
|---|---|

**Instructions and directions used for establish nursery site activity**

**4.1.1, Preliminary considerations:**

1. Identify the potential for planting material production and to set realistic production targets based on the resource availability. Availability of sufficient resources, particularly the genuine and certified scion / bud wood and rootstock according to the scientific recommendations in vogue as well as that of skilled manpower for the propagation methods to be followed should be the major considerations for setting realistic targets, from a quality control point of view.

2. Location of targeted planting material production as selection of an ideal location can also serve to improve Production quality considerably. In general, it should be located at a site with access to modern communication and transport facilities, good water source, electricity, skilled and unskilled labor availability throughout the season as well as professionally qualified and competent manpower to oversee the production and quality control. Places with a mild climate, long growing season and even distribution of rainfall is most suitable for planting material production while areas with extremes of temperature or commonly subjected to dry winds, frequent flooding, hail, storms or are known to be frost pockets are better avoided as they adversely affect the quality of planting material. Soil should preferably be light to medium in texture with good fertility, water holding capacity and drainage, ideally with a pH range of 6.0 to 7.0. Topography should preferably be plain with gentle slope (1 to 2 %); and in very sloppy areas terracing need to be done.

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. These generally include containers, growing medium, fertilizer (liquid feed or granular; if granule, regular release or control release), irrigation water, plant growth regulators, pesticides, herbicides, etc. The specifications for each input

should be two or three features critical to the production of quality planting material and should be quantitative (that can be measured and verified, Example: container – black poly bags 300 gauge thickness, 24 cm x 18cm size with 4 to 6 holes 5 cm above the bottom; irrigation water –less than 0.5 dsm-1 EC, less than 100 ppm CaCO3 content; etc). The specifications for size and durability of containers should be based on the duration the planting material has to retained in them without becoming pot-bound and without any bending or twisting of the taproot. Containers should have provision for drainage of excess water. The widely used growing medium in fruit crop nurseries at present is a mixture of sand, FYM and red earth in equal proportions. This medium needs sterilization by treatment with heat (steam or solarization) or chemicals (such as formaldehyde) to get rid of inherent soil borne pathogens such as Fusarium, Phytophthora etc and pests such as nematodes. Afterwards, the sterilized medium has to be inoculated with beneficial soil microorganisms such as Vesicular Arbuscular Mycorrhizae (VAM) and Phosphate Solubilizing Bacteria (PSB), supplemented with rock phosphate / super phosphate, filled into the containers and planted with the seed / seedling / cutting. Colonization of the beneficial microbes in the root zone can be verified forty-five days after the inoculation. Use of commercial sterile potting mixes can avoid sterilization of growing medium. Coco-peat, a byproduct of coir industry, has high water holding capacity and good texture, but is low in mineral nutrients. Organic materials such as leaf mold can also be used for preparing growing media, but its composition can vary widely making quality control difficult. The points to be considered for growing medium of nursery plants are proper drainage and water holding capacity, ability to supply requisite plant nutrients, freedom from pests and disease inoculums and proper texture to facilitate root growth. Handling and storing the media inside potting sheds helps to prevent their quality deterioration. The quality of irrigation water with respect to its pH, EC, and dissolved salts has to be defined based on the sensitivity of the plant species under consideration to these and has to be checked at frequent intervals, especially during summer.

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 ma y 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. This would be also useful in identifying probable flaws and to rectify them subsequently. At every step, continuous and effective coordination with research organizations on the latest technology development regarding

the nursery management aspects would be helpful to upgrade and perfect the quality control measures.

**Selecting safe and appropriate environment for nursery**

**Selection of site Location:**

The selected site for establishing a nursery should be located in an established nursery area. By doing so, one can share the experiences of fellow nurserymen and thereby many mistakes can be avoided in planning, management and marketing of the nursery stock. The selected site should preferably on a highway or at least connected with a good motor able road, which facilitates easy and economic transport of inputs and nursery plants to the users, orchardists and fruit growers. The selected site should also have electricity and other Communication facilities. These facilities will improve the production as well as marketing.

**Soil**

The success of any nursery depends mainly upon the quality of soil and abundant supply of good quality potable water. Before selecting the site for nursery, the soil and water analysis must be done, since most of the fruit and ornamental plants cannot tolerate salinity and alkalinity. The soil should be light to medium in texture with good fertility and sufficient water holding capacity along with good drainage. A soil pH of 6.0 to 7.0 is most suitable for any nursery. Salinity in soil or irrigation water leads to salt injury resulting in nutritional deficiencies, marginal browning of leaves and in acute cases death of grafts, layers and nursery seedlings especially in summer months. Therefore, a careful selection of soil with good quality irrigation water supply is of paramount importance for the nursery.

**Topography:** The topography of the selected land should be plain with one per cent slope. The slope facilitates smooth flow of irrigation water.

| **Self-Check -4** | **Written Test** |
|---|---|

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

1. Write Preliminary considerations for establishing nursery (10**points**)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| **Information Sheet-2** | **Designing blocks for lifting damping material.** |
|---|---|

Control of Damping-off: Damping-off is a common and serious disease in many forest nurseries. It can occur either in seed beds or in containers after transplanting. Damping-off is a pre-emergent and seedling disease caused by various fungi. Some of these fungi attack the seed just as germination starts, whereas others infect the newly germinated seedlings. Affected seedlings topple over, as though broken at the ground line, or remain erect and dry up. A watery-appearing constriction of the stem at the ground line is generally visible evidence of the disease. Damping-off is favored by high humidity, damp soil surface, heavy soil, cloudy weather, an excess of shade, a dense stand of seedlings, and alkaline conditions.

One of the best preventive measures for damping-off is to maintain a dry soil surface through cultivation, to reduce the sowing density, and to thin the seedlings to create better aeration at the ground line. The need for soil fumigation is minimized in nurseries where fresh soil mixtures are prepared annually.

Hardening-off: Seedlings continue under nursery care while they develop for 2-3 months. Then the good ones will be selected and placed in separate beds. They are given less water and exposed to the sun gradually to condition them for planting in the site. This hard treatment is called hardening-off. Seedlings will develop a dark green colour and look healthier in the open than under nursery shade.

**Establishing Nursery**

**How to establish a nursery**

**Site selection**

A ***good site for a tree nursery*** should have the following features:

- ® *Reliable, nearby water supply*
- ® *Source of soil*
- ® *Access to market for seedlings.*

In addition it is desirable to have:

- A well-drained soil with a gentle slope
- A natural shelter, such as tree cover, to provide shade for nursery workers.

**Soil**

A good soil for use in tree nurseries can be made by mixing:

- ***3 basins*** of soil collected from under vegetation cover, such as ***in forests*** or under large trees
- ***2 basins of clay soil***
- ***1 basin of sand***.

To test the mixture, roll a damp sample in your hand. A good mixture should roll and hold its shape but break if the roll is bent.

- If it does not break, then it has too much clay.
- If it crumbles before you can roll it, then it has too much sand.
- To ensure adequate fertility of the soil, add one basin of sieved manure or compost to every three or four basins of the standard mixture.

**Size of a nursery: -** this depends on the number of seedlings to be raised annually, but also on the production site.

***There are different factors that determine the size of nursery.***

(1) ***Number and type of seedlings to be raised***: The more seedlings are raised, the larger the size of nursery is required.

(2) ***Production techniques and the size of containers used***

(3**)** ***Availability of infrastructures.***

| Self-Check -4 | Written Test |
|---|---|

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

1. ***Write the different factors that determine the size of nursery*** (8**points**)

***Note:*** **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-2 | Selection and identification of trial blocks |
|---|---|

**Planning and layout of a nursery**

After selection of site for the establishment of a nursery, planning may be done in consultation with an experienced horticulturist or nurserymen. By doing so the cost on establishment, production and marketing can be reduced substantially, besides performing various nursery operations most efficiently and economically. While planning and layout is being done, the following components are to be taken care and provision should be made for these.

**1. 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. The fence could be further strengthened by planting a live hedge with thorny fruit plants (like Koranda).

**2. 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. But at the same time, the land should not be wasted by unnecessarily laying out of paths and roads.

**3. Progeny block/Mother plant block:**

The nursery should have a well-maintained progeny block or mother plant block/scion bank planted with those varieties in good demand. The grafts/layers/ rooted cuttings/ seedlings should be obtained preferably from the original breeder /research institute from where it is released or from a reputed nursery. One should remember that, the success of any nursery largely depends upon the initial selection of progeny plants or mother plants for further multiplication. Any mistake made in this aspect will result in loss of the reputation of the nursery. A well managed progeny block or mother plants block will not only create confidence among the customers but also reduces the cost of production and increases the success rate of grafting/ budding/layering because of availability of fresh scion material throughout the season within the nursery itself and there will not be any lag period between separations of scion and graftage.

**4. Wells, sump, pipelines, generators etc:**

Fruit and ornamental nursery plants require abundant supply of water for irrigation, since they are grown in poly bags or pots with limited quantity of potting mixture. Hence sufficient number of wells to yield sufficient quantity of irrigation water is a must in nurseries. In areas with low water yields and frequent power failures, a sump to hold sufficient quantity of water to irrigate the nursery plants is also very much essential along with appropriate pump for lifting the irrigation water. In areas where electricity failure is a problem which is more

common, an alternate power supply (generator) is very essential for smooth running of pump set. Since water scarcity is a limiting factor in most of the areas in the country a well laid out PVC pipeline system will solve the problem to a greater extent. An experienced agricultural engineer may be consulted in this regard for layout of pipeline. This facilitates efficient and economic distribution of irrigation water to various components in the nursery.

**5. 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.

**6. 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. Beds of 1-meter width of any convenient length are to be made. A working area of 60cm between the beds is necessary. This facilitates ease in sowing of seeds, weeding, watering, spraying and lifting of seedlings. Irrigation channels are to be laid out conveniently. Alternatively, sprinkler irrigation system may be provided for watering the beds, which offers uniform germination and seedling growth.

**7. Nursery beds:** Rising of seedlings / rootstocks in polybags requires more space compared to nursery beds but mortality is greatly reduced along with uniformity. Nursery beds area should also have a provision to keep the grafted plants either in trenches of 30cm deep and 1 m wide so as to accommodate 500 grafts / layers in each bed. Alternatively, the grafts/ layers can be arranged on the ground in beds of 1 m wide with 60cm working place in between the beds. Such beds can be irrigated either with a rose fitted to a flexible hosepipe or by overhead micro sprinklers

**8. Potting mixture and potting yard:** For better success of nursery plants, a good potting mixture is necessary. The potting mixtures for different purposes can be prepared by mixing fertile red soil, well rotten FYM, leaf mold, oil cakes etc. in different proportions. The potting mixture may be prepared well in advance by adding sufficient quantity of superphosphate for better decomposition and solubilization. The potting mixture may be kept near the potting yard, where potting/pocketing is done. Construction of a potting yard of suitable size facilitates potting of seedlings or grafting/ budding operations even on a rainy day.

**Structures for nursery:**

**1. Shade houses:**

Shade houses in nurseries in tropical and sub-tropical regions offer many advantages like rising of seedlings in bags directly, protecting the grafts from hot summer months, effective irrigation through upside down overhead micro sprinklers. The shade houses made with shade nets (50% or 75%) for regulation of shade are particularly very useful in arid regions where the humidity is very low during summer months.

**2. Green houses/Poly houses:** Grafting or budding of several fruit species under poly houses or low cost green houses with natural ventilation will enhance the percentage of graft/bud take besides faster growth of grafts due to favorable micro climatic conditions of poly house.

**General Nursery Management Practices**

Facilities required for propagating many plant species by seed, cuttings or grafting and budding include two basic units namely a structure with temperature control and ample light such as a green house or hot bed where seeds can be germinated or cuttings rooted. The second unit is a structure into which the young tender plants can be moved for hardening preparatory to transplanting and cold frames or lath houses are useful for this purpose.

Propagating structures

**I. Green houses:** There are number of types of green houses namely low cost green house and commercial green houses. In green house construction, a wood or metal frame work is built to which wood or metal sash bars are fixed to support panes of glass embedded in putty. In all poly houses/ green houses means of providing air movement and air exchange is necessary to aid in controlling temperature and humidity. It is best, if possible to have in the green house heating and self opening ventilators and evaporative cooling systems. ii. Plastic green houses: Green houses covered with various types of plastic film have become very popular for small home garden as well as for large commercial installation. Several kinds of plastic materials are available and are cheaper than glass. Plastic houses are usually of temporary construction except when permanent high cost coverings are used. Plastic covered green houses tend to be much lighter than glass covered ones with abuild up of excessive high humidity.

**a) Polythene film:**

This is the most inexpensive covering material but it is the short lasting one. However, UV ray resisting polyethylene film of various thicknesses is usually recommended which lasts longer.

**b) PVC film:**

This material is pliable and comes in various thickness and widths up to 6 ft. It is longer lasting than polythene and is more expensive PVC surface of film tends to collect dust and lower the light intensity in due course of time.

**c) Polyester film:**

This is a strong material with excellent weathering properties lasting for 3-5 years and is unaffected by extremes of heat or cold. Bu t is usually costlier than polythene film/pvc film

**d) Fiberglass:**

Rigid panels, corrugated or flat fiber glass sheets embedded in plastic are widely used for green house construction. Fiber glass is strong, long lasting, light weight and easily applied

which is coming in a variety of widths, lengths and thickness. It is costlier than poly thin film/pvc film.

**iii. Hotbeds:**

The hot bed is often used for the same purpose as a green house but in a smaller scale. Amateur operations and seedlings can be started and leafy cuttings root early in the season in such structures. Heat is provided artificially below the propagating medium by electric heating cables, pot water, steam pipes or hot air blows. As in the green house, in the hot beds attention must be paid for shading and ventilation as well as temperature and humidity control.

**iv. Lath houses:**

These structures are very useful in providing protection from the sun for container grown nursery stock in areas of high summer temperatures and high light intensity. Well established plants also can require lath house protection including shade loving plants Lath houses construction varies widely depending on the material used. Aluminum pre-fabricated lath houses are available but may be more costly than wood structures. Shade is provided by appropriate structures and use of shade nets of different densities allows various intensities of light in the lath houses.

| **Self-Check -4** | **Written Test** |
|---|---|

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

1. **Write the Structures for nursery** (14**points**)

***Note:*** **Satisfactory rating – 7 points** **Unsatisfactory - below 7 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-2 | Construction and installation of water system |
|---|---|

Introduction

Pumping machinery is used for transfer of water from one place to another and pumping of water from water sources.

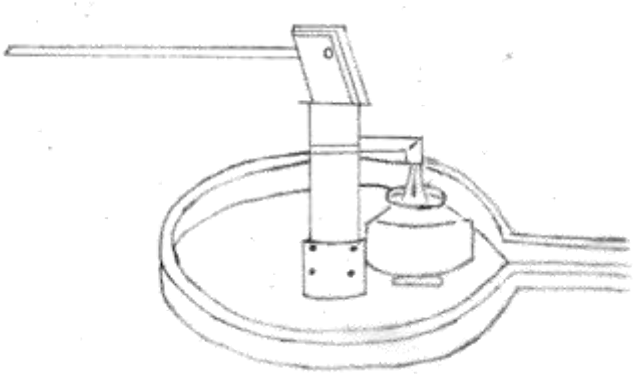
**Sources of Water** Ground water: Open well, tube well/bore well, hand pump are sources which make water available from ground.

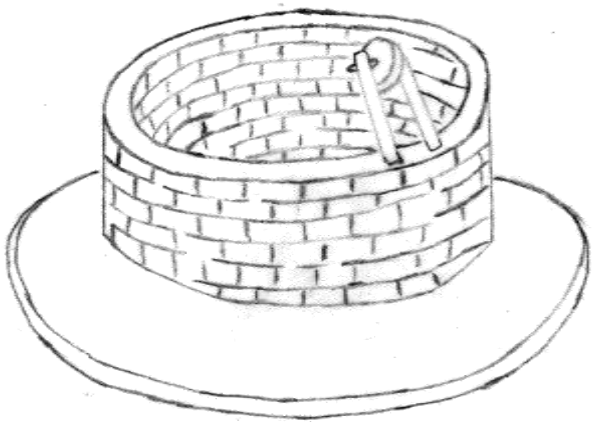
Water:-Securing an adequate supply of nursery and irrigation water can be a major problem. Water rights must be obtained for any water source. Therefore, special consideration must be given to a site where the quantity and quality of water are adequate for current and possible future requirements

All water needs and the timing of those needs must be considered. For example, in most nurseries, irrigation is necessary during the growing season and for frost protection. Restrictions on flow and on periods of delivery must be closely scrutinized. Is the water source reliable during drought years? Can breaks in canals, pipelines, and other delivery systems be expected? What are the time frames for repair? Are backup sources available in emergency situations? Is domestic water available through a city, village, or other municipality? Are there restrictions on quantity? Are costs high? Is it feasible to develop an on-site water source? Is water quality high? Are there any potential delivery problems? If no water is available near the site, can a transmission line be constructed? Irrigation water sources. Lakes are a good source of irrigation water. Storage capacity, draw-down, other uses, and contaminants must be examined before any commitment is made. Screening may be necessary to remove water-borne debris. Streams are sometimes used for nursery irrigation and must be checked for water rights, other uses, and quality. In addition, attention must be paid to intakes, diversions for pumping stations, protection during runoff periods, and maintenance of the stream channel to ensure maximum carrying capacity. Stream water may need to be screened to alleviate contamination by vegetation, weed seeds, frogs, fish, algae, and other water-borne debris. Irrigation water delivered through open ditches is usually controlled by irrigation districts and is subject to specific short delivery periods. Such a source is not reliable unless storage is made available on site and therefore is not recommended. Water drawn from wells is probably one of the best irrigation sources for most locations. Draw-down and pumping capacity must be checked to ensure that water is available in reliable quantities when it is required. Domestic or irrigation pipelines are reliable. In many instances, clean water will be supplied with adequate pressure and volume to eliminate the need for pumping. The two types of pipelines are similar, both generally well designed and constructed, although domestic water lines usually have more connections creating a high demand for water and more concern for failure of

the system. Systems must be reviewed to ensure that maintenance is adequate and repairs are timely.

Water quality:-Chemical contaminants may be introduced into an irrigation source through the soil or from precipitation or surface runoff. Contamination by minerals such as calcium or boron, for example, will usually be found in well water. However, because streams, lakes, and ditches also may have mineral contaminants, any potential site must have its water sources evaluated for mineral content and concentration. Water originating from any open source (lake, stream, or ditch) is subject to contamination by weed seeds. High concentrations of these can lead to unwanted vegetation in seedbeds and cover crops-a major problem. Special, well-designed screening devices can alleviate this problem.





**Open Well**: Where ground water is available at low depth (less than 15 meters - and water is available all year round, open well is used.

**Hand Pump**: Where safe ground water is available upto 60 m depth, hand pump is ideal choice for a cluster or habitation

**Bore Well/Tube Well**: Where ground water is at greater depth and open wells or hand Pumps are not viable, bore well or tube well is installed.

**Surface Water**: River, pond, dam site are sources where surface water is available. Moreover, rain water can be harvested and stored directly in storage tanks. This water is potable after first rain and can be used for drinking purpose also.

**Water Supply Mechanism**

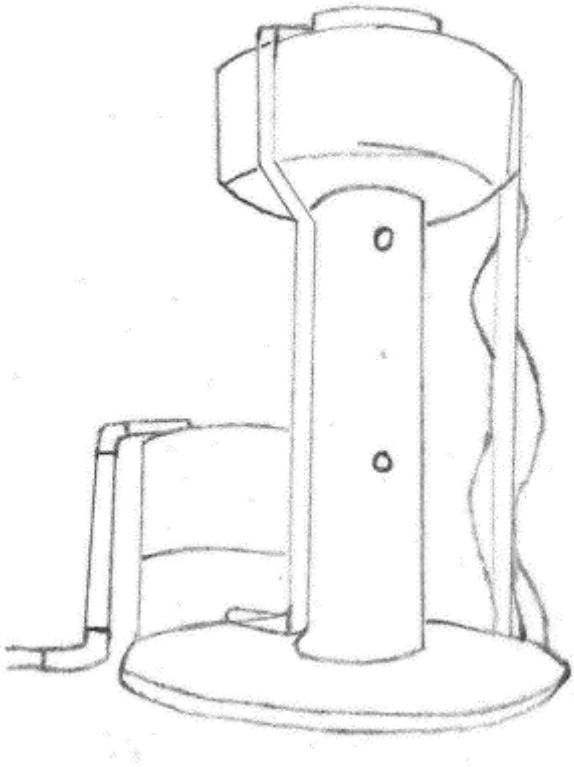
**Pump House and Pumping Machinery**: Pump is used to fetch water from source like bore Well, open well, sump or ground water storage and supply it to pipelines or elevated storage. There are three main components: a) pump, b) electrical or oil engine, c) panel board. Pump house is constructed for security and safety of machineries.

**Rising Main** : The delivery line carrying water from pump to storage tank (elevated or Ground) is called rising main.

**Storage Facilities**

**Elevated Surface Reservoir (ESR)** or elevated storage tank: ESR is constructed, where water is to be supplied at elevated height (less than the level of ESR) or where the distance is large and topography is undulating. Generally, ESR is at height more than 15 m. Water can be distributed directly from this storage tank by gravity or pump.

**Ground Service Reservoir (GSR):** GSR is ground level or plinth level storage tank. The plinth level is generally not more than 3 m.

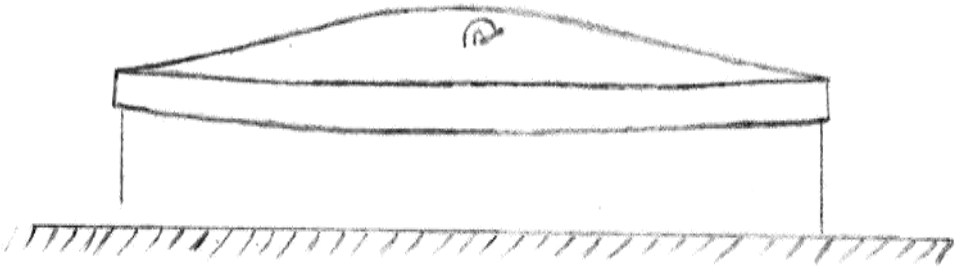


Storage capacity of the service reservoirs is estimated based on pumping hours, demand and hours of supply, electricity available for pumping. Systems with higher pumping hours require less storage capacity. Normally, such reservoirs are calculated to store half to one day daily water requirement.

**Sump**: Sump is used as additional storage at village/town level or cluster level. It is not used for direct distribution of water. Rather, it is used as intermediate or Contingency storage, to store water before pumped to ESR/GSR. The underground

**Sump**

storage tank in circular shape with dome line covering is called sump. Generally, the capacity of sump is more (one and half to two times) than ESR or GSR or two to five days water requirement, so that if the supply is disturbed for that time, the water is available for the people.



**Water Distribution**

For efficient distribution, it is required that water should reach end use with required flow rate with needed pressure in the piping system. There are three main types of distribution system that can be adopted in villages/towns:

- Gravity Fed Distribution

When the ground level of water source/storage is sufficiently raised than the core village/town area, such system can be utilized for distribution. The water in the distribution pipeline flow due to gravity and no pumping is required. Such system is highly reliable and economical.

- Pumping System

In such system, water is supplied by continuous pumping. Treated water is directly pumped into the distribution main with constant pressure without intermediate storing..Supply can be affected during power failure and breakdown of pumps. Hence, diesel pumps also in addition to electrical pumps as stand by to be maintained. Such system works only in condition where there is continuous power supply, reliable water source and where intermediate storage system cannot be installed

- Dual/Combination

In such system, both gravity as well pumping systems are used. Such systems are used where there are variations in topography in town/village.

Minimum Residual Pressure in a distribution system should be 7 m for single Storied, 12 m for two storied and 17 m for three storied building. (Source: CPHEEO)

**Distribution Lines**: The lines carrying water from storage to its end use (stand post/ Household tap etc.) Are called distribution lines. Distribution pipelines consist of main pipeline connected from secondary storage; sub-main pipes connected from main pipeline and service/branch pipes connected from sub-main for distribution to households.
Generally, Mild Steel (MS), Galvanized Iron (GI), High Density Polyethylene (HDPE)/ Poly Vinyl Chloride (PVC) pipes, Ductile Iron (DI) pipe with 15-200 mm diameter are used in distribution. These lines are generally underground (1-3 feet below ground). Valves are used to control the distribution.

Construction is the way of something is built or made

Installation is a way of something (such as a piece of equipments) that is put together and made ready for use.

**Construction and installation of water system**

Servicing irrigation system components

Irrigation system refers to the layout of the irrigation system for flooding should follow the natural slope of the nursery site as this enable to distribute water in all directions easily. Whenever possible, water should be distributed by gravity.

To keep the investment cost of the water -distribution system low, the discharge of all the water Sources (**surface water** which includes spring, river, streams, lake) and **Ground water** which includes (wells and pumping system) Should considerably exceed a daily requirement of about 8mm (PET-rate) otherwise expensive storage tanks and /or ponds have to be provided to store part of or the entire required daily water requirement.

There ***two main types of irrigation***/water distribution system can be distinguished in nursery. This may include:

**A. The furrow irrigation**:

- Open ditches with watering ponds **E.g.** Ebb and flow
- Open channel system **E.g.** capillary beds

**Advantage**

- Are relatively simple, cheap to construct but demands needs permanent maintenance to free them from silt and vegetation.

**Disadvantage**

- Require much land area

**B. The pipe irrigation:** water is sprayed in very fine droplets in short intervals onto the plants, where it evaporates.

- Sprinklers
- sprayers and drippers

**Irrigation system components** are serviced and faulty parts are ***repaired or replaced***. It includes:

- Pumps
- Line
- Pipes

- Sprinklers
- Sprinkler heads
- Solenoids
- Filters
- Controllers
- Sprayers and
- Drippers.

**Checking performance parameters of irrigation**

Performance parameters of the irrigation system are checked to ensure optimum ***performance***. Checks may include

- Identifying dry spots and blockages
- Water dumping
- Abnormal water flow and leaking heads
- Lines and pipes.

| **Self-Check -4** | **Written Test** |
|---|---|

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

1. What is pumping machine (4**points**)

***Note:*** **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-4 | Construction of access roads and windbreaks |
|---|---|

Introduction

Roads provide access to the site and to growing fields. When the site is developed, all access roads should be paved; they must be capable of taking heavy "semi" truck and tractor traffic in all kinds of weather. Parking areas must be evaluated and particular attention given to pedestrian and vehicle traffic flows. Possible conflicts with people, vehicles, buildings, and landscaping must be taken into consideration. The potential maximum number of future employees must be anticipated and allowances made for future parking if the need

When considering connecting points (entries and exits) to existing road systems, the development team should solicit input from the local community. A decision matrix such as that shown in Table 3 is extremely helpful. In that case, four entry points were rated from 0 (high impact) to 10 (low impact) in eight categories and their composite scores determined. Be-cause of anticipated conflicts, entry #1 was chosen though it was far from the least costly

**Construction of wind breaks**

**Wind breaks:**

These are three or four rows of suitable trees and shrubs that are planted on wind ward sides of production areas, germination beds or around the nursery.

- ※ They help to reduce drying, eroding, and abusive effect of winds on growing seedlings, and sometimes they protect the nursery from animals.
- ※ Avoid selecting these species whose root systems compete with bare rooted seedlings for water and nutrients.

Any insect or disease out of the wind breaks should be controlled quickly to reduce the risk of spreading to nursery seedlings.

**Windbreaks and shelterbelts**

In arid zones, the harsh conditions of climate and the shortage of water are intensified by the strong winds. Living conditions and agricultural production can often be improved by planting trees and shrubs in protective windbreaks and shelterbelts which reduce wind velocity and provide shade. Windbreaks and shelterbelts, which are considered synonymous in this manual, are barriers of trees or shrubs that are planted to reduce wind velocities and, as a result, reduce evapotranspiration and prevent wind erosion; they frequently provide direct

benefits to agricultural crops, resulting in higher yields, and provide shelter to livestock, grazing lands, and farms.

A main objective of windbreaks and shelterbelts is to protect the agricultural crops from physical damage by wind. Other benefits include:

- Preventing, or at least reducing, wind erosion;

- Reducing evaporation from the soil;

- Reducing transpiration from plants;

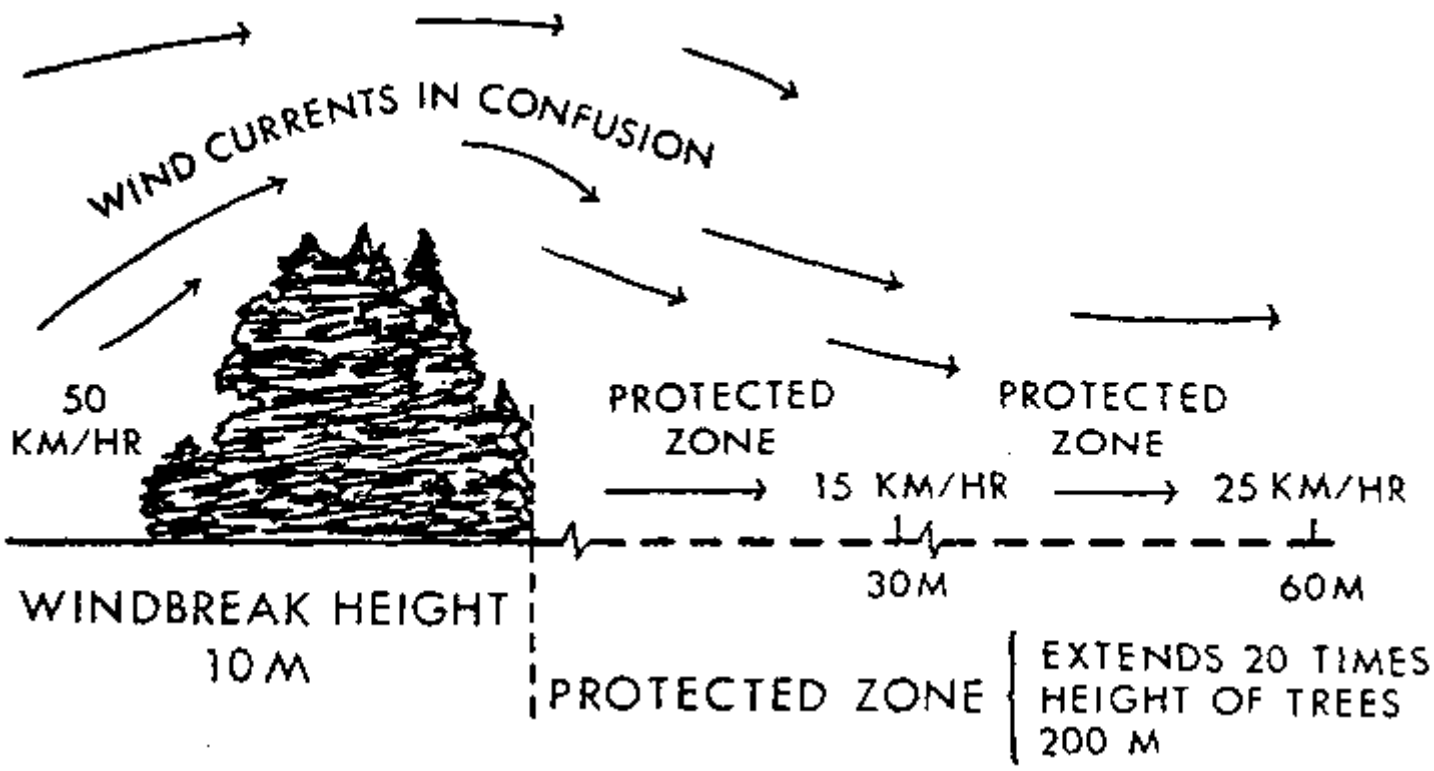
- Moderating extreme temperatures.

Quite often, protection can be combined with production by choosing tree and shrub species that, apart from furnishing the desired sheltering effect, yield needed wood products.

1 Design of windbreaks and shelterbelts

When considering windbreak or shelterbelt planting, three zones can be recognized: the windward zone (from which the wind blows); the leeward zone (on the side where the wind passes); and the protected zone (that in which the effect of the windbreak or shelterbelt is felt) (Figure 5.1).

**Figure 5.1 Functioning of a windbreak**




The effectiveness of the windbreak or shelterbelt is influenced by its permeability. If it is dense, like a solid wall (Figure 5.2), the airflow will pass over the top of it and cause turbulence on the leeward side due to the lower pressure on that side; this gives a comparatively limited zone of effective shelter on the leeward side compared to the zone that a moderately permeable shelter creates. Optimum permeability is 40 to 50 percent of open space, corresponding to a density of 50 to 60 percent in vegetation. Gaps in the barriers should be avoided. Permeability of dense shelterbelt can be improved by pruning lower branches at 0.50-0.8 m from the soil level (Figure 5.3).

It is generally accepted that a windbreak or shelterbelt protects an area over a distance up to its own height on the windward side and up to 20 times its height on the leeward side, depending on the strength of the wind. In reducing wind speeds, narrow barriers can be as effective as wide ones. Furthermore, a narrow shelterbelt has the advantage of occupying less land.

The shape of the cross-section of a windbreak or shelterbelt determines, to a great extent, the sheltering effect. To a large extent, the choice of tree or shrub species to plant, along with their planting arrangement, dictates the cross-sectional shape. In general, an inclined slope facing the wind should be avoided, as it only deflects the windflow upward. Barriers with a clear vertical side provide best wingspread reduction.

When designing a windbreak or shelterbelt, the direction of the wind must be considered. A barrier should be established perpendicular to the direction of the prevailing wind for maximum effect. To protect large areas, a number of separate barriers can be created as parts of an overall system. When the prevailing winds are mainly in one direction, a series of parallel shelterbelts perpendicular to that direction should be established; a checkerboard pattern is required when the winds originate from different directions. Before establishing windbreaks or shelterbelts, it is important to make a thorough study of the local winds and to plot on a map the direction and strength of the winds.

### 2.3 Selection of tree and shrub species

In the selection of tree or shrub species for windbreaks or shelterbelts, the following characteristics should be sought:

- Rapid growth;

- Straight stems;

- Wind firmness;

- Good crown formation;

- Deep root system, which does not spread into nearby fields;

- Resistance to drought;

- Desired phonological characteristics (leaves all year long or only

| Self-Check -4 | Written Test |
|---|---|

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

1. Which one of the following is selection of tree characteristic for wind break (5**points**)

   A. Rapid growth B. Straight stem C. Wind firmness D. Resistance to drought

2. What is the main objective of windbreak(5 points)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

# Basic Agriculture Production and Natural Resources Conservation Level I

# Learning Guide-3

**Unit of Competence: Support Nursery Establishment and Basic Nursery Work**

**Module Title: Supporting Nursery Establishment and Basic Nursery Work**

**LG Code: AGR BAN1 M05 LO5-LG-05**

**TTLM Code: AGR BAN1 M05 TTLM 0919v1**

## LO 4: Undertake basic nursery work

| Instruction Sheet | Learning Guide # 3 |
|---|---|

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

- preparation of seed and transplanting blocks
- pulverizing seeding beds and transplanting blocks
- preparation and leveling of seed bed and transplanting blocks
- carrying out seeding beds, mulching, shade construction, watering and protection activities
- maintaining clean 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:

- prepare of seed and transplanting blocks
- pulverize seeding beds and transplanting blocks
- prepare and leveling of seed bed and transplanting blocks
- carry out seeding beds, mulching, shade construction, watering and protection activities
- maintain clean work site

**Learning Instructions:**

7. Read the specific objectives of this Learning Guide.
8. Follow the instructions described below 3 to 6.
9. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5”.
10. Accomplish the “Self-check 1, Self-check t 2,” **in page -79, and 94,** respectively.
11. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -95,96,97.**
12. Do the “LAP test” **in page – 97**(if you are ready).

| Information Sheet-1 | prepare of seed and transplanting blocks |
|---|---|

**What is a seed?**

A seed is a small embryonic plant enclosed in a covering called the seed coat, usually with some stored food. It is the product of the ripened ovule of gymnosperm and angiosperm plants, which occurs after fertilization and some growth within the mother plant. The formation of the seed completes the process of reproduction in seed plants (started with the development of flowers and pollination), with the embryo developed from the zygote and the seed coat from the integuments of the ovule. All seeds have different sizes, shapes and colors.

Seeds of woody plants exhibit a great range of variation in shape, size, color and behavior. The most essential factor for the success of plantation is the ready availability of quality seeds. The quality of seed is responsible for the future performance of each and every seedling. Poor quality seeds may have the following problems:

- Low germination percentage
- Poor emergence
- Poor survival

**Transplanting**

- Water mother beds thoroughly before transplanting the seedlings.
- Always use some tools (e.g. bamboo sticks) to loosen the soil before pulling out seedlings from the beds.
- Make a deep and wide hole in the polythene bag or container for transplanting the seedlings. Hold seedlings at the base of the stem and pull it out gently from the mother bed.

**Preparing planting material**

**Sourcing seed and pre-treatments**

**Sourcing tree seed:** It is important to try and use ***good quality seed in*** planting. Seed can be collected from trees locally – ***from farms, forest or public land***

During seed tree selection, some of the ***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
- Vigorous
- Tolerant to stress

**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***. This method is recommended for seeds that have soft seed coats

**Procedure:**

- ✓ Soak the seeds in cold water which is 2 times its volume
- ✓ Remove all floating seeds
- ✓ Sowing the remaining seeds at the bottom in containers in the nursery or direct sow directly in the field after

- ***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
- **Nicking-cut slightly the seed at one tip to allow water penetrate**

It is important that fine seed is mixed with sand and uniformly broadcast on the seedbed to avoid overcrowding that can lead to damping off. Do not sow the seed too deep in the soil; the depth of holes should depend on the size of the seeds (usually 5 mm to 1 cm). Sowing

too deep is likely to prolong seed germination period or seeds may lot. Put a seed in each hole; gently cover with soil equal to the size of the seed itself. Water the pots.

Make a light shade with grass (netting material) to cover the pots or the seed bed after sowing. Water the sown seeds twice a day, early in the morning before 9.00 am and in the evening after 4.00 p.m. If this is not possible then water in the evening only since most of the water at this time is taken-up by the plant since there is very little evaporation.

| Self-Check -1 | Written Test |
|---|---|

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

1. Define seed (5 pts)
2. Define transplanting (5pts)
3. Write seed selection criteria(10pts)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-2 | pulverize seeding beds and transplanting blocks |
|---|---|

**Nursery Preparation**

• Plough & pulverize the soil thoroughly. Prepare nursery bed measuring 1 m wide and 15-20 cm high and of convenient length (3-5m).
• Treat seeds with Bavistin (Carbendazim) @ 2gm/ kg seed, against Phytopthora and other seed borne diseases.
• Seed rate is about 0.5-1 kg of quality seed per acre with minimum germination of 75%.
• Sow seeds about 2 cm deep in lines at cm apart.
• In mid-elevation areas, raised nursery in polytunnel for early chilli production and normal open nursery for main season chilli production.
• In high-elevation areas, sow the seeds in plastic tunnel. This will bring forward the growing season by one month.
• The seedlings are ready for transplanting in about 30 to 60 days after sowing depending on the elevation under ambient conditions or when the seedlings attained 12-15 cm height.

**2. Field Preparation**

• 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( 3-5m). Proper levelling of field and beds is important for water and disease management
• Raised bed and drainage is important for chilli wilt management
• Apply 10-12MT of well rotten FYM and 20:30:15 NPK kg/acre as basal dose.
• Apply all FYM during field preparation. Apply all the basal fertilizer at about 9-10gm of fertilizer mixture per planting hill and mix them into the soil with the help of a hand hoes.

**3. Transplanting**

• Transplant seedlings of 12-15cm high, preferably during evening time and water immediately to avoid transplanting shock.
• Transplant the seedlings at 45 cm between rows and 30 cm between plants in a row or a population of at least 25,000 plants per acre.

• Top-dress the crop with 10 kg of additional nitrogen after 30 and 60 days after transplanting. Split the top dressing fertilizer in two halves in very light soils.

**Transplanting**

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”

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. There appears to be nothing to be gained by leaving them longer in the seedbeds.

Transplanting into pots is done following the following procedure below.

- Erect a large portable shade above the bed.
- The translators should work in pairs on opposite side of bed. They can sit on low small stools.
- A hole is made with the dibble in the center of each pot.
- 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. Any air pocket prevents the establishment of the plant in the soil.
- If the seedlings has left too long in the seed bed the root should be trimmed back to 2-3 cm
- It is important that the roots hang straight in the hole. Twisted root systems do not produce satisfactory seedlings. The seedlings are placed at the same depth or slightly deeper than they were in the seedbed.
- The soil around the seedlings must be firmed gently and smoothed with the fingers so that no depression is left around the stem. The water would collect in the depression which would increase risk of death due damping-off.

| Information Sheet-3 | Preparation and leveling of seed bed and transplanting blocks |
|---|---|

**Preparation and leveling of seed bed and transplanting blocks**

**Compartment division**

※ the basic production unit is the compartment with beds running parallel to the shortest side. Each bed should be 1m wide and 0.4~0.6m apart for working path, enabling laborers to reach the center of the beds during watering and weeding on both sides.

※ One compartment can hold 10~20 beds. It is good if a single compartment can contain 10 beds to shorten the walking distance.

※ Germination compartment building, as well as soil storage occupies one compartment each.

※ for management purpose, several compartments can be combined to form blocks that can be framed by hedges.

**e) Bed construction**

※ seed beds are mostly 1m wide which enable people to reach the center of the beds during weeding and watering operations.

※ the length of the bed could be vary from 5~20 m.

※ usually 0.4~0.6 m paths are left in between the beds

**Procedures for seed bed construction**

**1)** Level the site where bed is to be constructed and firm the soil.

**2)** Make out the required site and shape of beds with pegs and cords.

**3)** Erect reverting boards **15 $m^3$ ~4cm** in size around the marked area.

**4)** Place a layer of gravel having **3cm** thickness or sand sieved to a depth of **5cm** in the bed followed by smoothing and pressing lightly with a flat board. Apply **2~3cm** thick layer of un-sieved forest soil on the top of gravel for good drainage, it acts as filter layer for seed bed to the top with seed bed soil that will be leached down.

**5)** Fill the remaining part of the seed bed to the top with seed bed mixture.

**6)** Level the soil with flat board.

**7)** Firm the soil on bed using hands to avoid any space unfilled with atmosphere.

Later, firm the soil using flat boards.

**8)** Protect the surface of beds with a thick layer of green grass and leaves.

**9)** Seed beds should be constructed orienting in east-western direction to have a balanced sunshine effect.

**Bed can be prepared in different**

**A. Raised**: 15~20cm high/ 1m wide and convenient length

(When risk of flooding is high)

**B. Ground** level: wooden planks or concrete with dimension: 15~20cm high, 1 m wideand convenient length.

**C. Sunken beds**: 15~20Cm deep, 1m wide and a convenient length.

This type of beds is Appropriate when precipitation is low.

| Information Sheet-4 | carry out seeding beds, mulching, shade construction, watering and protection activities |
|---|---|

**Preparation of suitable soil mixture**

The standard soil mixture various from country to country, but the mixture used willnormally contain:

1. Humus-rich soil as found under trees or in forest

2. Ordinary agriculture soil as found in crop fields, garden, or fallows

3. Sand soil the soil contains too much clay that they are heavy and crack when they are dry. Since the mixture depends very much on the quality of the soil available. No standard is given it varies from locality to locality.

e.g. 3 parts agricultural soil(clay soil)

1 part forest soil/ humus

1 part sand

3:1:1 ratio

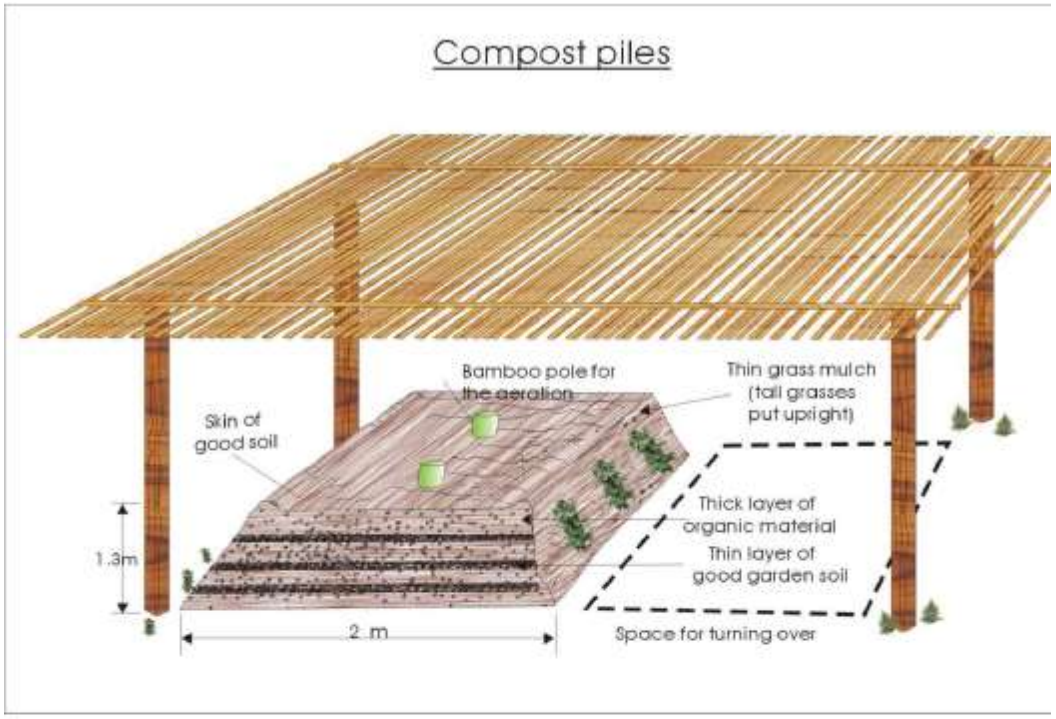
The suitable mixing proportion should be determined by experiment or experience.

Hence, every nursery develops its own standard soil mixture.

E.g., the nursery uses forest soil, compost, and sand at a ratio of 5:2:1

**Preparation of compost**

**Compost** is humus rich organic substance which provides organic matter to improve moisture holding capacity and nutrients as well. Compost is prepared by letting,alternative layer of C-rich composed through microbial action in a pile or pit.



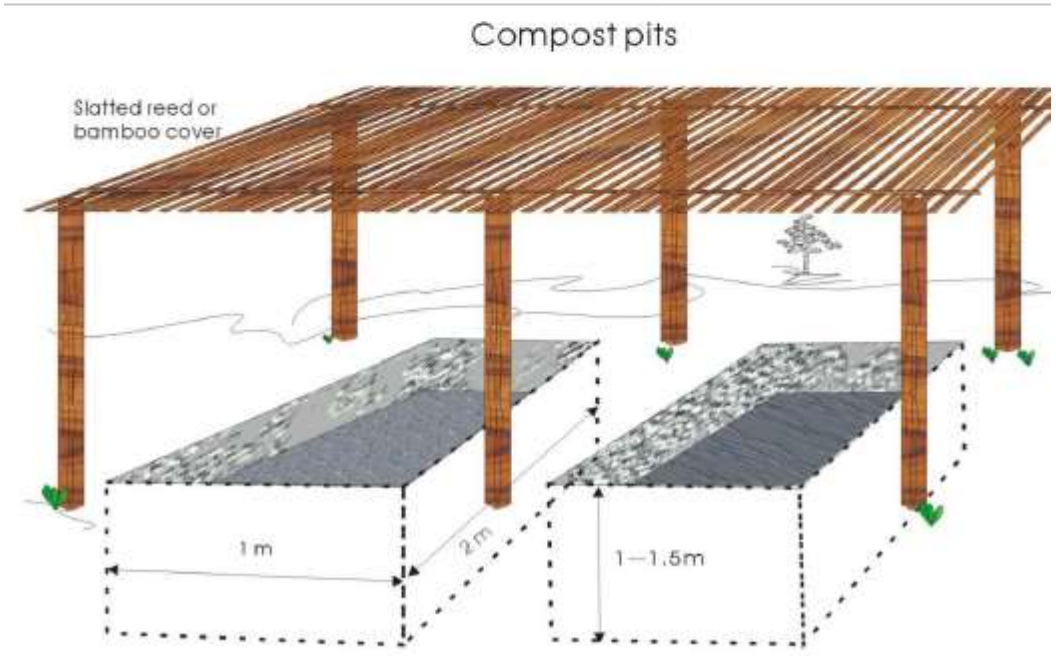




*Figure 4. Shows compost piles and pits respectively.*

**Potting the soil mixture**

**Potting:** is filling pots with soil

When the soil, sand, manure, or compost have been obtained, they are sieved andmixed thoroughly, the mixture is moist to become humid but not wet.

In general we have two types of seedlings

**1. bare-rooted seedlings:** are seedlings directly sown and grown on nursery bedswithout containers, such as polythene tubes.

**2. Potted seedlings:** are seedlings grown in containers, such as polythene (plastics)tubes, clay pot, banana leaves, tins…etc. expensive to raise due to the need for purchasing the required amount and size of plastic tubes, preparing soil mixture, filling and stacking of pots. With suitable soil mixture, seedlings can survive in a harsh environment.

**3. Placing the pots in blocks/ beds** placing pots on beds in a proper manner is very important pots are placed in upright position. They can't be squeezed but keep round pot space is to be left for rain and excessive water to be drained off easily it should be placed in a straight row.

Mulching may be defined as any artificial modification of the soil surface. It can be done in many ways, such as mulching by ordinary cultivation and covering of grass, leaves straw sawdust, sand etc. The primary purpose of mulching is to conserve soil moisture by lowering soil temperature and by physically blocking the loss of water in areas where watering is necessary through the year, mulching helps to reduce both the frequency of watering and the amount of water needed

**Mulching/ shading:-**Mulching: in nursery practice, it means covering beds by materials such as grass, dried straw leaves with 0.5~2 ㎝layer of organic materials which reduces: Evaporation, Conserve soil moisture, Decrease erosion and Soil temperature

**Transferring Seedling into Pots:-**Transplanting is the seedlings transferring from seed boxes, green house beds or open seed beds to transplant beds or containers in order to provide each seedling with adequate space to grow and develop.

**Shading** Just Like potted seedlings, newly potted wildings should be protected from heavy rainfall and direct sunlight. Normally, a permanent high shade about 3 m in height with a roof made up of black sarlon netting which can provide 80% shade, or a temporary shade using dried palm Leaves, should be erected over the transplanting beds before or immediately following transplanting.

**Watering** Following transplanting, special attention should be given to minimize evapo-transpiration of the potted wildings until new roots are formed. Hence, watering should always be carried out, especially of the newly potted wildings. During watering, care should be taken to minimize disturbance of the soil surface of the potted wildings by constantly moving the water sprays over them.

**Protective** measures should immediately be taken if there is indication of any fungal or insect attack on the potted wildings. For both fungal and insect attacks, precautionary measures similar to the potted seedlings should be taken. 12.6.2 Daily inspection of the entire growing stock in the nursery should be conducted. Any potted wilding found to be showing abnormal changes, including dead wildings, should be removed from the growing area for observation.

**Vegetative propagation**

Not all trees and shrubs used in planting program are produced from seed. Species whose propagation by seed is difficult can often be reproduced by vegetative propagation. Nursery stock that is obtained by vegetative propagation includes stumps, cuttings, and sets.

"Stump" is a term applied to nursery stock of broad-leaved species which has been subjected to drastic pruning of both the roots and the shoot. The top is generally cut back to 2 centimeters and the root to about 22 centimeters. Stump planting is suitable for "taproot-dominated" species. Frequently, stumped plants are used in sand dune stabilization plantations. Stumps are normally covered with wet sacks or layers of large leaves during transit to the planting site.

Cuttings and sets are also commonly used as planting stock. A "cutting" is a short length cut from a young living stem or branch for propagating; a cutting produces a whole plant when planted in the field. A rooted cutting is one that has been rooted in the nursery prior to field planting. "Sets" are long, relatively thin, stem cuttings or whole branches.

Size and quality of planting stock

There is a considerable range in what is considered the desired size of tree or shrub seedlings for planting. The optimum size varies, depending on whether the seedlings are bare-rooted or containerized, on the tree or shrub species to be planted, and on the characteristics of the planting site.

In general, it is agreed that plants with a well-proportioned root-to-shoot ratio represent good planting stock, but it is difficult to define an "optimum" root-to-shoot ratio. A root-to-shoot ratio based on weight might give a more accurate measure of balance. Stem diameter and height are other criteria for evaluating planting stock that might allow the setting of minimum acceptable limits. Experience indicates that medium-sized stock, between 15 and 40 centimeters, with a woody root collar, have a better survival rate that do smaller plants.

The maximum size for planting potted stock is largely determined by the size of the container. The larger the containers, the larger the plant that can be grown in it; but the period of growth is limited to that free of harmful root restriction. Excessively tall plants can be lessened in the ground or blown over, and root development might be restricted or inadequate to cope with the high transpiration demand of a large top.

| **Information Sheet-1** | **maintain clean work site** |
|---|---|

**Nursery Management Activities**

The overall objective of any nursery is to raise good quality, healthy seedlings at the lowest cost. The success of such nursery operations depend on many factors, these are:

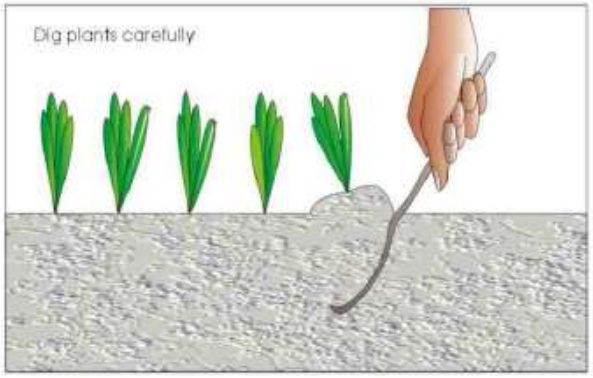
- Efficient supervision (management) and administration
- Use of well-prepared cultural methods and useful protection from pests, disease and other damage…
- Way of care and conditioning of seedlings.

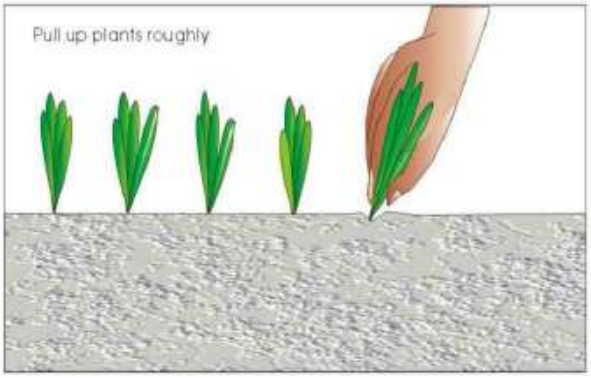
The major activities after sowing in the nursery management are:

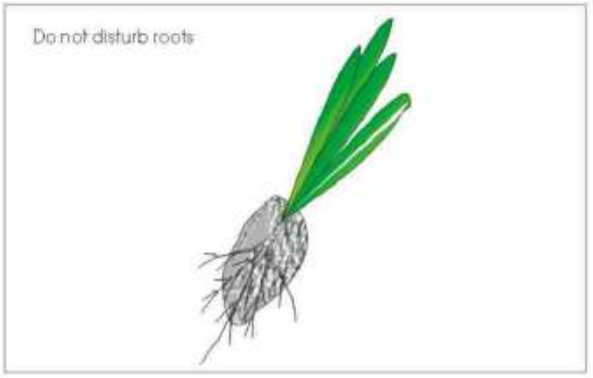
- watering
- thinning and root pruning
- shading
- Controlling of insect pest and diseases…etc.
- Weeding
- applying fertilizers

Right way

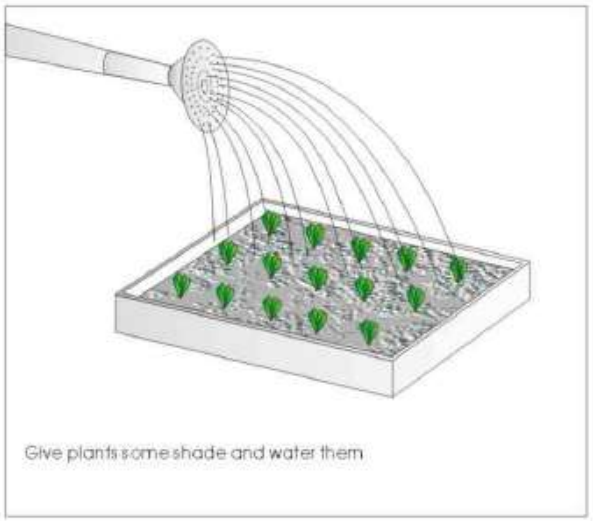
Wrong way

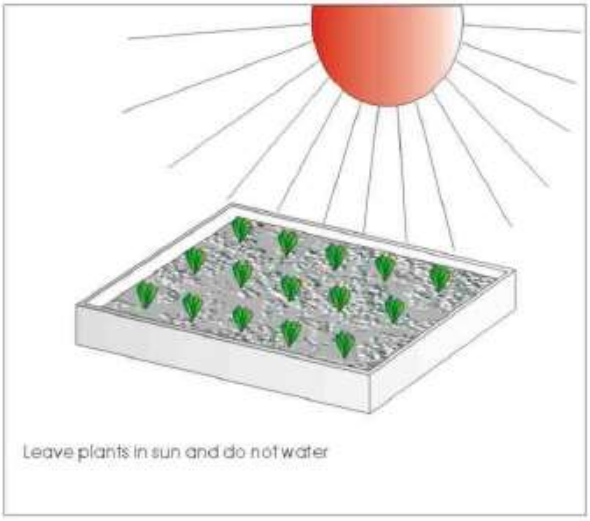


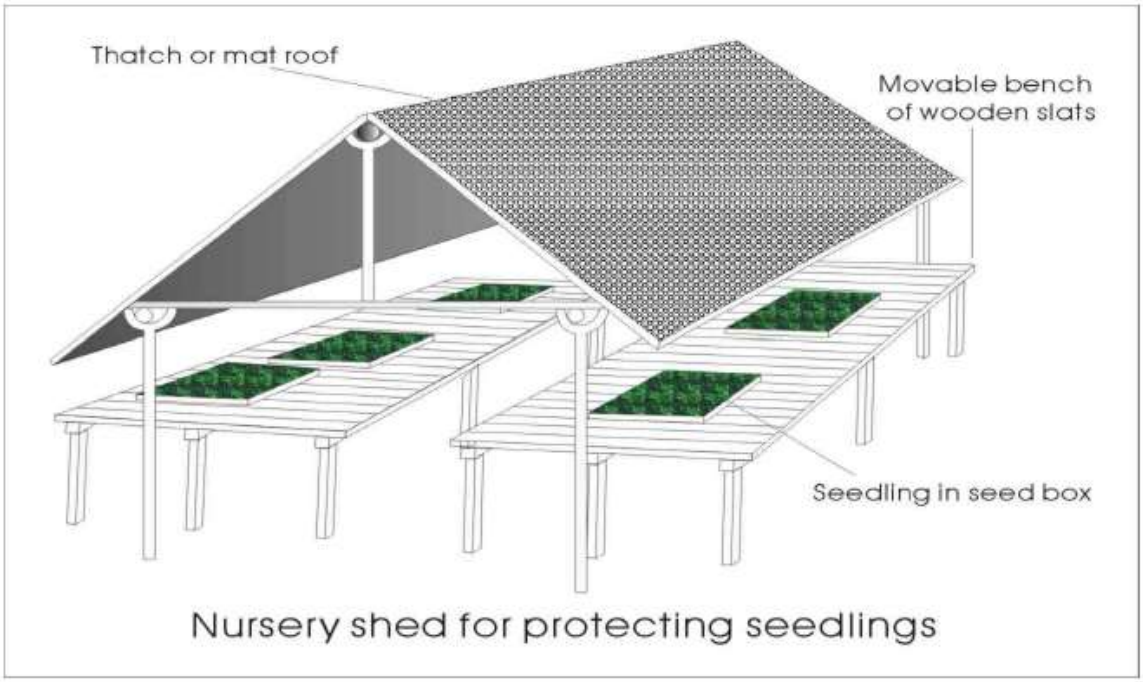





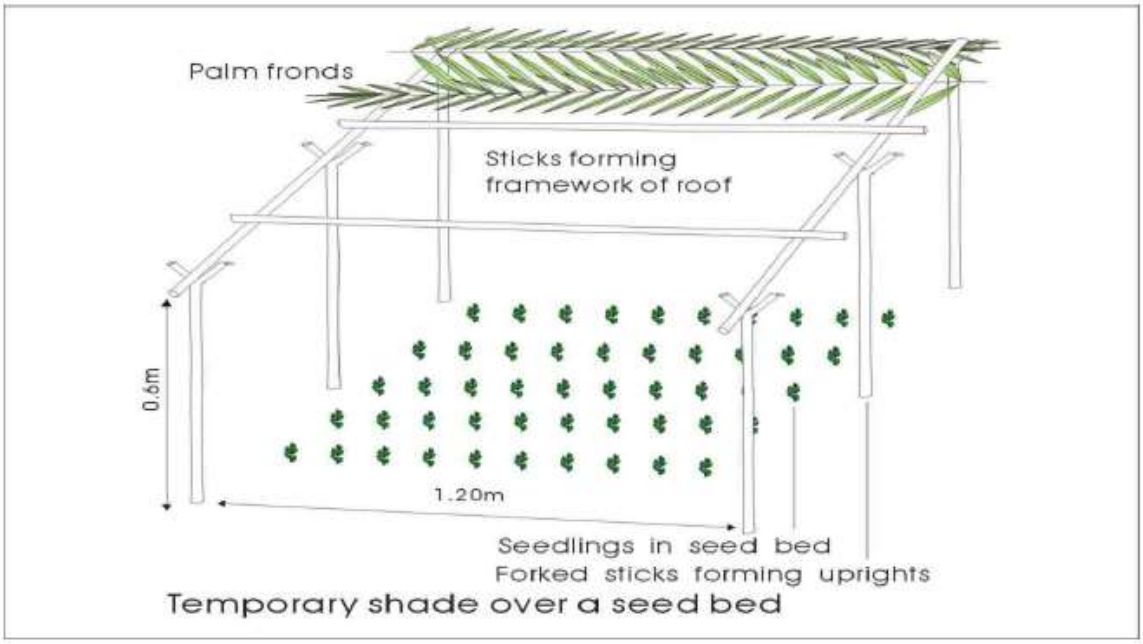



Picking out seedlings




Nursery shed for protecting seedlings




Temporary shade over a seed bed

**Practicing nursery hygiene**

Healthy plants are the goal of every nursery manager. This is not restricted to research nurseries but applies to nurseries of all sizes and levels of sophistication. Nursery hygiene does not necessarily mean using expensive or toxic chemicals — you can achieve a healthy nursery with ecologically sound management

| **Factors that influence plant health** | |
|---|---|
| **A biotic ('non-biological')** | • Excessively high or low Temperatures<br>• Drought or water logging<br>• Injury due to chemicals<br>• Physical damage, for example shearing off roots |
| **Biotic (biological)** | All biological organisms (bacteria, Viruses, viroids, phytoplasms, fungi, Insects, mites, nematodes, weeds, Parasitic plants, birds and mammals) that interfere with plant production |

***Traditionally, there have*** been two basic ***approaches to nursery health:***

- **Preventive actions:** Which include ***balanced fertilizers***, ***use of resistant species*** or ***cultivars***, timely hardening of plants, cleanliness in the whole nursery, and training of staff
- **Curative actions:** Which include the use of ***pesticides***, ***heat, biological*** control or ***physica***l measures (e.g. cutting out of diseased parts).

From these two approaches, ***integrated pest management*** has evolved, combining 'preventive' measures with 'curative' methods, and using chemical, biological and cultural control. It is neither practical nor wholly desirable to attempt total elimination of pests — many beneficial organisms are destroyed in such efforts, and a lack of beneficial organisms can lead to an explosive re-colonization of the nursery beds with pests.

***Nursery hygiene practices are followed to minimize risk of contamination. In this course, the practice was directly associated with:***

- **Practices removing weeds**
  - Keep the nursery area itself free of weeds. Many plant species can be alternate hosts of important nursery pests. This precaution includes a sensible selection of ornamentals, shade, hedge and windbreak plants in and around the nursery, as they too can be hosts for pests such as nematodes.
  - Treat all wooden supports with old engine oil or chemicals against termite attack. If possible, place propagation structures onto a slab of concrete.
- **Removing dead or diseased plant material**
- **Washing the work area on transfer of plants:**

  The whole nursery area needs to be well drained. Avoid water-logging at all costs.
- **Disinfecting tool, equipment and work areas**
  - Keep tools, work surfaces and containers clean at all times.
  - Take particular care with proper sterilization of containers, especially when these are re -usable ones.
  - Some tools and containers can be autoclaved but the necessary equipment is not always available. One of the most satisfactory and readily available chemicals for sterilizing nursery equipment is chlorine.

    ***E.g. Shoes and clothing***
  - Quite often, diseases are brought into a nursery inadvertently on shoes (soil-borne diseases and nematodes) or clothing (weed seeds). This is very difficult to control. The best way is probably to issue to staff boots and work clothes to wear during work in the nursery and to install a dip basin with 10% household bleach solution at the entrance of the nursery through which staff and visitors have to walk to disinfect their shoes, especially when they come from fields where soil-borne diseases or nematodes are present.

**Direction for use**

- To use it as a sterile, make a 10% solution (1 part bleach to 9 parts water) and soak house hold instruments or containers in it for at least 30 minutes.
- A 10% bleach solution is also used to sterilize bench surfaces and other work surfaces.

**Other disinfectants frequently used, especially in the laboratory are:**

- Formalin
- Mercuric chloride and
- 70% alcohol.

These are all more expensive than bleach, and in addition, ***formalin and mercuric chloride*** are extremely poisonous and are suspected carcinogens.

Using foot baths on entry to different work areas.

**Actions to prevent nursery contamination**

⌘ **Plant health status**

Healthy, well-fertilized and properly irrigated plants are better suited to withstand pest attacks. However, over fertilizing should be avoided, especially excess nitrogen, which weakens plants and makes them more attractive to many sap-sucking insects, such as aphids and psyllids.

⌘ **Plant density**

Avoid very dense spacing in germination and nursery beds, because diseases can spread easily. Close spacing can also lead to etiolated and weak plants which are susceptible to disease.

⌘ **Hardening**

Timely hardening of seedlings will produce strong and healthy plants that are able to withstand a certain amount of pest or disease attack.

⌘ **Resistant species or cultivars**

If possible, grow resistant types or cultivars, or avoid susceptible species altogether. For example, citrus should not be propagated in areas with high incidence of aphids, since aphids transmit citrus greening disease, and spraying against the aphids usually cannot check the problem to the necessary extent.

⌘ **Cleanliness in vegetative propagation**

When harvesting scion wood and cuttings, take care that they come from healthy stock plants that are not depleted of nutrients or drought stressed, to enhance their resilience to diseases. Always sterilize knives and secateurs with alcohol to avoid spreading virus diseases, which are often transmitted on the tools.

⌘ **Staff training**

To keep pest and disease levels low, all employees should be trained to recognize and report pests. Workers, who are in daily close contact with the plants through watering, weeding etc., will probably more often encounter such problems than a nursery manager would.

| Self-Check -1 | Written Test |
|---|---|

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

1. List factors that affect plant health(5pts)
2. Write some disinfectant(5pts)
3. _____are seedlings directly sown and grown on nursery beds without containers, such as polythene tubes.(2pts)
4. Write the types of nursery(6pts)
5. What does mulching mean(2pts)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions.**

| Operation Sheet-1 | Procedures to operate seed bed preparation |
|---|---|

## Types of seed bed and its procedures

**Steps 1-** Raised seed bed (When risk of flooding is high)

- Plough the land up to 45-60 cm deep.
- Remove all stumps and grassroots
- Pulverizing (grading) crashing collides of soil.
- Dry mater burn on bed to kill harm full insects
- Rake and level the soil then mix appropriate soil amendment and correct soil PH
- Prepare the bed of15~20cm high/ 1m wide and convenient length
- Make sure that the top of the bed must have mixed fine texture soil and sufficient OM
- Leave 60cm between two beds as awaking path
- Number the bed serially to maintain the record of planting stock

**Steps Sunken beds**: This type of beds is Appropriate when precipitation is low

- Plough the land up to 45-60 cm deep.
- Remove all stumps and grassroots
- Pulverizing (grading) crashing collides of soil.
- Dry mater burn on bed to kill harm full insects
- Rake and level the soil then mix appropriate soil amendment and correct soil PH
- Prepare the bed of15~20Cm deep, 1m wide and a convenient length
- Make sure that the top of the bed must have mixed fine texture soil and sufficient OM
- Leave 60cm between two beds as awaking path
- Number the bed serially to maintain the record of planting

**Level seed bed (flat)**

- Plough the land up to 45-60 cm deep.
- Remove all stumps and grassroots
- Pulverizing (grading) crashing collides of soil.
- Dry mater burn on bed to kill harm full insects
- Rake and level the soil then mix appropriate soil amendment and correct soil PH
- Prepare the bed of15~20Cm high , 1m wide and a convenient length
- Make sure that the top of the bed must have mixed fine texture soil and sufficient OM
- Leave 60cm between two beds as awaking path
- Number the bed serially to maintain the record of planting

**Pot filling and its procedure**

- Obtaining potting soil
- Prepare suitable mixture
- Fill pots:-the lower 1/3 compacted
    - :- 2/3 should be gently compacted to allow root development easily &avoid air pocket
    - :-the soil must be moist but not wet

- Place pot in bed :-to prevent the pot from falling away the beds should be framed by Stone Timber etc.

- Apply sowing

Procedures for Transplanting

**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**

- Erect a large portable shade above the bed.
- The Trans planters should work in pairs on opposite side of bed. They can sit on low small stools.
- A hole is made with the dibble in the center of each pot.
- 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.
- If the seedlings has left too long in the seed bed the root should be trimmed back to 2-3 cm
- The soil around the seedlings must be firmed gently and smoothed with the fingers so that no depression is left around the site

| LAP Test | Practical Demonstration |
|---|---|

Name: _____ Date: _____

Time started: _____ Time finished: _____

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

**Tasks 1- prepare** the 3 types of nursery.

**Task 2-** Prepare the pot filling procedures

Task 3- perform transplanting procedures

## List of Reference Materials


1. Agarfa ATVET College, 2005. Tree Nursery establishment and Management, Teaching

Manual (unpublished).

2. David M. and Smith, 1962. The Practice of Silviculture.Seventh edition, Yale University.

3, Debre-markos University-Forest development and management, teaching manual (Unpublished)

4. Mekelle University. Tree Nursery establishment and management, teaching manual (Unpublished)

5. PankajPanwar and S.D.Bhardwaj Handbook of practical forestry

6. UNDP and ILO, 1992. Tree Nurseries; An illustrated technical guide and training manual, Geneva, Switzerland.

7. Vinod Kumar, 1999. Nursery and Plantation Practices in Forestry, Scientific publisher, India.

8. Aldhous, J. R. 1972. Nursery practice. Her Majesty's Stationery Office, London. Forestry Commun. Bull. 43. 184 p.

9. Chavasse, C. G. R. 1980. The means to excellence through plan- tation establishment: the New Zealand experience. Pages 119- 139 in Proc., 10.Forest plantations, the shape of the future. Weyerhaeuser Science symp., April 30-May 3, 1979. Weyer- haeuser Co., Tacoma, Washington.

10. Goor, A. Y., and C. W. Barney. 1976. Forest tree planting in arid zones. Ronald Press, New York. 409 p.

# Basic Agriculture Production and Natural Resources Conservation Level I

# Learning Guide-4

**Unit of Competence: Support Nursery Establishment and Basic Nursery Work**

**Module Title: Supporting Nursery Establishment and Basic Nursery Work**

**LG Code: AGR BAN1 M05 LO6-LG-06**

**TTLM Code: AGR BAN1 M05 TTLM 0919v1**

## LO 6: Clean up and Store materials

| Instruction Sheet | Learning Guide # 6 |
|---|---|

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

- disposal of plant debris and waste materials
- removing surplus materials
- cleaning ,maintaining and storing tools and equipment

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:

- disposal of plant debris and waste materials
- removing surplus materials
- cleaning ,maintaining and storing tools and equipment

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5”.
4. Accomplish the “Self-check 1, Self-check t 2,” **in page -103, and 109,** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1” **in page -108.**
6. Do the “LAP test” **in page – 109** (if you are ready).

| Information Sheet-1 | disposal of plant debris , waste materials and surplus material |
|---|---|

## 1.1. Storing plant debris and waste materials produced during nursery work

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

**Methods of waste disposal could include**

- Organic waste; mulch and composting is suitable for plant debris, recycle card board and paper.
- Inorganic waste; plastic// metals /paper based materials may be recycled, reused or returned to manufacturer for inorganic materials that cannot be recycled it is best to take them to an authorized land fill (don't burn old containers as given off are toxic).
- Always clean up and dispose or recycle your old pots.

## 1.2. Processing and preparing plant debris and waste materials in appropriate and safe manner

**Managing waste materials**

**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

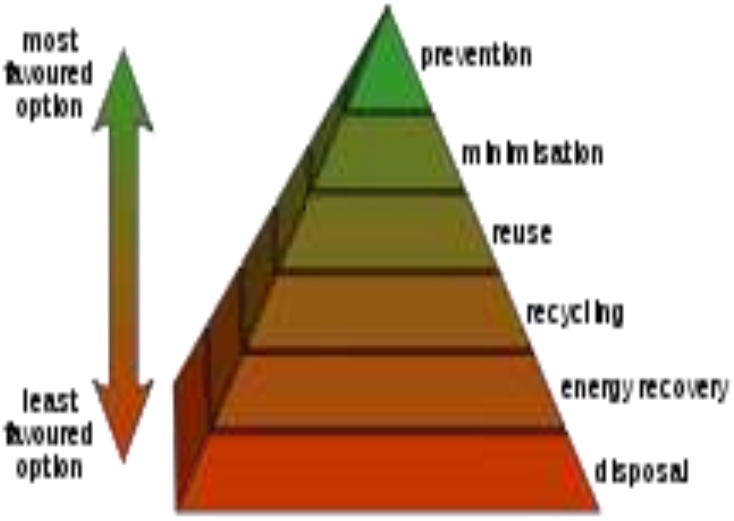



Diagram of the waste hierarchy

Waste hierarchy - The waste hierarchy refers to the "3 Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstone of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste.

An active compost heap

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.

### 1.3. Stockpile surplus materials of nursery

The Contractor shall plan his activities so that materials excavated from borrow pits and cuttings, in so far as possible, can be transported direct to and placed at the point where it is to be used. Should temporary stockpiling become necessary, the areas for the stockpiling of excavated and imported material shall be indicated and demarcated on the site plan submitted in writing to the organization for his approval, together with the Contractor's proposed measures for prevention, containment and rehabilitation against environmental damage? Stockpiles shall be positioned and sloped to create the least visual impact. No foreign material generated / deposited during construction shall remain on site.

| Self-Check -1 | Written Test |
|---|---|

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

**1.** Write the method of waste disposal (10pts)

**2.** What is waste management mean. (10pts)

1

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-2 | cleaning ,maintaining and storing tools and equipment |
|---|---|

## 2.1. Cleaning, securing and storing tools and equipment

WHAT IS CLEANING

Cleaning in a working environment involves removing dirt, grime, scraps and grease from all surfaces, equipment, utensils, crockery, etc.

USING CHEMICALS

A working area effectively cleaning does not merely involve wiping a damp cloth over surfaces. Correct cleaning procedures are required to minimize hygiene problems. This is why cleaning agents, detergent sand/or chemicals, are used extensively

CLEANING EQUIPMENT

While each piece of equipment has different cleaning requirements, there are some basic principles which are common to all equipment. These include

- ✓ ensure power is turned off and power cords are disconnected
- ✓ gas equipment should have the gas turned off and
- ✓ the pilot lights extinguished correct chemicals should be used
- ✓ protective clothing, gloves, goggles, and other equipment should be used
- ✓ ventilation should be provided
- ✓ Stainless steel surfaces should not be cleaned with scourers

STORING CHEMICALS

A general rule of thumb is to follow the manufacturer'sinstructions for storing chemicals. Most will recommend:

- ✓ store in shaded, cool and well ventilated areas
- ✓ keep away from heat and flammable sources
- ✓ keep away from children
- ✓ Store in a .dangerous goods. area; away from foods
- ✓ store in original container with a tight lid
- ✓ store chlorine-based chemicals away from acid, oil and
- ✓ bleach-based detergents

An effective cleaning agent must be capable of:

Dislodging dirt and grime sanitizing disinfecting (making it hard for bacteria to grow)

*PRE-WASH*

Cold water pre-wash is used to remove excess grime and soften other grime.

*WASHING*

Complete removal of waste from items being cleaned, usually with detergent

*DRYING*

When washing is complete drying is apply to evaporate the water.

*STACKING AND SORTING EQUIPMENT*

All equipment needs to be sorted according to size and type. This facilitates operations, especially when busy. Staff must take care that sensitive tool and equipment are not over-stacked and that correct lifting techniques are used whenhandling them. Expensive equipment should be securely stored.

CORRECT EQUIPMENT STORAGE

To reduce chances of injury, equipment must be stored in the correct manner. For example:

- ✓ All sharp objects, e.g. knives, scissors should be stored in the appropriate drawers, knife blocks or tool boxes
- ✓ large heavy items should not be stored on high shelves
- ✓ electrical equipment should not be stored or used near wet areas
- ✓ all washed equipment, utensils, crockery, etc., should be dried after washing
- ✓ Any mobile equipment, crockery, cutlery, etc., also need to be secured against theft. This is achieved by locking these items in secured rooms or wire cages with padlocks

Identifying and reporting malfunctions, faults, wear or damage to tools and equipment

## 1.2. Cleaning and maintaining workplace areas

There are numerous precautions that should be observed when storing tools and equipmentson the farm. Precautions include: Buildings where equipment an and power tools are stored should be located far enough away from structures that house livestock and hay in case of fire. Fuel storage tanks should preferably be locatedbelow ground, and a minimum of 40 feet from the nearest structure. Fuel cannot be stored in the samestructure as equipment or power tools. Tanks should be properly vented. If above ground, the area aroundthe tank should be free of litter, weeds and any fuel spills that could aid in starting or accelerating thespread of a fire. An approved10 B:C fire extinguisher should be located near all fuel pumps and tanks. Electrical lines coming into thebuilding should be high enough to facilitate equipment passing underneath. Electrical systems in machinesheds should be sufficient for the power tools and equipment that will require the use of electric current.

Electric outlets should be of the three-prong grounded type. Equipment storage buildings should not be used to store debris.

Doors also need to pull or slide open and close freely in case of an emergency. Exits should be clearly marked. Doors should be lockable to keep out children and unwanted visitors. Floor surfaces should be level and smooth, free of bumps and protruding rocks. Equipment should be parked so there is enough paces for a person to walk completely around it. Buildings should have adequate ventilation for the starting or running of an engine within the structure. (Note - engines should not be left running inside a building for a prolonged period of time unless exhaust is properly being vented externally). All tools and accessory equipment should be kept picked up and stored in their proper place, e.g., air hoses, oil cans, spare tires, jacks.

Contribute to Workplace

This unit is about the routine maintenance of the workplace, carrying out basic, non-specialist checks of work tools and equipment, cleaning the work area and using resources economically.

**Procedures in keeping a nursery site**

- Paths are swept and cleaned,
- planted areas are checked to ensure they are well presented,
- damaged turf is replaced/ re sown,
- disturbed areas are repaired,
- all materials, debris, tools and equipment are removed from site,
- damaged plants are pruned or replaced,
- Other signs of disturbance or damage are corrected

**KEY WORDS AND PHRASES**

***Cleaning agents*:**

Examples include: solvents and detergents used for cleaning tools and equipment.

***Legal requirements*:**

Examples include: local bye-laws, Environmental Protection Act; Health and Safety at Work Act; Hazardous Substances Regulations (including COSHH) and any EU Regulations applicable.

***Personal Protective Equipment*:**

Examples include: overalls, gloves, goggles and barrier cream.

***Resources*:**

Examples include: power, cleaning materials, time.

All of the items listed below form part of this National Occupational Standard.

**1. Equipment maintenance covers**

A. routine checks on work tools and equipment

B. cleaning work tools and equipment

C. replacing minor parts

D. visual inspection of electrical equipment

B. clearing away

C. dealing with spillages

D. disposal of waste, used materials and debris

**2. Work tools and equipment are**

A. hand

B. electrical

C. mechanical

D. pneumatic

E. hydraulic

**Legislative and organizational requirements and procedures**

1. The scope of your job responsibilities for the use and maintenance of hand tools, equipment and your work area.

2. Workplace policies and schedules for housekeeping activities and equipment maintenance.

3. The manufacturer's requirements for the cleaning and general, non- specialist maintenance of the tools and equipment for which you are responsible.

4. The regulations and information sources applicable to workshop cleaning and maintenance activities for which you are responsible.

5. The importance of reporting faults quickly to the relevant person.

6. The importance of reporting anticipated delays to the relevant person(s).

| **Operation Sheet-1** | **Cleaning and maintaining Tools and equipment** |
|---|---|

**Objective: -understand how to Cleaning and maintaining Tools and equipment**

**Procedures**

1. Collect tools together
2. Remove some dirty material properly
3. Apply oil to prevent rust
4. Remove rust with a wire brush
5. Sharpen tools for peak efficiency
6. Grind battered tools into shape
7. Put tools and equipment properly on shelf for storage

| LAP Test | Practical Demonstration on Cleaning and maintaining Tools and equipment |
|---|---|

Name_____ Date: _____

Time started: _____ Time finished:_____

**Instructions:**

**1.** you are required to perform any of the following **:**

- Request your teacher to arrange for you to join in Cleaning and maintaining Tools and equipment team. Make sure if all materials are available/present and check if they need maintenance or work properly. Show your output to your teacher for evaluation.
- Identify the type of personal protective equipment used in Cleaning and maintaining Tools and equipmentactivates
- Show to your teacher how to use in a working place properly and tell him /her their advantage

2. Request your teacher for evaluation and feedback.

| Self-Check -1 | Written Test |
|---|---|

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

1. What is cleaning (4 pts)
2. List the basic principles of common cleaning requirements (10pts)
3. List the general rule of storing chemicals. (10pts)

***Note:*** **Satisfactory rating - 12 points** **Unsatisfactory - below 1points**

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

# Basic Agriculture Production and Natural Resources Conservation Level I

# Learning Guide-7

**Unit of Competence: Support Nursery Establishment and Basic Nursery Work**

**Module Title: Supporting Nursery Establishment and Basic Nursery Work**

**LG Code: AGR BAN1 M05 LO7-LG-07**

**TTLM Code: AGR BAN1 M05 TTLM 0919v1**

## LO 7: Record and report

| Instruction Sheet | Learning Guide # 7 |
|---|---|

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

- Recording and documenting nursery establishment activities
- Reporting problems or difficulties in nursery work
- Recording and reporting materials, equipments and machinery
- Communication on work completion hazard information and 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:

- Record and document nursery establishment activities
- Report problems or difficulties in nursery work
- Record and report materials, equipments and machinery
- Communicate on work completion hazard information and Reporting work outcomes

**Learning Instructions:**

7. Read the specific objectives of this Learning Guide.
8. Follow the instructions described below 3 to 6.
9. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5”.
10. Accomplish the “Self-check 1, Self-check t 2,And Self-check 3” **in page -116, 118, and 124** respectively.

| Information Sheet-1 | Recording and documenting nursery establishment activities |
|---|---|

### 1.1. Recording work place information

Recording is process of writing down something that it can be used or seen again in the future.

Documenting:-is something or paper that gives information about something or that is used as proof some work like nursery establishment.

With the aim to ensure the complete stand history of certain plantation; it is indispensable to note all operation of nursery tending activity. Moreover for good nursery management, recording all work done, the progress made is essential. Records of workplace information may include:

- Environmental parameters (light, temperature humidity and wind)
- Date of treatments and
- Type of treatment and
- Rate of treatment

A careful recording will also help to tend nursery plant the most appropriate production data for each species

**Nursery registration form:-**The recording is done on individual nursery bed basis.

1. Species ----------
2. Provenance ----------
3. Date of seed collection
4. Reception date of seeds
5. storing condition
6. Method of seed pretreatment
7. Density of sowing
8. Quantity seed per sq. m ---kg
9. Area seed bed ---sq. m
10. Protective measures taken
11. Registration number of seed bed
12. responsible person
13. Expected number of seedlings per sq.m and in total
14. seedling description for planting
15. Destination of seedling Transportation specification (date, seedling transported, seedlings eliminated) and so on

**Nursery diary: all the operations and observations of the day should be mentioned in this book as detail as possible**

Example

| Date | Work done | Remark |
|---|---|---|
| 22/1/2012 | 2 people prepared beds | |

**Nursery calendar: here we record all the activities to be done and when they are to be done.**

Example

| Activity | S | O | N | D | J | F | M | A | M | J | J | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weeding | | | | | | | | | | | | |
| Pruning | | | | | | | | | | | | |
| Treatment application | | | | | | | | | | | | |
| Mulching | | | | | | | | | | | | |

**Nursery delivery Record: this shows how and where the seedlings were distributed**

Example

| Date | Species | Number | Bed No | Receiving station |
|---|---|---|---|---|
| 20/1/ 2012 | *Capsicum Annum* | 30000 | A2 | **Gode town** |
| 22/1/2012 | *Solanum* | 20000 | B3 | **Kalafo** |
| 23/01/2012 | Moringa | 10000 | C4 | Adadle |

**Attendance book: daily of laborers' is important.**

Example

| Name/date | 1 | 2 | ---------- | 30 |
|---|---|---|---|---|
| | P | S | | H |
| | A | P | | O |

Where: p= present, A = absent, S = sick, H = holiday, O = off duty

**Workers and work organization**

- ♦ It is recommended to employ permanent workers for the following activities: Sowing, Transplanting, Grading, Foremen, watchman
- ♦ For pot filling, manufacturing of shading and mats temporary workers can be employed.

## 4.1. Collecting Wastes

Waste is collected and disposed of or recycled to minimize damage to the external environment.

Waste may include:

- Left over treatments
- Unused containers
- Plant debris
- Faulty irrigation components.

Its implications for the external environment:

- Contamination of off-site ground water or soils from solids
- Nursery debris
- Nutrients or. E.g. composting
- Chemicals E.g. pollution

| Self-Check -1 | Written Test |
|---|---|

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

1. what is recording.(5pts)
2. what is documenting(5pts)
3. write the nursery registration form.(15)
4. write the content of nursery delivery record.(5pts)

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-2 | Reporting problems or difficulties in nursery work |
|---|---|

## 2.1. Problems or difficulties during completing or undertaking nursery work

Warning about Nursery and Garden Center products. They market products that are harmful to your plants, your health, and the environment. The # 1 product to avoid is "Weed and Feed" as they may contain a toxic herbicide called atrazine which if used around your shrubs and trees will kill them! It should not be used on residential property at all because; the roots of trees cover the entire property of most lots. Atrazine is also poisoning our clean water sources which directly affect human health. Furthermore, the two ingredients in these products aren't suitable to be applied at the same time. The pre-emergent herbicide part of the products needs to be applied about 2 months earlier than the soluble fertilizer part of the products. Some of the specific products that you should avoid are Scotts Bonus S, Vigero, or any labeled Weed and Feed and/or contain atrozine and also plant disease and different plant pests.

Disease is defined as any detrimental plant disturbance that interferes with its normal structure, function, or economic value. In other word, a harmful alteration of the normal physiological processes of the plant causes by a continuous irritation. Or, more simply, is a condition in which the affected plant differs from a healthy plant in either structure or function.

Diseases are caused by a biotic (nonliving) and biotic (living) factors. A biotic factor that cause diseases include air pollutants, light, moisture, nutrients, pesticides, pH, and temperature. Living disease-causing pathogens belong to groups of organisms classified as bacteria, fungi, virus, nematodes, parasitic higher plants, and protozoa. So, diseases can be classified according to the pathogens. The main diseases are as follows:

Insects are small animals belong to arthropod phylum. Their body is divided into three sections: head, thorax and abdomen. Most adult insects have three pairs of legs and one or two pairs of functional wings.

## 1.2. Identifying Common problems in nursery plants

Common problems in nursery plants are recognized, and rectified and/or reported to the supervisor. The most Common problems of Nursery plants may include:

- Dehydration/lack of moisture
- Pests and diseases
- Nutrient deficiencies
- Birds
- Rodents and
- Plants deformity.

| Self-Check -1 | Written Test |
|---|---|

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

1. What are the common problems of nursery plant (10 pts)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

| Information Sheet-2 | Recording and reporting materials, equipments and machinery |
|---|---|

## 2.1. Identification and reporting of environmental implications

In identification of environmental implications related to basic green infrastructure development and beatification of any ground area. WE should focus and assess indication source or vulnerable resource gose with the developmental processes like offsite ground water or soils from solids, debris, nutrients or chemicals, and level of noise, dust, high activity vehicle traffic and water runoff. Based on the above indicators and their natural standard against the assessment results will be analyzed by workers and verbally reported to the supervisor.

### 2.2. **Operation of machinery and equipment in different weather and difficult terrain**

Operation of machinery is not always done on lebel and comfortable land surfaces but sloppy, hilly, adulating, stony, sandy, etc access area can be work and driving medias. These traffics can be considered as difficult terrains, concerning the natural weather, rainfall, foggy visions, muddy roads, etc can be taken as an example of unfavorable condition in operating machinery and equipments. Since both weather and difficult terrains/bad land feature or terrains/ are naturally environmental phenomena. Any operator of machinery should take care of his life and expensive assets. Moreover any machineries should not be operated before the checkup of all parts of machinery and old tyers also replaced by the new ones so as to make drive free from any slides either on difficult terrain or muddy grounds. With these lightening, traffic hazard indicators should be checked and well maintained for their actively functioning

## 1.3. Identifying unsafe or faulty machinery and equipment

Hand tools, personal protective equipment, hand held power tools, grease guns, cleaning and maintenance supplies including grease, fuel, oil, chemicals, water steam, power and air.

After pre operational check an operator must identify and report unsafe or faulty machinery and equipment and prepare for repair and maintenance. This may include dismantling and assembling procedures, testing, tightening, minor adjustments and repairs, and routine servicing procedures including lubricating, and checks of cooling system, fuel, grease and oil, and battery levels. It may also include inspections of tire pressure, fan belts, leads, lines,

connections, air filters, air conditioning, brakes, clutch, electrical, gearbox, hydraulics, steering, lighting, transmission, and confirmation of safety guards, PTO stubs and shafts.

## Farm tractors

- Any farm tractor can be put in to various forestry operations however wood transportation for a short distance is the major one.

- To involve the farm tractor in to wood transportation, it has to be equipped with various logging accessories: winch, trailer and see the tractor figure

- Tractors also used for plowing agricultural land by putting different implements like moldboard, disk plough

| Information Sheet-3 | Communication on work completion hazard information and Reporting work outcomes |
|---|---|

**3.1. Information to identify Hazards and Control Risks**.

**Agriculture: -** is one of the most dangerous occupations in many parts of the world; for instance in USA the resent data show a death rate of 21 workers per 100,000. There are 150,000 disabling accidents involving farm workers are injuries on the farm. Other major causes of none fatal injuries on farms, in descending order of importance are machinery, hand tools, slips and falls, and tractors. In general, the annual cost of farm accidents in the US is estimated to be between 4&5 billion dollars.

**3.1.1. Information in regards to identify hazards and control risks in the work place** can be provided regularly as source materials. These may include

- variable written and graphical instructions,
- work bulletins,
- data sheets,
- diagram or sketches,
- OHS manual,
- industry or workplace codes of practice,
- organization operating procedures,
- safety work procedures / manuals and
- material safety data sheets (**MSDS**),
- workplace guidelines / work shop manuals;
- manufacturer diagrams, charts, catalogue specification manual,
- service and operation manuals;
- design specification manual,
- repair request documentation job cards, and Record
- report**.**

**Material and safety Data Sheet (MSDS**): - refers to the information that is displayed in the working area to Identify hazards in the work place. The information typically found in a MSDS includes:

- The identity of chemical; the manufacturer's name and address; and an emergency Contact number. A non-Emergency number for more information may be included.
- Hazardous ingredients found in the chemical.
- The physical and chemical characteristics of the chemical.
- Fire and explosion potential of the chemical.

- Health hazards posted by the chemical.
- Precautions for safe handling and use of the chemical.
- Procedures for controlling spills of the chemical.
- Control measures for the use of the chemical

**Safety and Hazards in nursery workplace**

- **Human and Environmental Factors Relating to safety.**

Human error is usually a major factors in the cause of accidents on the farm Being tiredness, paying not attention, and use of poor judgments are frequent causes of accidents involved to animals.

People both younger and older than **25 & 64** years, respectively have more accidents on the farm than those between this ages. Farming is an occupation in which children are likely to be in the work area. Their curiosity and lack of experience can easily lead them in to situations where they get hurt or exposed. They may have poorer balance and failure vision. This may cause them to have more accidents around in work place . Sometimes workers are not properly instructed in handling tools and material. This can also results in accidents.

There are many dangerous hazards involved to in nursery. Such as Physical hazards,

**Physical factor** refers to situations causing accidents like curiosity and lack of experience, poorer balance and failure to vision due to older age or other cases, lack of instruction in handling animals, working for prolonged period of time during a day, being tired, mistakes in judgment, etc. that are related to equipment and vehicle operation and repair, trip and fall hazards, and lifting heavy weights, which are common to other industries. Physical hazards should be prevented and controlled according to applicable guidance presented as safety rules or procedures.

**2.3 Identifying and reporting Occupational Health and Safety hazards in the workplace.**

- Move field roads further from canals and ditches.
- Control the vegetation and/or clearly mark the location of canals, ditches, and other hazards.
- Maintain field roads. Widen the roads, bridges, and culverts. Eliminate sharp, blind corners or Curves and rough or slippery surfaces.
- Prune or hedge trees to improve visibility and reduce the danger of accidents caused by tree limbs.
- Remove tree stumps and other field obstacles.

- Conduct walk-through inspections of hillsides for washouts before beginning tractor operations.
- Clearly mark or fill dangerous washouts..

*Risk associated working in Difficult Terrain*

- Be on the lookout for potential hazards when riding. Rocks, bumps, irrigation pipes and wildlife all have the potential to cause an accident, and should be approached with caution.
- Take extra care when operating a bike on unfamiliar or rough terrain. Where possible, use familiar farm tracks.
- Be particularly careful when turning, approaching a rise or navigating an obstacle.

Develop a "safety first" attitude. Follow safe work practices all the time and a good example for others

**2.3. Report work out comes**

An important point in every work including nursery work is recording data, analyzing and reporting, all the steps from the initial to the final product of the work. One of the ways of communicating to the employer or the customer is reporting work outcome .This report includes information regarding

- Raw materials
- Supplies
- Problem encountered
- Length of work
- Alternative measures
- Hazards and safety
- Techniques and system of work
- Cost expended
- Material availability
- Sustainability of work
- Labor required

| Self-Check -1 | Written Test |
|---|---|

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

1. What do you do when risks under take in work area (10 pts)
2. What types of information included in material &safety data sheet(5pts)
3. what types of information included during work out come report(5pts)

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

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

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questions**

## List of Reference Materials


1. Agarfa ATVET College, 2005. Tree Nursery establishment and Management, Teaching

Manual (unpublished).

2. David M. and Smith, 1962. The Practice of Silviculture.Seventh edition, Yale University.

3, Debre-markos University-Forest development and management, teaching manual (Unpublished)

4. Mekelle University. Tree Nursery establishment and management, teaching manual (Unpublished)

5. PankajPanwar and S.D.Bhardwaj Handbook of practical forestry

6. UNDP and ILO, 1992. Tree Nurseries; An illustrated technical guide and training manual, Geneva, Switzerland.

7. Vinod Kumar, 1999. Nursery and Plantation Practices in Forestry, Scientific publisher, India.