Acknowledgements

Course Team

This unit was written for people in Samoa who want to learn more about horticulture by the National University of Samoa. It is presented according to the National Competency Standard of the Samoa Qualifications Authority - HIP 001 Introduction to Basic Horticulture in the Pacific – Level 2.

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Icons Used in the Units

In the margin of these units, you will find the following icons which tell you what to do:

- Beginning of each Element.
- Read the Objectives of the unit.
- Complete the Task. Activities help you to process and apply what you are learning.
ELEMENT 1: Prepare and Sow Outdoor Seedbeds by Hand

This basic horticulture programme aims to help you develop a positive attitude towards farming in general, especially towards growing fruits and vegetables. It should also help you to gain knowledge, understanding and appropriate skills for growing greenhouse crops. You will also learn how to grow both local and introduced food plants, using good farming methods.

Taking this unit should help you to grow crops in your home garden. Doing so will also improve the nutritional quality of your diet and provide you with extra income.

Objectives

By the end of this unit, you should be able to:
- Cultivate soil using hand tools
- Recognize the different types of organic and inorganic fertilizers and soil conditioners
- Know how to apply fertilizers and lime
- Sow seeds by hand in outdoor seedbeds using broadcast or drilling methods
- Maintain seedbeds to raise seedlings

Syllabus

Here is the syllabus that you will study in this unit. You will pass it by showing that you can meet each of the performance standards listed below.

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**NCS Purpose Statement**  
The purpose of this unit is to equip candidates with the knowledge and skills of safety practices that they will require when working in the horticulture industry. Work at this level will be performed under supervision and according to workplace procedures.

**Classification:** Horticulture
### Learning outcome 1
Demonstrate knowledge on cultivating soil using different types of basic horticultural facilities, tools and materials, their safe use and proper disposal practices.

- **Performance standard 1.1**
  - Name and describe the basic tools and materials used in horticulture.
- **Performance standard 1.2**
  - Follow procedures, handling, maintaining and storing of tools.
- **Performance standard 1.3**
  - Dispose of broken tools and carry out inventory of tools from time to time according to workplace procedures.
- **Performance standard 1.4**
  - Cultivate single pit, depth and tilth are consistent over the seedbed.
- **Performance standard 1.5**
  - Investigate if the soil is well aerated and evenly suitable for soil characteristics or its texture.
- **Performance standard 1.6**
  - Added materials are incorporated uniformly throughout the seedbed.

### Learning outcome 2
Investigate and acquire knowledge on fertilizers application.

- **Performance standard 2.1**
  - Identify fertilizers, manure and lime by sight.
- **Performance standard 2.2**
  - Demonstrate understanding on accurately measuring of fertilizer and lime.
- **Performance standard 2.3**
  - Investigate how fertilizers are space evenly over the specific area at the instructed rate of application.
- **Performance standard 2.4**
  - Follow instruction on proper handling of fertilizer.

### Learning outcome 3
Demonstrate different skills required to prepare land for horticultural planting and activities.

- **Performance standard 3.1**
  - Assist in seedbed clearing of weeds and disposing of trash according to workplace procedure.
- **Performance standard 3.2**
  - Differentiate between land preparations practices for organic and conventional horticultural production.
- **Performance standard 3.3**
  - Prepare land for planting.
- **Performance standard 3.4**
  - Prepare seedbeds or mounds for planting.

### Learning outcome 4
Sow seed by hand in outdoor seedbeds using broadcast or drilling methods.

- **Performance standard 4.1**
  - Demonstrate plant spacing for different types of seeds.
- **Performance standard 4.2**
  - Prepare planting holes for drilling method and lines for broadcasting.
- **Performance standard 4.3**
  - Practice labeling of seeds, date of planting and variety on the plant tag.
- **Performance 4.4**
  - Practice keeping workplace clean and tidy.
Learning outcome 5
Maintain seedbed to seedling stage of growth.

Performance standards 5.1
- Describe impact of maintaining optimum seedling growth.

Performance standard 5.2
- Demonstrate awareness of the importance of good husbandry practices in seedling growth.

Performance standard 5.3
- Practice record keeping in maintaining seed germination to seedling stage of growth.

Explanatory notes
In order to demonstrate the skill and knowledge in this unit the candidates should be able to:
- Speak and understand Basic English.
- Perform basic addition, subtraction, multiplication and division.
- Ask questions to clarify work tasks or instructions.
- Use common horticulture terminology
- Identify types of agricultural systems in Samoa.
- Identify the need to improve horticultural skills and knowledge.
- Follow basic horticultural safety.
- Identify soil types.
- Demonstrate an interest in plants.
- Identify different types of plants.

Suggested assessment methods
Assessment methods employed must include both level of knowledge and understanding, practical skills. Authentic assessment methods should be used to assess practical skills while traditional assessment methods must be employed to assess the level of knowledge and understanding.

Resource information
The following resources may be required for training and assessment:
- Green house as an outdoor laboratory for demonstrations.
- Arable piece of land for demonstration or available demonstration farm.
- Good bathroom and toilets facilities.
- Available first aid equipment
- Tools and equipment required to perform skills outline in the performance criteria.
- Clean water and comfortable environment.
- Proper storage rooms.
- Safety warning instructions in all areas of practical work.

SAG responsible for developing this NCS
Agricultural Sector Advisory Group to SQA

Moderation Information
Providers and assessors of this qualification or parts of this qualification must comply with SQA National Moderation system. Details of this system are available from SQA.
How to work through this unit

This unit contains the information and guidance you need so that you can complete the assessment tasks. You will need to complete all tasks and send evidence to your tutor. If all your tasks meet the performance criteria, you will gain credit for this unit. Read the information for each section, and do the practice work if any is suggested, before you do the tasks. You may need to ask your Supervisor for advice if you are not sure of something.

This unit also contains a list of technical and specialist terms used in horticulture. For example, ‘drilling’ means a completely different thing when talking about a garden than what it means in carpentry. These terms are contained in a glossary, which you will find at the end of the unit. Have a look now, and see what is there, and then turn to it as you are reading if you want to check any terms.

Please note:
It may take you several months to complete this unit, as you need to
• Prepare a garden
• Prepare a seedbed
• Sow a crop
• Maintain your seedbed.

Two different kinds of tasks

This unit contains two different kinds of tasks:
• For some tasks, you will need to write your answers.
• For other tasks, you will need to show a supervisor the work you are asked to do and ask them to complete the verification statement at the end of the task.

Who can be a supervisor?
A supervisor must be a senior person in your community – but not a family member – who has experience and knowledge of horticulture. They may be a teacher, an employer, or a village elder so long as they know about gardening.

What does a supervisor need to do?
A supervisor needs to watch you completing a task and then confirm that you completed the task correctly and safely and that the result of your work is good. Sometimes, if your work is not good enough, your supervisor might ask you to do a task again.

Once your supervisor is satisfied that you can complete the task to a good standard, they will sign the space below the task description that you are competent in that task.
Before you go any further...

Find a suitable person who can supervise you and check your work. Show them the tasks in this workbook that they would need to watch you do, and ask them if they would be willing to act as your supervisor. If they are willing, then ask them to complete the statement below.

I (name of supervisor)......................................................... am willing to act as supervisor for (name of student).......................................................... and to verify that .......................................................... has completed the identified tasks in this workbook to a satisfactory standard.

I am suitable to be a supervisor because

........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................

(Brief description of skills and experience)

My contact details are:

........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................
........................................................................................................................................................................

Signed: ...........................................................

Date: ..............................................................
ELEMENT 2: Cultivate soil using hand tools

Cultivating is one of the most important tasks for a farmer. When you cultivate the soil with a hand tool such as a fork, you do so for two reasons. Firstly, you need to prepare a firm, fine seedbed for best possible seed germination. The second most important purpose of cultivation is to control weeds. Cultivating helps aerate the soil and enables you to turn under cover crops or plant residues that are left on the soil surface, providing organic matter for soil organisms to live on.

Using tools

When you are using tools for gardening, choose the right ones for the job. This will not only make the job easier but will also ensure that there is less danger of injuring yourself or anyone else.

When not using tools, put them down in ways that no injuries can occur. For example, always put down a rake with the teeth pointing downwards. You should also maintain and store them safely and correctly once you have finished with them. Safety will be an important aspect of your training throughout this course.

Materials:

Cultivation tools that you use in a garden might include:

- Spade
- Fork
- Rake
- Hoe
- Pick axe
- Bush knife

Figure 1: Tools stored in a shed
Cleaning and storing tools

If tools are kept clean and maintained properly, they will last much longer and work better. It is important to take good care of tools because they are expensive. Proper care and storing of tools also helps to prevent injuries.

Cleaning tools
Practice cleaning all the tools you use after you have finished with them, so that they are ready again for their usage and also to increase their working life. Ask your supervisor the best way to clean each tool.

Storing tools
Tools must be hung up neatly in their correct position so that they do not fall and cause injuries. Before storing a tool it should be cleaned first.

 Keeping tools sharp
Tools such as knives, axes and picks should be kept sharp because it makes work much easier when tools have sharp edges. Blunt cutting tools do not cut well, which makes work a lot harder.

Preventing rust
Most farm and gardening tools are made of metal; if they are stored when wet, they will rust quickly. Rusty tools do not last very long. To prevent tools from rusting, they should be cleaned, oiled and stored in a dry place.

Always store tools correctly to save everyone the frustration of looking for something and also to prevent injuries. If you are hanging tools up, hang them up safely.

Figure 2: How to store tools and equipment in tool shed.
**Assessment task**

Your first assessment task is to demonstrate that you can select tools suitable for the task and use them safely. You also need to follow procedures for handling, maintaining and storing tools.

It is recommended that you need to be able to safely use a
- Spade
- Garden fork
- Bush knife
- Hoe
- Pick axe, and
- Rake

**Task 1: Using and caring for tools**

Complete this task for your assessor to mark.

Make notes, draw sketches and show diagrams here about how to safely use, carry, maintain and store the following tools.

a. Spade:

b. Garden fork:

c. Rake:

d. Bush knife:
Write notes or draw sketches here on:

a. All the cultivating tools you have used and then make notes on the procedures for cleaning each tool.

b. How and where each tool should be stored.

Performance Standards

1.1: Name and describe the basic tools and materials used in horticulture.

1.2: Follow procedures for handling, maintaining and storing tools

Tools are cleaned and stored after usage according to workplace procedures.
Digging over the ground

Once you know how to use and maintain gardening tools correctly, you need to learn how to dig the ground over so that you do not damage the soil structure and also create a nice tilth, or even soil texture to a uniform depth.

**Tilth** is the cultivation of land, to a texture that is best suited for sowing seeds. An experienced farmer can determine whether the soil is of right tilth for sowing seeds.

The best way to dig ground using a spade is to work using the single-spit approach. A ‘spit’ is the width of soil that can be easily turned over in one dig of the spade. A spit is usually about 30-40 centimetres wide and 20 – 50cm deep. The lower levels are then exposed and aerated. At the same time annual weeds are turned in and buried so that they will provide valuable humus to the plants.

Ask your supervisor to show you, then practise the technique of single-spit digging to create a good tilth on your own.

**Assessment task**

For your next task, you need to demonstrate that you can dig over a garden, using techniques that suit the soil characteristics.

![Figure 3: Digging and turning over the soil](image)

**What you will need:**

- Area to dig
- Tools required
  - Pick axe
  - Bush knife
  - Garden fork
  - Spade
Practice:
Practice digging the ground over, while using the single spit digging method.

Task 2: Preparing a garden bed

Complete this task for your assessor to mark.

a) How does the soil’s characteristic affect the way we dig over the ground?

b) Make notes and sketches about single spit digging

Performance Standard

1.3 Plain (single spit) digging is used in accordance with the soil characteristics.

Preparing the soil and digging in nutrients

You should know how to spread any organic matter or other material you are given to put into your garden. You then need to incorporate it evenly throughout the soil, and then you should finish off by raking the area and leveling it evenly.

Practice doing this.
Dig some holes to check that you have got an even mix, and then do the assessment task.
The soil is the medium of growth for plants. It is an important factor of production, and it needs special attention in order to conserve and renew its fertility. The extent to which air is incorporated in the soil depends on the structure of the soil and the nature of frequent tilling of the soil.

To replace soil nutrients depleted with successive crop removal, you need to apply fertilizer or manure or give long periods of fallowing.

Activities to give and get back most out of the soil are classified as
a. **Pre-planting**: Activities such as bush clearing, burning, tilling and ridging are all classified under pre-planting operation.

b. **Planting**: This is the placing of seeds or stem cutting and plants in the soil.

c. **Post-planting**: Actions such as thinning, fertilizing, weeding, mulching, spraying, watering, harvesting and, lastly, taking crops to the market to be sold.

**Assessment task**

Task 3 asks you to describe what you do to prepare a soil for planting.

**Task 3: Cultivating soil to a fine tilth**

Complete this task for your assessor to mark.

Write notes and make sketches here on:

a) Creating a soil tilth.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

b) Depth of tilth.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
c) Soil aeration

………………………………………………………………………………………………………
………………………………………………………………………………………………………
………………………………………………………………………………………………………

d) Creating an even soil surface

………………………………………………………………………………………………………
………………………………………………………………………………………………………
………………………………………………………………………………………………………

e) Removing debris and tiny stones from the bed

………………………………………………………………………………………………………
………………………………………………………………………………………………………
………………………………………………………………………………………………………

f) How nutrient materials are incorporated uniformly into the soil

………………………………………………………………………………………………………
………………………………………………………………………………………………………
………………………………………………………………………………………………………

Performance Standards

1.4 Cultivate single pit, depth and tilth are consistent over the cultivated area
1.5 Soil is aerated suitably for the soil characteristics or its texture.
1.6 Added materials are incorporated uniformly throughout the seedbed.
ELEMENT 3: Recognize fertilizers and their applications

For this element, you need to be able to recognize and state the uses of lime, nitrogen, phosphorus and potassium. You also need to be able to talk about the value of organic fertilizers, such as compost and mulching materials, and manure such as chicken and sheep wastes.

Identifying Fertilisers

A wide range of different fertilizers are used in planting, and they might vary in form and appearance as well as in their effect and in their mode of action: whether fast-acting or slow-releasing agents and organic or synthetic. Timing of fertilizer application has a significant effect on crop yields. Proper timing of fertilizer application increases yields, reduces nutrient losses, increases nutrient efficiency and prevents damage to the environment. Applying too much fertilizer can burn the plants, leading to wilting and death. Therefore it is important to identify a range of different fertilizers and know how and when to apply them.

Nitrogen (N) is essential to plant growth and reproduction, while phosphorus (P) is essential for seed germination, root development, flowering, fruit formation and crop maturation. Potassium (K) plays an important role in plant metabolism, in carbohydrate formation and translocation of starch to all parts of the plant. Lime helps acid soil to be neutralized thus increasing the nutrient status of the soil, and as for the organic manures, the mineralization of humus adds nutrients to the soil, which will lead to an increase in plant yield.

Assessment task

Task 4 requires you to show to your supervisor that you can identify a range of fertilizers by studying their characteristics.

What you will need

Samples of the fertilizers, limes and manures discussed above.

Practice

Check the various fertilizers used at work and practice identifying as many as you can. Look for distinguishing features in appearance, colour, odour and so on. Test yourself often until you can recognize them easily.
Task 4: Identifying lime and other fertilizers

Your Supervisor will verify that you have completed this task correctly

Your supervisor will select lime and three other fertilizers from the range statement for you to identify. You need to state what each sample is and how you identified it, for example, dark colour, rough texture and no smell...

Name of Sample 1:
How you identified it
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

Name of Sample 2:
How you identified it
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

Name of Sample 3:
How you identified it
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

Name of Sample 4:
How you identified it
........................................................................................................................................
........................................................................................................................................

Supervisor’s verification:
I verify that ......................................................... correctly identified the four samples of fertilizer provided.

Signed: ................................................. Date: .................................................

Performance Standard
2.1 Fertilizer, manure and lime are identified by sight.
Measuring and spreading lime and fertiliser

Assessment task

Task 5 requires you to show that you can measure lime and fertilizers accurately and spread them evenly over a soil surface, in appropriate amounts.

For commercial bags of fertilizers, the appropriate rates of spreading fertilizers are usually provided on the outside labels. For natural fertilisers, you will need to ask your supervisor how much to spread.

What you will need

- Fertilizers and lime
- Container
- Scales
- Selected area of ground
- Instruction from your trainer or supervisor

Practice

Learn how to check that the measuring scales you use are zeroed correctly. Gain as much experience as you can on measuring out and applying of fertilizers and lime.

Now complete Task 5

Task 5: Measuring and applying fertilizers

Your supervisor will verify that you have completed this task successfully. You also need to send it to your Assessor for marking.

a) List the names or types of materials to be incorporated into the soil.

........................................................................................................................................

........................................................................................................................................

........................................................................................................................................

b) Ask your supervisor to assess you as you measure and apply fertilizer or lime.
c) Make notes here about the process and the important points you need to remember


Supervisor’s Verification:
I verify that .......................................................... demonstrated that they can read scales and that they measured an appropriate amount of fertilizer for the ground to be covered.

I verify that the method used by ........................................ to spread the fertilizer resulted in an even and consistent spread.

Signed: ___________________________  Date: ___________________________

Performance Standards

2.2: Fertilizer or lime is measured out accurately, in accordance with workplace procedures.

2.3: Fertilizer or lime is spread evenly over the specified area at the instructed rate of application
Handling and storing fertiliser and fertiliser equipment

Fertilizers and lime are very hygroscopic, meaning they can absorb water very easily, from moisture in the atmosphere and from the floor and walls of buildings. Fertilizers should be stored in a dry, clean place because, once they get wet, they are very difficult to use.

You need to gain as much experience as you can about storing fertilizer, lime and its associated equipment. Make sure that you understand why the storage methods and procedure used are very important.

Figure 4: Different types of synthesized fertilizers kept locked and secured in the tool shed.

Assessment task

Task 6 requires you to show that you understand the importance of correctly storing fertilizer and fertilizer equipment.

What you will need

- The fertilizer measuring scales
- Containers
- Fertilizers and limes you have been using
- Appropriate storage areas.

Now complete Task 6
Task 6: Storing fertilizers and fertilizer equipment

Your supervisor will verify that your descriptions are accurate, and your assessor will assess your discussion.

a.) Briefly describe how and where fertilizer, lime and its associated equipment are stored at work.

b.) Comment on whether or not you think these storage methods and facilities are adequate, and list any improvements that you think need to be made.

i. Comment

ii. Improvements

C.) List the most important points that you need to remember when storing fertilizers, lime and associated equipment.
Supervisor’s verification:

I verify that …………………………………………………………. has provided an accurate description of the fertilizer storage facilities and storage methods for the facility observed, and that the comments and suggestions for improvement are appropriate.

Signed: ______________________ Date: ______________________

Performance Standard

2.1 Fertilizer, manure and lime are identified by sight.

Figure 5: The usage of grasses for mulching in taro gardens.
ELEMENT 4:
Prepare a seedbed by hand for sowing

Some seeds can be planted directly into the part of the garden in which they will grow, mature and be harvested. Most seeds, however, need to be started in a specially prepared seedbed that will encourage germination and early growth. Once they have grown strong enough in the seedbed, they can be planted out to where they will grow to full size. In this section, you will be asked to look at a seedbed constructed by hand and ready for sowing.

Firstly, weeds and trash from previous sowings need to be removed and disposed of. Secondly, soil needs to be cultivated to get an even and suitable tilth for planting. Small seeds need a very fine soil texture and need only shallow holes, maybe half an inch deep, or scattered on the surface and covered with very fine soil. Larger seeds required a deeper hole of about one inch depth and can tolerate a coarser soil. [Your supervisor will give you specific examples and help you to prepare appropriate seedbeds.]

You need to look at the conditions that encourage the seed to germinate. For seeds to germinate (that is to start growing), they need both oxygen and moisture in the soil. If soil is too wet, there won’t be enough oxygen and the seed will not germinate. If there is not enough moisture in the soil, the seed will again not germinate, so it is important that the soil is kept well aerated and moist.

Figure 5: Constructing a seedbed
Site selection

Select an area near to your home with a water source. It should be:

- Good, well-drained and fertile soil.
- Fairly level land with no steep slopes.
- Sunny and open, not shaded by large trees.
- Protected from pigs, chickens, and so on.

Steps in preparing the ground for a seedbed:

1. Remove logs, roots, stones and weeds.
2. Turn the ground over to a depth of 15 – 30 cm. Work backwards, using a spade for turning the soil and a hoe for breaking up clods of earth.
3. Dig compost or other recommended fertilizers into the soil.
4. Use a rake and a hoe to make the soil as fine and even as you can get it.

Choosing seeds

To know what kind of seedbed you need to prepare, you need to know what kind of seeds you are going to grow. Will you be planting tiny seeds, such as carrots, or large seeds, such as pumpkins?

What to do when selecting seeds:

Read the seed packet labels carefully. Make sure that you do not have seeds that are past their ‘use by’ date.

Choose seeds that are disease resistant and that have a high germination rate. The seed resistance to disease and the germination percentage are usually printed on the seed packet.

Check whether the seeds are a bush variety, which are usually ground cultivated, or a staked variety, which need to be grown on stakes.

Aerating, watering and mounding seedbeds

To grow well, most seeds need access to air. This is provided by preparing the soil so that it is light, open, and soft. A soil that is hard and solid will not let air in. You may need to dig around your seed rows to keep the soil from going solid.

Seeds also need water. However, you must be careful how much water you give. Too little water, and the seedlings will dry out and die. Too much water, and the seedlings will drown and the soil will go hard and soggy. Your supervisor will tell you how much water to give and when to water.

Some plants, such as pumpkins, grow best when planted in mounds. A mound for pumpkins will usually consist of a rich layer of compost, which the plant roots will access, covered by soil, into which you plant the seeds. Because water runs downhill, you might have to water mounded plants more often than plants sown in a flat bed.
Assessment task

Task 7 requires you to report on how you prepared a seedbed for planting. Task 8 asks you to report on how you maintained your seedbed.

What you will need

- A selected area for your seedbed
- Selected crop and seed
- Appropriate tools and equipment

Practice

Gain experience at clearing ground ready for further seedbed preparation.

Now complete Task 7 and Task 8

Task 7: Preparing a seedbed

Complete this task for your Assessor to mark.

Take a photo of your seedbed before you start any work, showing all the weeds and surface trash. Attach your photo in the space provided.
Start work on your seedbed by removing all weeds and surface trash, and then disposing of them correctly.

Now complete the following:

Describe how you removed and disposed of weeds and surface trash.

Name the crop you intend to grow in your seedbed.

What size is your seed? Give the approximate measurements or dimensions.

Based on the size of your seed, outline what sort of soil tilth this seed will need for planting.

Describe how you prepared the seedbed to create an even and suitable tilth for sowing your seeds.
Take another photograph, showing the fully prepared seedbed. Attach your photograph below.

Performance Standards

3.1: Assist in seedbed clearing of weeds and disposing of trash according to workplace procedure.

3.3: Prepare land for planting.
Task 8: Moisture, aeration and mounding

Complete this task for your Assessor to mark.

Continue work on your individual seedbed, and make sure that you use techniques that ensure good aeration and appropriate moisture levels in your seedbed.

1. Describe the germination conditions required by your seed.

2. Outline how you prepared the seedbed to ensure that these germination requirements were met.

3. What do you mean by mounding a seedbed?

4. Why might your seedbed need mounding?

Performance Standards

3.3. Prepare land for planting
3.4. Prepare seedbeds or mounds for planting
ELEMENT 5:  
Sow Seed by Hand in Outdoor Seedbeds Using Broadcast or Drilling Method

Seeds are sown in a seed bed for several reasons:
1. To stop the seeds from being blown away by the wind, eaten by insects or birds or washed away by rain drops.
2. To enable water to be applied evenly to keep the soil moist, so that the seeds can germinate all at the same time.
3. To enable you to select only the best seedlings for planting out.

Broadcasting is the throwing of seeds on the surface of a well prepared seedbed. When drilling, however, you use a string line to get straight rows and then use a stick to prepare the drills (rows or holes) to the right depth for the seed you are sowing. You need to gain experience at sowing seeds using both broadcasting and drilling methods. Try and learn to broadcast seeds evenly on your seedbed and also to incorporate them into the soil at a uniform depth. Check with the seed packet labels about the different seed depth drills and different spacing intervals. Remember to firmly cover the seeds with soil.

Once you have sown the seeds, you then need to label them carefully with labels that will remain legible until the crop has developed to the stage where it is obvious what it is.

Practice marking and labelling the planting tag properly. All the main information should be written clearly and be easy to read on the seed tag.

Always make it a habit to leave the worksite clean and tidy when you have finished work. All tools, materials, equipment and seeds should be stored away in their correct places. Dispose of or remove any leftover rubbish to its allocated area.

Work on the seedbed, especially the weeding and watering of the seeds or crops, should be an ongoing process, because young seedlings can easily get choked or dry out and die.

Assessment task

Task 9 asks you to discuss how you sowed your seeds and labeled them.
What you will need:

For this task you will need
- Your seedbed
- Crop seed
- Appropriate tools and equipment
- Labeling materials.

Complete Task 9 now.

Figure 6: Seedling growing in seed boxes ready for transplanting

Task 9: Sowing and labelling seeds

Your Supervisor will verify that you have completed this task correctly. You must also send it in for your Assessor to mark.

Seed sowing

1. State what method of sowing seeds that you used.
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2. Give the reasons why you chose this method.
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3. Describe all the steps involved in the seed sowing method that you had chosen for your seedbed.

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Labeling

1. List all the information that you have included on your seedbed tagging.

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2. Describe how you placed and positioned the labels in the seedbed.

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Keeping the workplace tidy after sowing and labelling

1. Explain how you tidied around the your surrounding after you had finished working on your seedbed.

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2. Describe in detail how and where you stored all the tools, equipment and unused seeds.

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Supervisor’s verification:
I verify that ................................................................. has provided a correct record of the work done in sowing and labeling seeds.

Signed: ........................................ Date: ........................................

Performance Standards

4.1. Broadcast seed is sown at an even depth, in relation to workplace procedures.

4.2. Drilled seed is sown at a correct depth in straight drill spaced at intervals, in regard to workplace procedures.

4.3. Sowings are labeled accurately and correctly.

4.4. The working site is left clean and tidy with all the equipment washed and unused seed stored in its proper places.
ELEMENT 6:  
**Maintain Seedbed to Seedling Stage of Growth**

You have sown your seedbed, now you need to maintain it to ensure good germination and seedling development. As part of the assessment for this section you will be continuing to work with your seedbed and chosen crop, by weeding, watering, and controlling pests and diseases if you need to.

![Figure 7: Maintaining seedbeds.](image-url)

Different crops have different pests, and different ways of controlling these pests. Ask your supervisor what to look out for and how to control pests on the crops you have chosen to grow.

![Figure 8: English cabbage infested by white cabbage butterfly caterpillars](image-url)
Assessment task

Task 10 asks you to report on the work that you did in maintaining your seedbed until the seeds began to grow.

What you will need

- Your seedbed
- A range of appropriate tools and equipment
- Work records.

You will also need to ask your supervisor to verify that your record is accurate.

Complete Task 10 now.

Task 10: Maintaining your seedbed

Your Supervisor will verify that you have completed this task correctly. You must also send it in for your Assessor to mark.

In the space provided below, record all the work that you did in maintaining your seedbed. Include all the information on all of the following.

1. Sowing and germination dates of seeds;

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2. Seedling growth rates and development including its measurements;

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3. Maintaining the seedbed by

   a. Watering:

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b. Fertilizing:

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c. Weeding:

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d. Thinning:

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e. Controlling pests and diseases

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Supervisor’s verification:

I verify that .................................................................................................................. had provide a correct record of the work done in maintaining a seedbed.

Signed: ........................................... Date: .................................................................

Performance standards:

5.1 Seedbed is regularly maintained to ensure optimum seedling growth
5.2 Seed germination and seedling growth is checked regularly.
5.3 Records are kept of seedbed maintenance from seed germination to seedling stage of growth.
Congratulations!

You have now finished working through Introduction to basic horticulture. Once you have finished all the assessment tasks, send your completed unit to your Assessor, who will mark it and tell you whether you have gained a pass in this unit. If you do not receive a pass, your Assessor will tell you what you need to do to gain a pass.

Vocabulary

1. **Aerated soil**: Loosening or puncturing the soil to allow water and air penetration into the soil.

2. **Broadcasting of fertilizers**: A method of fertilization that is used before planting, this is a process by which synthetic fertilizers are thrown onto the prepared beds or given area.

3. **Bush Knife**: A tool that is used for cutting, slashing and weeding off unwanted weeds or plants.

4. **Compost**: Organic soil materials made from decayed plants that can be dug into the soil to improve fertility.

5. **Contouring**: Ridges that are constructed horizontally across slopes.

6. **Cultivate**: The process of breaking up the soil surface, the removing of weeds.

7. **Debris**: Scattered pieces of cut or leftovers plants that are left on the field after harvesting.

8. **Digging**: Preparing the soil by inserting a spade to break up the soil. A well dug garden will have been dug to a depth of two shovel blades.

9. **Draining**: The removing of excess water from the soil surface and upper subsoil, using ditches or other means.

10. **Drilling**: Dropping of the seed into holes in the soil made with your finger and then covering the seeds using your hands or a wooden plank.

11. **Fertilisers**: A mineral plant food. A complete fertiliser will contain the main elements used by growing plants; Nitrogen (N), Phosphorus (P) and Potassium (K).
12. **Fork**: A tool used for turning manure or loosening the soil before transplanting and for uprooting stumps. A fork breaks the soil up more finely than a spade.

13. **Germination**: The process that transforms the embryo in a seed to grow into a seedling.

14. **Hoe**: A tool mainly used for making heaps, loosening the surface soil in order to promote plant growth and to destroying weeds.

15. **Hydroscopic**: The ability to attract moisture from the air and make the substance wet.

16. **Lime**: Also known as limestone, a mineral that can neutralize soil acidity and release other nutrients for plants to use.

17. **Maintaining tools**: Farm tools should be cleaned after use and kept in store for a long time.

18. **Manure**: Organic matter, excreted by animals, which is used as a soil conditioner and fertilizers.

19. **Mounding**: The raising of soil into piles or mounds to help plants grow.

20. **Mulching**: Green or dried grasses that are used to cover the top soil around the growing seedlings. Their purpose is to help prevent the evaporation of water to the atmosphere and control the growth of weeds.


22. **Nutrients**: "Plant food". Mineral elements which are needed by plants in small quantities.

23. **Organic gardening**: The method of gardening using only materials derived from living things. (that is, composts and manures)

24. **Organic fertilizer**: Any material which originated as a living organism. (i.e. composts and manures)

25. **Pest and diseases**: Organisms that reduce the quantity and quality of any farm produce.

26. **Pick axe**: A tool mostly used to dig trenches and drains, when the soil surface are made up of igneous rocks or the soil surface are rocky.
27. **Planting:** The art of cultivating certain plants to grow for consumption. It involves both placement in suitable soil and maintenance of growing conditions.

28. **Potassium:** A nutrient required by plants in large amounts because it helps form carbohydrate and translocation of starch to all parts of the plants.

29. **Rake:** A tool used for leveling the soil surface, breaking large crumbs into small ones, removing stones and weeds from seedbeds.

30. **Records:** Individual daily farm activities that are written and kept for future evaluations.

31. **Seedbeds:** An elevated garden bed offering better drainage, aeration and warmer soil.

32. **Seedling:** A plant that has just emerged from its seed with its first root, stem and leaves.

33. **Single spit digging:** Digging the soil to a one spade width (one spit) at a time in order to improve soil drainage and soil fertility.

34. **Soil structure:** The physical appearance of the soil. It may be sandy, stony, organic and so on.

35. **Soil texture:** The measurement of the coarseness or fineness of the soil particles.

36. **Sow seeds:** Is the direct planting of seeds on a prepared seed box or trays and also on a given seedbed.

37. **Spade:** A tool used for lifting the soil and completely turning it over, also used for leveling and for digging holes.

38. **Staking:** A practice that is used to drive a stick/stake into the ground, for plant support.

39. **Storing tools:** The placing of tools and equipment in their secure and proper place in a room to minimize injuries and theft.

40. **Synthetic fertilizer:** A mix of mineral nutrients such as NPK to help sustain the growth of the plant.

41. **Thinning:** Removing excess seedlings, to allow sufficient rooms for the remaining plants to grow.

42. **Tilling:** The shallow cultivation of the top soil that will cover up large cracks and pore spaces.
43. **Tilth**: cultivation of land, tillage.

44. **Varieties**: Different breeds of the same plant. For example, ‘Moneymaker’ and ‘Russian Red’ are varieties of tomato.

45. **Water source**: The sources of water channels that can be used to water the plants.

46. **Weeds**: Any plant or group of plants that are growing where it is not wanted.
EVALUATION:

PREPARE AND SOW OUTDOOR SEEDBEDS MANUALLY:

People credited with this UNIT standard are able to:
- cultivate soil using hand tools
- recognize and apply fertilizers and lime
- prepare a seedbed by hand for sowing
- sow seed by hand in outdoor seedbeds using broadcast or drilling methods
- and maintain seedbed to seedling stage of growth
- clean and maintain tools and equipment after use
- storing tools and equipment in its proper place

Checklist:

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Comments:

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Competent or not competent:
YES / NO

Assessors signature:

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COURSE DESCRIPTOR:

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**Delivery Mode:** Partial Face to Face
Semester 2

**Explanation:**
This is a multi-discipline course integrating husbandry and maintaining tools and equipments together with constructing seedbed manually and fertilizer applications, and other useful means of safety procedures management approach to assist students to apply practical situations.