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**NATIONAL CERTIFICATE IN ORNAMENTAL
HORTICULTURE LEVEL 1**

**Workbook : Identifying and preparing soils
for planting**

**Identifying and Preparing Soils
for Planting
Learner Workbook**

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Version 2

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A c k n o w l e d g e m e n t s

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Lifestyle College

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Workshop Overview

Purpose

The purpose of this study session is to equip you with the skills necessary to prepare an area for planting and the knowledge necessary to recognise the main components of soil.

This study session forms part of the National Certification in Ornamental Horticulture Learnership at NQF Level 1 and is aligned with the Unit Standard: Identifying and preparing soils for planting, which carries 4 credits.

Who is it for?

This study session and unit standard forms the skills and knowledge for people within the ornamental horticulture or landscaping industry who are required to prepare an area for planting and gives the learner the ability to:

- Recognise the differences between topsoil and subsoil.
- Understand why topsoil should be conserved.
- Identify the three main soil types and their characteristics.
- Understand the importance of tilling and digging an area to be planted.
- Understand the importance of adding soil enrichments to the ground before planting.

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What's in it for you?

The skills and knowledge acquired in this study session will equip you the competence needed to be able to prepare an area for planting and help you to identify:

- Topsoil and subsoil.
- Sand, loam and clay.
- The particle size and textures of each soil type.

This study session will also help you to understand:

- The main differences between topsoil and subsoil.
- The benefits of planting in topsoil as opposed to subsoil.
- The reasons for stockpiling topsoil.
- The factors that influence water retention in the three soil types.
- The role that particle size plays in determining the infiltration rate of a soil.
- The benefits of tilling or digging a soil prior to planting.
- The various methods of loosening and turning soil and the depth that each achieves.
- The benefits of adding organic enrichments to the soil before planting.
- The improvements in the nutrient levels of a soil, through the addition of synthetic fertilisers.

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What about assessment?

If you can correctly prepare an area for planting and answer all the knowledge questions in the summative assessment, you will receive credits for a competent rating on your assessments.

These credits contribute 1 unit standard and 4 credits towards the National Certificate in Ornamental Horticulture Learnership at NQF Level 1.

The laid down policies and procedures with regard to assessment, moderation, RPL and appeals govern this assessment.

You will be rated "Competent" or "Not Yet Competent" against the assessment criteria.

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Unit Standard

Title	Identifying and Preparing Soils for planting
Number	
Level	1
Credits	4
Field	Agriculture and Nature Conservation
Sub field	Horticulture
Issue date	
Learning assumed to be in place	None

Specific Outcomes	Assessment Criteria
1. Recognise the differences between topsoil and subsoil and explain why topsoil should be conserved	1.1 Describe the main differences between topsoil and subsoil. 1.2 Explain the benefits of planting in topsoil as opposed to subsoil. 1.3 Detail the reasons for stockpiling topsoil. Range: Topsoil – organic residue, humus, darker colour, smoother texture, water retention, stockpiling. Subsoil – no organic or humus, lighter colour, rougher texture.

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Specific Outcomes	Assessment Criteria
2. Identify the three main soil types and their characteristics	<p>2.1. Identify the three main soil types.</p> <p>2.2. Describe the particle sizes and textures of each soil type.</p> <p>2.3. Describe the factors that influence water retention in the 3 soil types.</p> <p>2.4. Describe the role that particle size plays in determining the infiltration rate of a soil.</p> <p>Range:</p> <p>Sand – large particles, rough texture, predominantly macro pores, good drainage and aeration, poor water retention.</p> <p>Loam – mixture of small and large particles, moderate drainage and aeration, good water retention.</p> <p>Clay – fine particles, smooth texture, mostly micro pores, poor drainage and aeration, lengthy water retention.</p>
3. Understand the importance of tilling and digging an area to be planted	<p>3.1. Explain the benefits of tilling or digging a soil prior to planting.</p> <p>3.2. Describe the various methods of loosening and turning soil and the depth that each achieves.</p> <p>Range:</p> <p>Tilling, rotavating, single digging, double digging, breaking compaction, improving friability.</p>

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Specific Outcomes	Assessment Criteria
4. Understand the importance of adding soil enrichments to the ground before planting	4.1. Describe the benefits of adding organic enrichments to the soil before planting. 4.2. Describe the improvements in the nutrient levels of a soil, through the addition of synthetic fertilizers. Range: Organic – compost, peat moss, sawdust, bark, peanut shells, manure, guano, bone meal, improve water retention, friability, condition of soil, slow release of nutrients. Inorganic/synthetic – superphosphates, agricultural lime, N.P.K. fertilizers, gypsum, improve chemical composition, balance pH, increase nutrient level.

Embedded Knowledge

Embedded knowledge is reflected within the assessment criteria of each specific outcome and must be assessed in its own right, through oral and written evidence. Observation cannot be the only assessment.

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Critical Cross Field Outcomes

- Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made – specific outcomes 1 and 4.
- Work effectively with others as a member of a team, group, organisation or community. Specific outcome embedded in the learning for this level of learner.
- Organise and manage oneself and one's activities responsibly and effectively.
- Collect, analyse, organise and critically evaluate information. Specific outcome 1,2, 3 and 4.
- Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation. Specific outcome embedded in the learning for this level of learner.
- Use science and technology effectively and critically, showing responsibility toward the environment and health of others. Specific outcome 1,2, 3 and 4.
- Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation. Specific outcome 1, 2, 3 and 4.

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**Unit Standard Accreditation and Moderation
Options**

1. Internal moderation.
2. External moderation.
3. Moderation of assessment will be overseen by the relevant ETQA, according to the moderation guidelines in the relevant qualification the agreed ETQA procedures.
4. Internal assessment.
5. External assessment with the relevant registered/accredited industry body/ETQA.
6. An Assessor accredited by the relevant ETQA, will assess the Learner's competency.
7. Formative and summative assessment of qualifying Learners against this unit standard should be in alignment with the requirements of the NSB.
8. Practical assessment activities will be used that are appropriate to the contents in which the qualifying Learners are working.
9. Assessment will include self and peer assessment, practical and oral assessment, observations, questions and answers, etc.
10. Direct observation is required in simulated or actual work conditions.
11. Reporting skills are demonstrated by effective communication, using verbal and/or writing skills.
12. Assessment is to be structured to include formative and summative component, as well as the submission of a Portfolio of Evidence.
13. The assessment should ensure that all the specific outcomes, critical cross field outcomes and embedded knowledge are assessed.
14. Specific outcomes must be assessed in their own right, through oral and practical evidence and cannot be assessed by observation only.

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Essential embedded knowledge must be assessed in their own right, through oral and practical evidence and cannot be assessed by observation only.

15. Special outcomes and essential embedded knowledge must be assessed in relation to each other.

16. If qualifying Learners are able to explain the essential embedded knowledge, but are unable to perform the specific outcomes, then they should not be assessed as competent.

17. If qualifying Learners are able to perform specific outcomes, but are unable to explain the essential embedded knowledge, they should not be assessed as competent.

18. Evidence of the specified critical cross-field outcomes should be found, both in performance and in essential embedded knowledge.

19. Assessment activities must be fair, so that all Learners have equal opportunities. Activities must be free of gender, ethnic or other bias.

20. This unit standard can be assessed together with any other relevant registered unit standard.

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Who does what?

You are expected to actively take part in the lessons by:

- Asking questions.
- Planning and preparing for your training and assessment.
- Completing the assessment tasks that you are given.
- Telling your trainer when you need help or don't understand.

Your learning will be supported in the following ways:

- Your trainer will provide you with all the necessary training material.
- Your trainer will manage the learning process during the training.
- The assessor will plan and prepare you for assessment, assess your competence and provide feedback to you and any follow up assessments that may be necessary.

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Introduction

An old, old tale about soils...

A long, long time ago, before the Far-off Times, came the time of the Very Beginnings. A time when all the animals still wore shoes. Yes, you heard right, the large elephant wore shoes, the muddy hippo wore shoes, the galloping horse wore shoes and even the burrowing mole wore shoes.

You see at the time of the Very Beginnings the animals didn't respect the soil and thought of it as dirty and troublesome.

Some soils were very sandy and the animals kept getting sand in their shoes – and you know how annoying it is to have sand in your shoes!

Other soils were very muddy and sticky and this clay soil stuck to their shoes – and you know it is impossible to walk around with muddy, sticky shoes!

So every day the animals would take their sandy shoes off to empty them of sand and take their clayey sticky shoes off to allow the mud to dry. And very soon there were shoes scattered all over the land – on the hills, on the plains, in the valleys and especially near the watering holes. Just imagine how difficult it must have been trying to find your pair of shoes after having had a drink at the watering hole!

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As time passed the animals become more and more angry and more and more cross with the soil. Until at last they held a meeting and decided to ask the plants and earthworms who lived in the soil to help them with this troublesome soil problem.

They first went to the plants and asked them for their help. This is what the plants told them:

“In very sandy soils we are often very thirsty because the water runs straight through the soil and we have to wait for the next rains to fall before we can drink again.

The sticky, heavy soils hold too much water and our roots can not get enough air and we nearly drown.

But in the soils where the earthworms live, we have plenty of water and air. That is why so many of us grow so big and beautiful where the earthworms live. Go and ask the earthworms for help.”

So the animals went to the earthworms and asked for their help. This is what the earthworms told them:

“We have a secret that we will share with you, but first you must promise to respect and look after the soil from now on.”

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Now do you want to know what that secret was?

Then hold up your right hands and promise that you will respect and look after the soil from now on.

This is the earthworms secret:

“We are the guardians of mother earth. Our job on earth is to make fertile soil so that healthy plants can grow and so each night we come up to the surface of the soil and eat decaying plants, pieces of leaves and other plant material. Inside our stomachs live tiny bacteria that break down the plant material, which we then give back to the soil through our droppings and this helps to fertilize the soil in which we live. Our burrows help to bring air into the soil and so you can say we dig and till to tend the earth.

But there is a lot of soil and not enough of us, so please won't you help us to look after the soil, so that the plants can grow healthy and strong and you can use the plants for food, medicine, shade and shelter?”

And so from generation to generation, the four lessons of the earthworm have been handed down. As guardians of the earth, these lessons are now passed to you.

Let's begin with lesson 1.

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Lesson 1 : Soil Layers

Specific outcomes of this lesson :

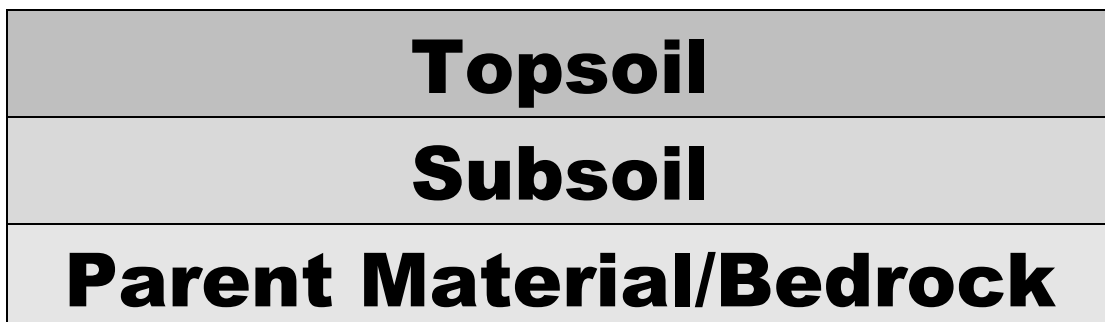
Recognise the differences between topsoil and subsoil and explain why topsoil should be conserved.

After you have worked through Lesson 1, you should be able to:

- Describe the main differences between topsoil and subsoil.
- Explain the benefits of planting in topsoil as opposed to subsoil.
- Detail the reasons for stockpiling topsoil.

Soil Layers

The first lesson that the earthworms taught the animals is that when you dig or burrow into soil like the plant's roots, you will find that the soil has three different layers:



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- The top layer of soil is called the **topsoil**. This layer of soil is usually darker in colour than the other layers of soil because it has a high content of organic material such as leaves and animal litter. As this organic matter breaks down it makes humus. Humus is rich in nutrients, which gets taken up by plants and these nutrients help the plants to grow healthy and strong. Because humus is a soft material it helps bind together very, very small clay particles into larger crumbs. This helps the soil to absorb and hold water. In this layer you will also find bacteria, fungi and other small organisms, although you won't be able to see these with the naked eye.
- The next layer of soil is called the **subsoil**. This layer of soil is more rocky, often sticky and normally a lighter colour than the topsoil because all the iron and organic matter or humus has been washed out. Subsoil is usually harder to dig than topsoil and it is very difficult for plants to grow in subsoil.
- Underneath the subsoil is the solid bedrock called the **parent material** this is where the subsoil and topsoil come from in most soils.

It takes about two thousand years for nature to make 3cms of topsoil and about 60 years for good humus to form from organic matter in the soil. Topsoil is valuable because it cannot easily be replaced (it takes many years to form). But it takes a very short time for man to destroy this topsoil if it is not looked after properly. Most South African soils are usually very shallow and so when you dig you must be careful to keep the topsoil on top and not bury it under subsoil.

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Your Turn...

ACTIVITY 1

Look at the three trays of soil on the table and then answer the following questions:

- Which tray holds topsoil?

- How do you know this is topsoil?

- Which tray holds subsoil?

- How do you know this is subsoil?

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**Did you notice the main differences between the topsoil and
subsoil?**

To grow into healthy, strong plants, plants need:

- Water.
- Nutrients.
- Air/oxygen.
- Space between soil particles for the roots to grow.

The organic material and humus found in topsoil:

- **Gives the topsoil a darker colour** than the subsoil.
- **Gives the topsoil a smoother texture** than the subsoil, which is rougher to the touch.
- **Improves the soil structure.**
- **Absorbs and holds lots of water**, this is called the water holding capacity of the soil. This helps plants to get the water that they need in order to grow. Subsoil has poor water holding capacity.
- **Holds nutrients** that help the plant to grow. Subsoil has very little plant food or nutrients.

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- **Improves the aeration in the soil** and allows for more air spaces in the soil. This helps the plant's roots to get the air/oxygen that they need. Subsoil has fewer air spaces and less aeration than topsoil.
- **Improves the drainage of the soil**, so that the plant doesn't drown. Subsoil has less organic matter than topsoil and the nutrients leach (get washed down) through the subsoil.

**Why do you think you it is important to know the difference
between topsoil and subsoil?**

Soil is the "home" of plants and it is from the soil that the plant's roots gets the water, nutrients and air/oxygen that the plant needs to grow. But the roots of plants are not only found in the top of the soil. The plants roots often go deep down into the soil and so we need to dig into the soil to see what type of soil the roots of the plant will find.

If the plant's roots find topsoil the plant will grow strong and healthy, but topsoil varies in depth from garden to garden from a few centimeters to a metre or more. If the plant's roots only have a few centimeters of topsoil and then lots of subsoil the plant will not be able to reach its full size and spread.

Always remember that without good healthy soil plants will struggle to grow.

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Your Turn...

ACTIVITY 2
What are the main differences between topsoil and subsoil?

What are the main differences between topsoil and subsoil?

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Your Turn...

ACTIVITY 3

Why it is better to plant in topsoil rather than in subsoil?

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Your Turn...

ACTIVITY 4
How would you explain to a group of children why we need to conserve (look after) topsoil?

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Stockpiling Topsoil

Wherever there are new buildings going up or other land construction taking place that require the topsoil to be cleared or removed, it is important to save the topsoil. Remember to grow strong healthy plants we need good soil and you can't grow strong healthy plants in subsoil. When we save the topsoil, this is called stockpiling the topsoil.

We need to stockpile topsoil because:

- Topsoil is not easily replaced.
- Saving topsoil is cheaper than buying new topsoil.
- New topsoil that is brought onto the site from another site can be different to the site's original topsoil. If the topsoil is too different from the subsoil on the site you can get problems with the soil draining too quickly or too slowly.

Once the construction is finished and the subsoil has been shaped, the topsoil can then be placed back onto the site before the planting stage.

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Your Turn...

ACTIVITY 5

Why do we need to stockpile topsoil?