

**NATURAL RESOURCES
CONSERVATION AND DEVELOPMENT
LEVEL II**

Learning Guide -23

Unit of Competence: Assist Nursery Work

Module Title: - Assisting Nursery Work

LG Code: AGRNRC2 0919 LO6-LG-23

TTLM Code: AGRNRC2 TTLM 0919v1

LO 06: Maintain the nursery environment

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

- Surveying and packing perimeter
- Preparing the pits for wind breaks
- Preparing and planting plant species
- Hedging rows Planting
- Monitoring environmental protection measures
- Environmental parameters and marketing requirement

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

- survey and pack the perimeter of the nursery site is out according to the work manual of the organization
- dug and prepare the pits for plantation of wind breaks based on the standards of spacing and species arrangement
- prepare and plant Appropriate plant species are between the blocks and around the nursery based on organizational guideline
- plant the hedge rows between the existing blocks and along the road sides according to the organizational **work order** manuals

Environmental protection measure parameters are monitored against the needs of the plants and enterprise guidelines.

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, Sheet 5 and Sheet 6”.
4. Accomplish the “Self-check 1, Self-check 2, Self-check 3, Self-check 4, Self-check 5 and Self-check 4” in page -4, 6, 8, 10, 17 and 21 respectively.

Information Sheet-1	Surveying and packing perimeter requirement
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6.1. Surveying and packing perimeter requirement

Survey of land resources –climate, water, soils, landforms, forestry, and range lands-are needed to avoid costly mistakes and to improve efficiency of investment. Valid techniques have been developed for all types of resource survey, and the method of land evaluation has helped in translating environmental data in to terms land use potential.

There are two basic stages to the assessment of land resources: Natural resource survey and land evaluation.

-Natural resource survey refers to the description, classification, and mapping of the physical environment: climate, water, geology, land forms, soils, vegetation, and fauna. In practice geology survey is a separate task, and soil surveyors make use of whatever data available. Land forms are generally surveyed jointly with soils. An alternative to assessing factors individually is to map the physical environment as a whole, as in the land systems approach.

Soil survey- the basic stages in soil survey are description and identification of soil types, classification, and mapping.

Climatic data for land-use planning	
LAND QUALITIES	CLIMATIC CHARACTERISTICS
<ul style="list-style-type: none"> • Sufficiency of energy • Frost hazard • Sufficiency of water 	<ul style="list-style-type: none"> • Temperature regime, sunshine hours, day length • Probability of frost (local occurrence - not adequately recorded in standard data) • Evaporation

Crop water requirement

Rainfall probability

Effective rainfall

- Irrigation need/drought hazard
- Length of growing season
- Hazard of high winds, high temperature, hail, low humidity
- Erosion hazard
- Rainfall probability - crop water requirement
- Period of energy and water sufficiency
- Probability of occurrence in the growing season
- Rainfall intensity

Water resource data for land-use planning

- Present water use
 - River abstraction, tanks, groundwater
 - Location of abstraction points, sluices, dams, wells and boreholes, with yields
- Present storage capacity of tanks and reservoirs
- Reliable yield of water for each river catchment - 75% and 90% probability low flow (from hydrograph records) or 75% and 90% probability rainfall - E_o over seven- or ten-day day periods x area of catchment
- Safe yield of groundwater (from test pump data or well records)
- Depth below surface of useful groundwater
- Location of aquifers
- Water quality

- Location of irrigable land
- Legal and customary rights

Surveying land use

In the second stage, land evaluation, the potential of mapped areas for different kinds of land use is assessed. Historically, methods for land evaluation were developed after those for resource survey.

Three methods have been described for the analysis of problems of rural land use: farming systems analysis, diagnosis and design and rapid rural appraisal. These have much in common: all are centered on interviews with a sample of rural land users, preferably stratified according to identified classes of farming system. The methods are not confined to problem diagnosis but include elements of later steps in land-use planning, particularly the design of improved land-use types and social analysis.

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



1. What is survey of land resource? (5)
2. Write two basic stages to the assessment of land resources (5)

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

❖ Short Answer Questions

1 _____

2 _____

6.2. Preparing the pits for wind breaks requirement

Windbreak

Where strong and/or desiccating winds prevail, a windbreak consisting of at least one, but preferably two, row(s) of shrubs and one row of trees should be planted along the nursery side facing the main wind direction.

Larger species with medium dense crowns are best, e.g. Filaho, Cassia, Eucalyptus. Grevillea. The trees should be fast-growing in order to become quickly effective.

The trees should be far enough from the beds to avoid crowns extending over them, even when trees have grown bigger.

In some cases, windbreaks made of dead material may be needed permanently or as a temporary solution until living windbreaks become effective.

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

1. What wind break? (10)

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

❖ Short Answer Questions

1 _____

2 _____

6.3. Preparing and planting plant species

6.3.1. Planting: It is most common used method. For a surer success of a forestation and reforestation works the planting out is carried out by utilizing nursery raised seedlings, root-shoot cuttings (stumps), branch cuttings, etc.

Planting techniques

Planting techniques depend on types of seedlings.

a. Notching: is used only for bare rooted plants and consists of cutting a slit in the ground with a spade or conical planting hoe, opening the slit wide enough to insert the roots or the plant, and finally closing the slit by pressing with the foot.

This is common technique with small bare rooted plants in temperate zones. It could be applied in planting of bare rooted eucalyptus on cultivated sites. The important thing is to make the slit deep enough so that roots are stretched straight. Notching techniques cannot be practiced on very sand or clayey soils.

b. Hole (pit) planting is used for all types of seedlings. Holes sufficiently large to accommodate the container or the roots or the seedling usually 30cm x 30cm x 30cm will be prepared. Digging has to be done several days before planting. Then the plastic is slit open and removed carefully so that the soil cylinder remains as intact as possible. The soil is placed back in to the hole so that the soil cylinder is covered 3 – 5 cm deep. Preferably, only topsoil should be used for filling the hole. It is advantageous particularly for uncultivated land. At the end, the soil around the plant is firmed with feet.

Bare rooted plants are put in to the hole so that their roots are spread in a natural position. None of the roots should turn upward.

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

1. What is planting? (10)

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

❖ Short Answer Questions

1 _____

2 _____

6.4. Hedging rows planting

6.4.1. Hedges: Can be considered as life fences

- It is a one or two rows of seedlings which is/are planted in a straight line. It can serve as shelter belt in protecting seedlings against strong winds.
- It may take 2~3 years to grow it in full size.
- Need continuous and regular tending operation.
- (Hoeing, Weeding & watering)
- Fast growing species are selected for making hedge.
- E.g., *Cupressus lustranica*, *Casuarinas*, *Dodonea*, *Viscosa*...etc.
- A fully grown *Cupressus* hedge can grow up to 1m height and 1m width at base (can be attained at 3~4 years age)

6.4.2. Procedure to construct a hedge

1. Allocate a 2.5-3m wide strip for the hedge along the boundary of the nursery.
2. Dig a 1m wide strip in the center of the strip in 30cm depth.
3. Make out 2 rows, 50cm apart, 25 cm from either side of the cultivated strips.
4. Plant vigorous seedlings (30cm in height) at 50cm interval along each line so that the seedlings in one row are staggered against the other rows.
5. Manage them properly (watering and weeding)
6. Start clipping lightly to form a shape of hedges wider at base and tapering upwards, when plants are 1.5m tall.

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

1. **What is hedging? (6)**
2. **Write Procedure to construct a hedge (10)**

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

❖ **Short Answer Questions**

1 _____

2 _____

6.5. Monitoring environmental protection measures

6.5.1. Environmental consideration

In many cases, there is a desire to plant trees in order to give protection to degraded areas. On such fragile sites, great care should be taken not to disturb the soil. Often complete protection of the already existing vegetation is sufficient to obtain a natural re-growth after sometimes. When trees are to be inserted on to such sites, it must be done carefully often in combination with the construction of small check dams.

6.5.2 .Environmental protection

6.5.2.1 .Soil and water conservation

Desirable characteristics of the species are;

- Good survival and fast growing on poor site
- Ability to produce a large amount of litter
- Strong and wide spreading root system with numerous fibrous roots; on sites prone to land slides deep roots are essential.
- Easy to establish; little need for tending
- Capacity to form a dense crown and to retain foliage year round or at least the dry season
- Resistance to insect, disease and browsing damage
- Able to improve soil through nitrification

Some useful species are: *Acacia* species, *Eucalyptus* species and *Albvizzia lebbek*

6.3 Biophysical factors

The main factors which may limit tree growth and choice of species are:

6.3.1. Climatic factors

- a. **Seasonal deficiency of water** which causes slow growth, low yields and in most series causes even death. Sometimes this can be solved by irrigation. In areas with sever dry seasons correct choice of species is essential.
- b. **High temperate**: this may cause ever green species suffer from excessive transpiration stress during high temperate in dry seasons. Again to minimize heat damages, correct choice of species is necessary.
- c. **Low temperate**: frost can damage and kill young plants in coldest places in highlands. For such sites, frost- hardy species must be planted (*Juniperus*, *Hageniya*, *Olea*).

6.3.2. Soil factors

- a. **Unfavorable soil profiles with hard pans**: growth may be limited either by the physical inability of roots to penetrate such layers or by inability of rain water to inter the soil so that the water is lost from the site by run off. Before starting large plantations it is necessary to check that the soils are deep enough: e.g. a minimum depth for Zabian eucalypt plantation is said to be about 2m. In Madagascar where soils of some

plantations are shallow, the hard pan is broken with a crawler- tractor down subsoiler which rips the ground down to 60cm.

- b. **Nutrient deficiencies:** Shortage of Nitrogen, phosphorous and potassium
Remedy: Fertilization

6.3.3. Crop factors

Pests and disease: *Armillariya mellea*- fungus in old stumps can attack pinus species especially *P. patual* in hard wood sites where indigenous forest was cleared. Also *P. radiate* is susceptible.

The major categories of biological agents which might damage seedlings in nurseries are the following:

- Insects
- Pathogens: These are microscopic organisms that include fungi, bacteria, viruses and nematodes.
- Animals: These include mice, rats and squirrels

Inspecting pest and disease incidents: The effect of pest and disease on the seedling is not easily detected it requires continuously follow up and inspection. Because the problem might be because of other problems/deficiency of nutrients, water and etc.

6.4. Prevention

The most effective strategy against past and disease are to prevent them from ever being introduced and established. Preventive measures typically offer the most cost-effective means to minimize or eliminate environmental and economic impacts.

Prevention relies on a diverse set of tools and methods, including education. The Forest Service has a wealth of experience and skills within its own organization in addition to those available through numerous collaborators. As an agency capable of working across the landscape and with international partners, the Forest Service is in a good position to lead efforts to prevent potential invaders.

Our emphasis will be to identify and protect nurseries that have not been invaded by pest and disease. Prevention includes education and outreach to raise the awareness of the pest and pathogen problem. By enlisting the skills of our science and education programs, we can achieve a successful pest and disease prevention awareness

campaign on a national scale. Establishing effective domestic and international partnerships is also critical for effective prevention programs.

6.5. Insect

There are many insects that are potential pests in nurseries, but relatively few appear to be of economic importance to seedling production. In the majority of nurseries insects are a nuisance but they do not regularly cause major plant losses. The nursery foreman should, however, be constantly vigilant to detect any pest/disease problem at an early stage so that preparations can be made for control if this should become necessary. There are several insects which may at times become a significant problem in some nurseries and these are considered below.

- Grasshoppers and crickets
- Termites and ants
- Scale insects and mealy bugs
- Cutworm and other caterpillars

6.6. Control of Birds, Rodents and pests

6.6.1. Birds and mice: in some areas, birds can eat germinating seeds (especially of pines) during the day and mice during the night. Birds can be kept at a distance by spreading thorny branches onto the seedbeds. The problem is that the tiny seedlings may be damaged when branches are re-moved. A better way of controlling both birds and mice is to construct frames with close mesh wire (less than 6-mm mesh) and set these protect the seedbed.

6.6.2. Red ants: if red ants attack germinating seeds or seedlings, dieldrin can be sprayed.

6.6.3. Grasshoppers: Spraying the seedlings with a suspension of dieldrin or aldrin wettable powders some sticker can control leaf-eating insects.

6.6.4. Cutworms: These may cut seedlings below the soil surface. Spraying the seedbed soil with a suspension of dieldrin can control them. Aldrin wettable powders could also help controlling the cutworms.

The soil can be sprayed with tobacco water. Poor quality dried tobacco leaves are soaked into water to make a kind of dirty colored solution.

The third alternative is applying a mix of gamoxone powder with the upper layer of the seedbed soil before sowing.

6.7. Disease

Fungi, bacteria, or viruses may cause disease. However,

Most of disease in a nursery is produced by **fungi** where as bacteria and viruses normally do not create problems.

6.8. Damping off disease.

Damping-off is a disease of young seedlings caused by a number of soil born fungi (such as *fusarium*, *pythium*, *Rhizoctonia*etc) altogether there are about 30 species of fungi.

6.8.1. Damping off can be divided into two.

6.8.1.1. **Post emergence damping off**; decay occurs in the root and the stem. Tissue of the root collar turn dark in color causing seedlings to fall over with their leaves still green and die. This is the common type damping-off and regarded as the any type of damping-off by some authorities.

6.8.1.2 **Pre-emergence damping off**: Fungi, which live in, the soil attack seeds immediately after germination. They destroy the emerging radical (primary root). This type of damping-off is difficult to identify. Failure of seedlings to emerge can be attributed to other reasons such as quality of seed. Some scientists do not regard this pre-emergence damping-off at all.

Control: Damping-off is favored high humidity, damp soil surface and heavy clay soils, cloud weather, too heavy shade, dense stands of seedlings which reduce evaporation, high content of organic matter, high levels of nitrogen, alkaline soils (pH 6 or above). Warm weather encourages its spread. The risk of damping-off is especially high when sowing done during rains. Damping-off can be controlled by paying due attention to proper cultural practices and by using certain chemicals.

Cultural practices: The most effective **preventive measures** are avoiding of excessive watering and maintain of good aeration in seedbeds. Correct density of sowing is important as aeration in dense patches of seedlings is much reduced. Too heavy

shading must be avoided. During long periods of cloudy weather, it is advisable to remove the shades entirely

The basic nursery facilities are fence, hedge, windbreak, beds, access road (working path) and irrigation system.

6.9. 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

6.10. Hedges:

- Can be considered as life fences
- It is a one or two rows of seedlings which is/are planted in a straight line. It can serve as shelter belt in protecting seedlings against strong winds.
- It may take 2~3 years to grow it in full size.
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6.11. Wind breaks:

These are three or four rows of suitable trees and shrubs that are planted on windward 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.

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



1. What is fencing? (5)

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

❖ **Short Answer Questions**

1 _____

2 _____

6.1. Climatic factors

6.2. Seasonal deficiency of water which causes slow growth, low yields and in most series causes even death. Sometimes this can be solved by irrigation. In areas with severe dry seasons correct choice of species is essential.

6.3. High temperate: this may cause ever green species suffer from excessive transpiration stress during high temperate in dry seasons. Again to minimize heat damages, correct choice of species is necessary.

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and mice is to construct frames with close mesh wire (less than 6-mm mesh) and set these protect the seedbed.

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

1. What is a soil factor? (5)
2. Write climate factors. (5)

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions

1 _____

2 _____

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