



ASSESSOR GUIDE

Soil fertility



Title:	Understand Basic Soil Fertility and Plant Nutrition						
Applied Title:	Understand Basic Soil Fertility and Plant Nutrition						
Field:	Agriculture and Nature Conservation						
Sub-Field:	Primary Agriculture						
SETA (SGB):	AgriSETA						
Skills Area:	Soil Fertility & Plant Nutrition						
Context:	Subtropical fruit Production						
US No:	116053	Level:	2	Credits:	5	Notional Hours:	50
Author:	H. Coetzee						
Adaptation:	T. Bekker						

This material is adapted from production learning material developed by and under license from:



P.O. Box 461, Hillcrest, 3650
(031) 313-3364

Disclaimer

By accepting this document and reading its contents you agree to be bound by the terms of this disclaimer.

The use of the contents of this document is at your own risk. The Citrus Academy does not warrant that the content of this document is suitable for your intended use or that it is free of inaccuracies or omissions. The opinions and advice expressed in this document are not necessarily those of the Citrus Academy. The Citrus Academy, its directors, officers, employees, agents and contractors shall not be liable for any loss or damage of any nature suffered by any person as a direct or indirect result of the use of, or inability to use any advice, opinion or information contained in this document, or any misrepresentation, misstatement or omission, whether negligent or otherwise, contained in this document.

You indemnify the Citrus Academy against any claim by any third party against the Citrus Academy, its directors, officers, employees, agents or contractors arising from, or in connection with, the use of, or reliance on, the contents of this document. It is your responsibility to determine suitability of the contents of this document for your intended use.

Table of Contents

Directions	4
Step 1	5
Step 2	6
Step 3	7
Step 4	8
Step 5	9
Step 6	17
Step 7	22
Step 8	29
Step 9	30
Step 10.....	36

Directions

Please Note: There is a separate assessment guide for the learner. The learner must use this guide to prepare himself / herself for the assessment.

This assessment guide contains all necessary activities and instructions that will enable the assessor and learner to gather evidence of the learner's competence as required by the unit standard. This guide was designed to be used by a trained and accredited assessor who is registered to assess this specific unit standard as per the requirements of the AgriSETA ETQA.

Prior to the delivery of the program the facilitator and assessor must familiarise themselves with content of this guide, as well as the content of the assessment guide for learners.

The assessor, facilitator and learner must plan the assessment process together, in order to offer the learner the maximum support, and the opportunity to reflect competence.

The policies and procedures that are applicable during the execution of this assessment are available on the website of the Citrus Academy, contained in a document named Policies and Procedures for Assessment, and must be strictly adhered to. The assessor must familiarise himself with this document before proceeding.

This guide provides step-by-step instructions for the assessment process of:

US No:	116053	Level:	2	Credits:	5
---------------	--------	---------------	---	-----------------	---

The step-by-step instructions agree and are conducted in concert with the steps described in the learner assessment guide. The steps are as follows:

Step	Description	Timeframe
1	Pre-Assessment Briefing and Checklist	Before delivery of program
2	Learner Declaration of Authenticity	Before delivery of program
3	Diagnostic Assessment of Learning Assumed to be in Place	Before delivery of program
4	Assessment Plan for Gathering of Evidence	Before delivery of program
5	Learner Formative Assessment Activities	During delivery of program, assessment after delivery of program
6	Knowledge Questionnaire	After delivery of program
7	Integrated Summative Assessment Tool	After delivery of program
8	Re-assessment Procedures	After completion of assessment
9	Documentation	After completion of assessment
10	Administration and Completion of Portfolio of Evidence	After completion of assessment

Step 1

Pre-Assessment Briefing and Checklist

A pre-assessment briefing for learners is held before the delivery of the program. Use the checklist below to ensure that all these points are addressed and discussed with the learners.

Pre-Assessment Briefing Checklist		
	√	X
Organise resources – people, equipment, venue, etc.		
Explain the purpose of the assessment		
Discuss the standards or criteria to be used		
Discuss assessment roles and accountabilities		
Decide on assessment venues		
Negotiate evidence required, and where or how this evidence may be gathered		
Explain the methods of assessment that will be used during the gathering and summing up of evidence		
Negotiate the date of submission for the activity workbook and the date for the summative assessment		
Discuss resources required for the assessment e.g. equipment, materials, etc.		
Explain the procedure if the learner is found to be not yet competent		
Explain the appeal and review procedures		
Identify any potential learning barriers and negotiate strategies to overcome these		
Complete and sign the assessment plan with the learner		

The learner and assessor must sign the **Learner Contract** in the learner assessment guide.

Step 2

Learner Declaration of Authenticity

The learner is requested to complete and sign the Declaration of Authenticity in the learner assessment guide. This should be checked and co-signed by the assessor.

The format is as reflected in the learner assessment guide.

Step 3

Diagnostic Assessment of Learning Assumed to be in Place

In the learner assessment guide, the learner is asked to indicate whether they have completed the learning assumed to be in place as prescribed by the unit standard.

The assessor must guide the learners through this step, explaining in detail the content of the mentioned learning areas, because names of learning programs do not always agree with the names of the unit standards, and learners might indicate the incorrect information.

If learners indicate that they have not yet completed the mentioned unit standards, the assessor should prescribe an action plan to allow the learner to obtain the skills required by recommending additional training, competence portfolios, or the relevant RPL assessment for the given unit standards.

The format is as reflected in the assessment guide for learners. Please read it and familiarise yourself with its content.

Step 4

Assessment Plan for Gathering of Evidence

A pro-forma assessment plan for this unit standard has been drafted in the learner assessment guide. Explain the plan to the learner and complete the dates and signatures as indicated.

The format for the assessment plan is as reflected in the assessment guide for learners. Please read it and familiarise yourself with its content. Make a note of the dates agreed upon in the table provided below.

Learner and Assessor Assessment Plan		
Unit Standard	Understand Basic Soil Fertility and Plant Nutrition	
Registration Number	116053	
<i>Step</i>	<i>Description</i>	<i>Completion / Submission Date</i>
Step 5	Learner Formative Assessment Activities	
Step 6	Knowledge Questionnaire	
Step 7	Integrated Summative Assessment Tool	
Step 8	Re-Assessment Procedures	
Step 9	Documentation	
Step 10	Administration and Completion of Portfolio of Evidence	

Step 5

Learner Formative Assessment Activities

The Learner Assessment Guide contains comprehensive activities and worksheets that the learner must complete during the delivery of the learning program. It is imperative that these activities be completed as part of the learning process in order to give the learner the opportunity to develop the skills, knowledge and attitudes that are required for competence.

Learners must complete all the activities in the workbook.

Learners must be encouraged to take control of their learning by indicating areas in the workbook where they experience difficulty.

Learners hand in the Learner Assessment Guide to the assessor or the facilitator, only if the facilitator is a subject matter expert, for the assessment of the formative assessment activities. The assessment of these activities must be done according to the prescribed benchmarks and according to the marking matrix that follows.

The learner must not move on to the next step before this step has been completed and learners show sufficient capacity and readiness for summative assessment. If problems areas are identified, the learner should be guided with a developmental action plan, which is documented separately and signed by the learner, the facilitator and the assessor.

Model answers are provided below.

Activity 1 – Worksheet

Complete the worksheet below.

Define an essential plant nutrient.

An essential plant nutrient is an element that is required by a plant to complete its lifecycle from seed to seed. In the absence of such an element, the plant cannot complete its lifecycle. This element cannot be substitute by any other element to complete the cycle.

What is the common name for sources of plant nutrients?

Fertilisers

Which of the fourteen essential plant nutrients are the most important?

All fourteen elements are equally important. Even Mo, which is required in very small quantities, is required to complete the lifecycle.

Plant nutrients can be grouped into two major groups. Name them and two nutrient elements in each group.

Macro essential nutrients: N, P, K, Ca, Mg and S

Micro nutrient elements: Na, Cl, Cu, Mn, Fe, Zn, B and Mo

Activity 2 – Job Card

Develop a job card with a model procedure for manually applying fertiliser, including preparing for the application.

Key Concepts:

1. Obtain the instruction and verify the type of fertiliser, concentration and mass per bag before calculating how many bags need to be offloaded at each orchard.
2. Ensure that the irrigation was done to mark the areas to be fertilised.
3. Take a bag of the appropriate fertiliser to calibrate scoop measures suitable to scoop the appropriate mass of fertiliser required per tree. This can be done by putting the appropriate mass into an old, but clean oil or jam tin. Then mark the level of the fertiliser in the tin on the inside. Cut the tin to size on the mark level. A full scoop will then be equal to the mass of fertiliser required per tree.
4. Verify the type of fertiliser, concentration and mass per bag in the fertiliser store, before the fertilisers is loaded and transported to the orchard.
5. Calculate the number of trees that can be fertilised per bag and offload the bags at the calculated intervals.
6. Take one scoop of fertilisers and spread it evenly over the area marked by the irrigation water. One scoop per tree. Ensure that the fertilisers is spread according to the instructions. All fertilisers except single and double supers must be spread evenly. Supers must be banded (placed in a narrow strip of about 10cm wide, in the wetted area).
7. After the operation is completed, collect and count the empty bags.
8. Collect the bags still containing fertiliser and take it bag to the fertiliser store.
9. Determine the mass of fertilisers left in the bags.
10. Calculate the mass fertilisers applied and compare with the calculation in step 1 above.

Activity 3 – Practical

Join the team on the farm you work on and work with them to apply fertiliser. You should practice this activity for at least three working days, in different areas. Make key notes for yourself. On the third day, make an appointment with the assessor to come and observe you doing this activity. Let the assessor sign that you can demonstrate the correct techniques.

Key Notes:

1. Obtain the instruction and verify the type of fertiliser, concentration and mass per bag
2. Calculating how many bags need to be offloaded at each orchard.
3. Ensure that the irrigation was done to mark the areas to be fertilised.
4. Calibrate scoop measures
5. Verify the type of fertiliser when loading.
6. Calculate the number of trees per bag.
7. Take one scoop of fertilisers and spread it evenly over the area marked by the irrigation water
8. Collect and count the empty bags.
9. Collect the bags still containing fertiliser and take it bag to the fertiliser store.
10. Determine the mass of fertilisers left in the bags.
11. Calculate the mass fertilisers applied
12. Compare with the calculation in step 1 above.
13. Calculate the accuracy of the operation ($\text{Kg fertilisers applied} \div \text{kg fertilisers instructed to apply} \times 100 = \text{accuracy as a \%}$).

Activity 4 – Worksheet

Complete the worksheet below.

What is the most important principle of sampling?

To bring the orchard to the laboratory. The sample must represent the orchard in every aspect and must be a smaller image (not a piece) of the complete orchard.

Describe the procedure of taking leaf samples in an orchard, starting with selecting index trees/rows.

1. **Select two rows at about 1/3 and 2/3 of the orchard.**
2. **Do a thorough inspection of the two sets of rows and compare the visual conditions of these trees with that of the rest of the orchard. If the trees in these two sets of rows are representative of the rest of the trees the two sets of rows can be taken as the index rows.**
3. **Mark the index rows with white PVA paint on the trunk of the first trees in each row.**
4. **Note this on the orchard plan/map for future reference. In future all sampling should be done from these index trees.**
5. **Enter the orchard between two index rows and collect a leaf from a fruit bearing terminal/twig from behind the fruit from tree number two on the right hand side.**
6. **Then move to tree number 5 on the left hand side and pick another leaf from a fruiting terminal.**
7. **Then move to the right hand side and repeat the process until you can exit the orchard.**
8. **Then move to the second set of rows on the other part of the orchard.**
9. **Repeat steps 5 to 8.**
10. **Collect 50 to 100 leaves per sample. Put the leaves in a marked clean plastic bag.**
11. **Squeeze out the air without damaging the leaves and close tightly.**
12. **Keep the sample in the shade until it can be taken to the office.**

Activity 5 – Worksheet

Complete the worksheet below.

Name three physical properties of soils.

- **Texture**

What is soil texture?

The texture of soil is determined by the ratio in which clay, silt and sand are present. It is a

What is soil structure?

Soil structure refers to the manner in which all the soil particles, including organic material,

Name three structural forms.

No structure, Plate-like, Prismatic, Blocky and Granular

What does layering means in the context of soils?

Layering, or stratification, refers to the layers of soil that have formed over a very long time.

Name three chemical properties of soils.

- **nH**

<ul style="list-style-type: none"> • Organic matter
Described the term resistance as it relates soil.
Resistance is the opposite of electrical conductivity, and refers to the resistance of a soil paste to conducting an electrical current. Resistance is expressed in ohms. It is an indication of the total dissolved salts in the soil solution.
What do we call the stable form of the organic matter in the soil?
Humus
Name the two main components of humus.
Humic acids and fulvic acids and you can add the insoluble humins.

Activity 6 – Group Activity

1. In your group, match the symbols, names and functions of essential nutrient elements on the cards that the facilitator provide you with.
2. Decide whether the elements are macro or micro nutrient elements.
3. List the elements with their symbols and function under the correct heading below.

<i>Element</i>	<i>Symbol</i>	<i>Function</i>
Macro Nutrient Elements		
Nitrogen	N	Nitrogen forms part of all protein and enzyme molecules and is therefore involved in almost every physiological process in plant production.
Phosphorus	P	Phosphorus is involved in all energy transfer reactions in the plant. It is also part of the nucleic acids in cells.
Potassium	K	Potassium has many rolls, including cell-division and transport of photosynthetic products from the leaves to the roots and other parts.
Calcium	Ca	Calcium forms a vital part of all cell-walls, keeping the cells together in the same way as cement in a brick wall.
Sulphur	S	Sulphur is involved in the production of the sulphur-containing amino acids and in reproductive processes. A sulphur deficiency will reduce flowering and fruit set.
Magnesium	Mg	Magnesium forms the centre metal ion in the chlorophyll molecule, which is required for photosynthesis, apart from its role in other physiological processes.
Micro Nutrient Elements		
Sodium	Na	Sodium can replace potassium to some extend in certain plants.
Chloride	Cl	Chloride is a micro-nutrient, with plants requiring about 20mmg per litre in their nutrient solution. Chloride is involved in the reactions where water molecules are split during photosynthesis.
Copper Iron Manganese Zinc Boron Molybdenum	Cu Fe Mn Zn B Mo	Are involved in many physiological reactions as catalysts.

Activity 7 – Worksheet

Complete the worksheet below.

Name three important features of nutrient deficiency symptoms.

Any three of the following:

- 1. The leaf should display the same characteristics on the left-hand and right-hand side of the midrib. This is important in distinguishing between nutrient deficiencies and other leaf symptoms.**
- 2. Nutrient deficiency symptoms first appear on either new or old leaves. From there the symptom can spread to the entire plant.**
- 3. Certain nutrient deficiency symptoms appear first or more noticeably in the fruit.**
- 4. Nutrient deficiency starts with mild symptoms and develops into severe symptoms.**

Why should deficiency symptoms not be used to manage the nutritional program for commercial production?

A deficiency symptom is the result of a physiological process that could not be completed. Therefore, before a symptom is visible, the plant had suffer already and production being reduced.

Is too low a supply of a nutrient the only reason why nutrient deficiency symptoms will develop?

No, factors that restrict the absorption of the nutrient, although present in adequate concentration, can also cause the development of a nutrient deficiency.

What is meant by the term "inducing a deficiency"?

A deficiency is induced when the available form of the nutrient is converted to an unavailable form, or when the absorption of a nutrient is restricted by other factors causing too low supply.

What is the main purpose of the fertilisation program in commercial fruit production?

The main purpose of a fertilisation program is to supply those nutrients that are not supplied in adequate concentrations or in the correct chemical form, by the soil and the irrigation water to enable the subtropical trees to produce optimal yields and quality.

Activity 8 – Group Activity

Follow the instructions of the facilitator and complete the worksheet below.

No model answer supplied, depends on discussions.

Assessment Guide – Assessor and Facilitator

Skills Area: Soil fertility

Level: 2

Unit Standard: 116053

Marking Matrix and Assessor Report for Formative Assessment Activities Formative Evidence Collection Summary for Unit Standard 116053 – Level 2					
	Action Required from Learner to Develop Competence	Competence Assessments	Standard for Activity	Allocation of Marks	Feedback to Learner and Comments on Evidence
<p>Specific Outcome 1:</p> <p>Accurately Prepare and Measure the Appropriate Quantity and Quality of Required Soil Nutrient Applications</p> <p><i>Range:</i> Soil nutrient preparations refer to either agro-chemical or organic production methods. These can include preparation of compost and liquid nutrients, management of lime, single or mixed fertilisers, or other substances.</p>	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct A signature + commentary from the supervisor / coach / mentor or facilitator in learner workbook	As per model answer sheet	
<p>Specific Outcome 2:</p> <p>Take an Appropriate Sample for Nutrient Analysis</p> <p><i>Range:</i> A sample refers, but is not limited to leaf, soil and fruit samples</p>	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct A signature + commentary from the supervisor / coach / mentor or facilitator in learner Workbook	As per model answer sheet	
<p>Specific Outcome 3:</p> <p>Understand the Properties and the Composition of Soil</p> <p><i>Range:</i> Soil properties refer to the texture and structure, water holding and drainage capacity, and soil composition in terms of silt/clay/gravel ratios. Soil</p>	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct A signature + commentary from the supervisor / coach / mentor or facilitator in learner Workbook	As per model answer sheet	

Assessment Guide – Assessor and Facilitator

Skills Area: Soil fertility

Level: 2

Unit Standard: 116053

Marking Matrix and Assessor Report for Formative Assessment Activities Formative Evidence Collection Summary for Unit Standard 116053 – Level 2					
	<i>Action Required from Learner to Develop Competence</i>	<i>Competence Assessments</i>	<i>Standard for Activity</i>	<i>Allocation of Marks</i>	<i>Feedback to Learner and Comments on Evidence</i>
composition refers to the basic mineral content of soil. These should be related to the basic interaction between soil composition and productivity.					
<p><i>Specific Outcome 4:</i></p> <p>Identify and Interpret the Basic Symptoms of Nutritional Deficiencies in Crops</p> <p><i>Range:</i> Different crops may include, among others, field crops and horticultural crops. Macro elements may include, among others, Nitrogen, Phosphorous Potassium and Calcium.</p>	Attend classroom lesson, participate and ask questions	Activities in learner activity book were completed correctly	Activity answers must be at least 85% correct A signature + commentary from the supervisor / coach / mentor or facilitator in learner Workbook	As per model answer sheet	
US CCFO: Identifying	Attends all lessons, activities, practical and completes activities and workbook as per instructions	Attendance register and facilitator report	Learner must at least be present and no negative commentary about the learner should be made in the facilitator report.	N/a	
US CCFO: Working					
US CCFO: Organising					
US CCFO: Communicating					
US CCFO: Science					
US CCFO: Demonstrating					
US CCFO: Contributing					
US CCFO: Collecting					

Assessment Guide – Assessor and Facilitator

Skills Area: Soil fertility

Level: 2

Unit Standard: 116053

Assessment Feedback Form – Activity Workbook			
	Comments / Remarks		
Feedback to learner on assessment			
Feedback from learner to assessor			
Learner's Signature		Date:	
Assessor's Signature		Date:	

Step 6

Knowledge Questionnaire

Before the summative task is undertaken, the learner must be reminded of what is expected from him / her in terms of summative and reflexive competence. Read and explain to the learner this section in the learner assessment guide. The learner and assessor must sign off this section to acknowledge that this step was completed.

- Use the planning and questioning format below to help you collect evidence for foundational and embedded knowledge as prescribed by the outcomes of the unit standards.
- Provide the questions as listed to the learners as a guide.
- Ensure that you apply the exact same methodology for each learner in order to ensure that VACS principles are adhered to.
- The benchmark for learner competence is an 85% overall questionnaire score.
- Only a suitably qualified and registered assessor who is ALSO a subject matter expert in this specific field can mark this assessment tool for learner assessment.
- If no such a person can be found to assess the learner, then it is advised that a qualified assessor consults with the appropriate subject matter expert prior to the assessment in order to establish key points for competence and / or uses model answers as supplied by a subject matter expert to allocate marks. The subject matter expert should be consulted for any answers that the assessor might have queries on.
- Use a header in the following format for each questionnaire paper:

Unit Standard:	116053	NQF Level:	2
Learner Name			

- The assessor should copy and paste as required and hand out questionnaire to learners.
- Marks and scores should be allocated

Questionnaire Questions

Model answers are provided below.

Why is it necessary to be accurate in measurements and preparations of nutrient applications and agro-chemicals?
Too much of any chemical, including fertilisers is as damaging as too little. Too much could cause damage to the roots or leaves as well as the environment. Too little means an ineffective treatment with below par results, if any. With agrochemicals such as pesticides, biological resistance is aggravated by too low concentrations.
Give two examples relevant to subtropical plant farming of appropriate quantities and qualities of soil nutrient preparations.
No model answer provided due to cultivar variation.

Explain the difference between agro-chemical and organic fertilisers.

Agrochemicals are manufactured from chemicals and organic fertilisers are made by allowing organic material to decompose. The amount of nutrients contained in agrochemical fertilisers are precisely stated, while the nutrient content of organic fertilisers cannot be easily determined.

Explain in your own words the procedure that you would follow if you were told to collect fertiliser from the store, prepare it and apply it. (Question may apply to dry fertiliser, liquid fertiliser or compost.)

1. **Verify the type of fertiliser, concentration and mass per bag before calculating how many bags need to be offloaded at each orchard.**
2. **Ensure that the irrigation was done to mark the areas to be fertilised.**
3. **Take a bag of the appropriate fertiliser to calibrate scoop measures suitable to scoop the appropriate mass of fertiliser required per tree. This can be done by putting the appropriate mass into an old, but clean oil or jam tin. Then mark the level of the fertiliser in the tin on the inside. Cut the tin to size on the mark level. A full scoop will then be equal to the mass of fertiliser required per tree.**
4. **Verify the type of fertiliser, concentration and mass per bag in the fertiliser store, before the fertilisers is loaded and transported to the orchard.**
5. **Calculate the number of trees that can be fertilised per bag and offload the bags at the calculated intervals.**
6. **Take one scoop of fertilisers and spread it evenly over the area marked by the irrigation water. One scoop per tree. Ensure that the fertilisers is spread according to the instructions. All fertilisers except single and double supers must be spread evenly. Supers must be banded (placed in a narrow strip of about 10cm wide, in the wetted area).**
7. **After the operation is completed, collect and count the empty bags.**
8. **Collect the bags still containing fertiliser and take it bag to the fertiliser store.**
9. **Determine the mass of fertilisers left in the bags.**
10. **Calculate the mass fertilisers applied and compare with the calculation in step 1 above.**

Explain in detail what the purpose of sample taking on a subtropical plant farm is.

The sample is an image of the orchard that can be taken to the laboratory to be analysed. The analytical data of leaf and soil samples are being use to optimise the fertilisation programme, prevent the development of imbalances, to optimise production and profit, to protect the environment and minimize pollution. Fruit samples are taken to determine the quality of the fruit. The analytical results are being use determine the optimal picking time, shelf life and even potential market.

Give two types of samples that can be taken to tell us more about soil fertility.

Soil samples and leaf samples

Explain how you would go about taking a leaf sample, by writing down the step-by-step procedure.

1. **Select two rows at about 1/3 and 2/3 of the orchard.**
2. **Do a thorough inspection of the two sets of rows and compare the visual conditions of these trees with that of the rest of the orchard. If the trees in these two sets of rows are representative of the rest of the trees the two sets of rows can be the taken as the index rows.**
3. **Mark the index rows with white PVA paint on the trunk of the first trees in each row.**
4. **Note this on the orchard plan/map and take future samples from the same index trees.**
5. **Enter the orchard between two index rows and collect a leaf from a fruit bearing terminal/twig from behind the fruit from tree number two on the right hand side.**
6. **Then move to tree number 5 on the left hand side and pick another leaf from a fruiting terminal.**
7. **Then move to the right hand side and repeat the process until you can exit the orchard.**
8. **Then move to the second set of rows on the other part of the orchard.**
9. **Repeat steps 5 to 8.**
10. **Collect 50 to 100 leaves per sample. Put the leaves in a marked clean plastic bag.**
11. **Squeeze out the air without damaging the leaves and close tightly. Keep the sample in the shade until it can be taken to the office.**

<p>Why do you think it is important to label samples?</p> <p>When the laboratory reports on the samples, the orchard name will be the reference to connect the analytical data with the appropriate orchard. Likewise, the name of the farm or farmer will help the laboratory to link the samples with the correct farm.</p>
<p>Explain why you think it is necessary to follow specific procedures when preparing and packaging samples.</p> <p>The conditions during storing and transport of samples to the laboratory can change the composition of the sample. The prescribed procedures were developed to limit these changes to the minimum and to create analytical results that can be used to the benefit of better sustainable production.</p>
<p>Give two examples of packaging procedures.</p> <p>Leaf samples. Leaves are put into a clean plastic bag. The air is squeezed out and the bag closed tightly and stored indoors at 4°C.</p> <p>Soil samples. Soil samples are collected and put into plastic bags or carton boxes and closed to prevent spilling. Storage is done at room temperature.</p>
<p>Explain what you understand by soil properties in terms of texture and structure.</p> <p>The texture of soil is determined by the ratio in which clay, silt and sand are present. It is a fixed property of a soil. The various combinations are grouped into textural classes ranging from clay to sand.</p> <p>Soil structure refers to the manner in which all the soil particles, including organic material, are arranged to form structural units. The structural units are named according to their physical appearance.</p>
<p>Explain what you understand when we refer to the water holding capacity and drainage capacity of soil.</p> <p>This term "water holding capacity" refers to the volume of water that is retained by the soil after the soil has been saturated and allowed to drain freely under gravitational forces.</p> <p>The drainage refers to the ability of the soil to get rid of all water that cannot be retained.</p>
<p>What would you say would be the most favourable soil properties for subtropical plant production?</p> <p>The most important properties are:</p> <ul style="list-style-type: none"> • A depth of at least 50cm with no restriction to drainage in the next 50cm. • Clay content between 7 and 25% • No layering • pH between 6,5 and 7,5 • Resistance more than 500 ohms • No salinity • No huge imbalances <p>Less important only because they can be changed or managed relatively easily and cheap are:</p> <ul style="list-style-type: none"> • Optimal fertility level. • Medium water holding capacity. • Medium cation exchange holding capacity.
<p>What do you understand under the concept of "soil composition to productivity" ratio.</p> <p>The poorer the composition the lower the productivity and visa versa but this can to a great extend be managed and manipulated.</p>
<p>Name and explain a basic test that can be used on a subtropical plant farm to identify the soil texture.</p> <p>To do the field test consisting of rolling the soil into a sausage as follows.</p> <ul style="list-style-type: none"> • Take about 50g soil; • Add water to wet the soil; • Knead it into a thick paste; • Roll the soil between the palms of your hands into a sausage; and

<ul style="list-style-type: none">• Try to make a circle. <p>The extent to which a circle can be formed is an indication of the clay content.</p>
<p>Describe briefly in point form the role of minerals in soil health and how this relates to plant production on a subtropical plant farm.</p>
<p>Specific minerals are required for crop production, without them the crop will fail or be weak or fail to produce fruit. Too much of the minerals will cause toxicity in plants.</p>
<p>List three macro elements and say what their role in plant nutrition is with specific reference to subtropical plant farming.</p>
<p>N: Nitrogen (N) helps plants use carbohydrates to gain energy, like certain foods we eat help us to gain energy. Nitrogen controls how plants take their form and how they function inside, and nitrogen helps plants make protein that help them grow strong and healthy.</p> <p>K: Potassium (K) is very important in the plant photosynthesis process and in helping plants metabolize their food to get energy. Potassium controls water and chemicals inside plants that help plants function well. Potassium also controls the absorption of water into plant pores.</p> <p>P: Phosphorus (P) plays an important part in how plants and animals form and in how they function and grow. Phosphorus is known to help plants during photosynthesis, P helps plants respire (breathe), P provides energy transfer and storage, and P also helps plants efficiently use water. Seedlings and roots grow more quickly and vegetable and fruit production is increased when plants get enough phosphorus.</p>
<p>List three micro elements and say what their role in plant nutrition is with specific reference to subtropical plant farming.</p>
<p>Related to specific crop which micro elements are required</p> <p>Boron (B):</p> <ul style="list-style-type: none">• Helps in the use of nutrients and regulates other nutrients.• Aids production of sugar and carbohydrates.• Essential for seed and fruit development.• Sources of boron are organic matter and borax <p>Copper (Cu)</p> <ul style="list-style-type: none">• Important for reproductive growth.• Aids in root metabolism and helps in the utilization of proteins. <p>Chloride (Cl)</p> <ul style="list-style-type: none">• Aids plant metabolism.• Chloride is found in the soil. <p>Iron (Fe)</p> <ul style="list-style-type: none">• Essential for formation of chlorophyll.• Sources of iron are the soil, iron sulfate, iron chelate. <p>Manganese (Mn)</p> <ul style="list-style-type: none">• Functions with enzyme systems involved in breakdown of carbohydrates, and nitrogen metabolism.• Soil is a source of manganese. <p>Molybdenum (Mo)</p> <ul style="list-style-type: none">• Helps in the use of nitrogen• Soil is a source of molybdenum. <p>Zinc (Zn)</p> <ul style="list-style-type: none">• Essential for the transformation of carbohydrates.• Regulates consumption of sugars.• Part of the enzyme systems which regulate plant growth.• Sources of zinc are soil, zinc oxide, zinc sulfate, zinc chelate.
<p>Explain what you understand under “basic symptoms of nutritional deficiencies in crops”.</p>
<p>A nutrient deficiency is when there is not a sufficient quantity of a specific nutrient element and the plant cannot complete a certain physiological process as a result.</p>
<p>Give an example on a specific symptom of a nutritional deficiency in subtropical plants and explain what the cause of it might be.</p>

Nitrogen: General yellowing of foliage, beginning with older leaves, then appearing on younger leaf flush. Leaves become progressively more yellow, with no distinct pattern. In severe cases, leaves will senesce and foliage will become sparse. N deficiency often occurs in winter or early spring because of low tree N reserves, low soil temperatures and/or lack of root activity.

Iron: Yellowing of new leaves. In mild cases, leaf veins may remain green (interveinal chlorosis). In severe cases, leaves will become ivory-colored with no visible venation followed by leaf and twig abscission. Iron deficiency often appears in winter due to low soil temperatures, and root inactivity. High soil pH will cause iron deficiency. Iron deficiency will also occur on poorly drained soils.

Manganese: Interveinal chlorosis on the new foliage. Leaf size is normal. Veins appear green but are fuzzy or mottled; interveinal areas are yellow. Manganese deficiency often appears in winter due to low soil temperatures, and root inactivity, but will disappear in the early spring. Only a persistent and severe pattern on the foliage needs correction.

Zinc: New leaves are yellow, mottled and smaller than normal. When symptoms are mild, veins remain green, and interveinal areas are yellow or cream colored. When symptoms are severe, veins turn yellow, especially near the leaf tip. Small green dots in the yellowed area may appear. Necrosis (tissue browning and death) may occur beginning at the leaf tip and margins. Severely affected trees exhibit leaf and twig defoliation.

Briefly describe the steps that you would take to rectify the problem that you described above.

- **Confirm deficiency through soil and / or leaf analyses.**
- **Determine cause of deficiency (too little applied, problems with uptake, problems with absorption)**
- **Consult an expert for recommendations.**

Explain what basic ecological principles you think is important when fertilising our soils.

The most important principle is that of pollution by over fertilisation, especially of nitrogen, but also the less mobile ones like phosphorus. Excessive applications lead to the increase of these elements in underground and open water. This stimulates the growth of unwanted organisms. Applications without proper motivation based on analytical data can create imbalances difficult to correct, destroy the structure of the soil and/or lower the fertility.

Give an example of an organic nutrient source and give an example of the type of subtropical plant farm where it might be used.

**Chicken manure, on any farm.
Kraal manure, on any farm.
Guano, on any farm.
Compost, mostly on farms where subtropical fruit is produced according to organic farming rules.**

Give two examples of soil conservation principles and explain why this is important to remember in soil preparation and plant nutrition.

Erosion is an important aspect when establishing the orchard. During this period the surface is unprotected and can easily be eroded. The aim in preparing the soil is to improve its potential in a sustainable way. However, if not done according to scientific principles, the preparation methods can destroy and degrade the potential of the soil.

Step 7

Integrated Summative Assessment Tool

Two assessment tools are provided in this step, being:

1. Practical Assessment Tool
2. Attitudes and Attributes Assessment Tool

These assessment tools have been drafted in its entirety and follows below. It must be copied and completed for every learner in the same manner and according to the same procedure.

Learners must not be given these tools in preparation for summative assessment. This corresponding step in the learner assessment guide is a direct reflection of these tools and is drafted in a format that is appropriate to the learner's level of language competence.

1. Practical Assessment Tool

- All the sections of this document must be completed and signed where appropriate by the learner and the assessor.
- The learner must be given appropriate feedback and told whether they were declared competent or not yet competent. The assessor must record the appropriate commentary and guide the learner with detailed action plans for areas where the learner is found not yet competent.
- In line with the policies and procedures, the assessor must offer learners an opportunity for feedback on the assessment as well as an opportunity to appeal against the declaration.
- Should learners be found not yet competent, a detailed action plan with specific commentary on development must be drafted together with the learner and the facilitator in order to develop the necessary competence. A date for re-assessment must be agreed upon with the learner.
- All the evidence must be signed and copied, if necessary, to be placed in the learner's portfolio of evidence.
- Use this checklist to help collect evidence of practical competence as prescribed by the specific outcomes of the unit standards.
- Ask the questions as listed in order to test foundational and reflexive competence relevant to the specific task.
- Ensure that the exact same methodology is applies for each learner in order to ensure that VACS principles are adhered to.
- The benchmark for learner competence in this tool is 85% in EVERY task.
- This assessment tool can only be used for learner assessment by a suitably qualified and registered assessor who is ALSO a subject matter expert in this specific field.
- If no such a person can be found to assess the learner, then it is advised that a qualified assessor consults with the appropriate subject matter expert prior to the physical assessment in order to establish key points for observation. The subject matter expert should attend the assessment in order to judge competence of the learner.

2. Attitudes and Attributes Assessment Tool

- Use this rating scale to judge the learner’s CCFO competence according to the unit standard.
- The learner’s entire performance and all the stages of learning, as well as all gathered evidence must be considered for this section.
- It is advised that the assessor consult with facilitators, mentors, coaches and supervisors in order to ensure that an objective rating is allocated.
- A rating between 1 and 5 should be given, as follows:

<i>Rating</i>	<i>Description</i>
1	No evidence can be found
2	The evidence found is weak and this is still a major development area for the learner
3	The evidence found meets the average expectation for a learner on this level
4	The evidence found is of a high quality and exceeds the average standard expected
5	The evidence found is outstanding and the learner attitudes and traits are very well developed

- Learner must be given constructive feedback on each rating.
- Ensure that you apply the exact same methodology for each learner in order to ensure that VACS principles are adhered to.
- The benchmark for learner competence in this tool is 3:5 in EVERY CCFO.

At the end of this step, an assessment feedback form is provided which must be completed and signed by the assessor, learner and moderator, where applicable.

Practical Assessment Tool					
Unit Standard:	116053	NQF Level:	2		
Learner Name:					
Tasks and Question	Criteria Checked For / Key Concepts Observed (to be completed as per the real contexts and examples used whilst in the field)	Learner Competent	Learner Not Yet competent and Recommended Revision	Assessor Comments	
Task 1: Accurately prepare and measure the correct quantity and quality of specific soil nutrient or fertiliser as instructed by the assessor.					
1.1. Name the nutrients this type of fertiliser might add to the soil or plant.					
1.2. Explain the correct procedure for storage of this type of fertiliser.					
1.3. Explain the health and safety rules that you should keep in mind whilst performing this task					
1.4. Explain why it is necessary to measure correctly whilst performing this task					
Task 2: Take a leaf, soil and fruit samples and prepare them to be sent to a laboratory for nutrient analysis.					
2.1. Explain what kind of information we might be able to find out about the plant's nutrient status from its leaves.					
2.2. Explain what kind of information we might be able to find out					

Assessment Guide – Assessor and Facilitator

Skills Area: Soil fertility

Level: 2

Unit Standard: 116053

about the plant's nutrient status from taking soil samples.				
2.3. Explain in detail the correct procedures that have to be followed in order to take samples correctly.				
2.4. Explain how to label the sample correctly and why the labelling of the sample is important.				
2.5. Explain in detail the steps to follow to prepare and package the sample that you have taken.				
2.6. Explain what the financial consequences would be to the farming business if we fail to follow the correct procedures and the sample analysis becomes inaccurate and irrelevant.				
Task 3: Go to the orchard and perform two types of tests that will help to identify the following properties of soil:				
3.1. Soil structure and texture				
3.2. Soil water-holding capacity and drainage capacity				
3.3. Soil composition				
3.4. Explain which test or sample indicates soil fertility and how this compare with the best soil for subtropical fruit production				
3.5. Explain the role that minerals play in subtropical fruit production				
3.6. Explain what you				

Assessment Guide – Assessor and Facilitator

Skills Area: Soil fertility

Level: 2

Unit Standard: 116053

think would happen to your subtropical fruit crop if you did not check soil types, never improved fertility and did not make any effort with soil preparation.				
Task 4: Walk around in the subtropical fruit orchard and point out any basic symptoms of nutritional deficiencies that you might observe.				
4.1. Explain what your observation tells you about possible nutritional deficiencies and what you would recommend in order to improve it.				
4.2. If no examples of specific deficiencies or abnormalities were found, explain in detail to the assessor what you look for in the orchard. Explain specifically:				
4.2.1. Leaf symptoms you checked for				
4.2.2. Fruit abnormalities you checked for				
4.2.3. Plant abnormalities you checked for				
4.3. Explain what steps you need to take in order to report such nutritional deficiencies when you observe them when working on the farm				
4.4. Explain what would happen if workers on a farm did not ever report nutritional deficiency symptoms that they might observe				

Attitudes and Attributes Assessment Tool

Use the following rating table in this assessment:

Rating	Description
1	No evidence can be found
2	The evidence found is weak and this is still a major development area for the learner
3	The evidence found meets the average expectation for a learner on this level
4	The evidence found is of a high quality and exceeds the average standard expected
5	The evidence found is outstanding and the learner attitudes and traits are very well developed

CCFO Criteria	Rating
Identifying – The learner can identify problems and deficiencies correctly.	
Working in a Team – The learner is able to work well as member of a team.	
Organising – The learner works in an organised and systematic way whilst performing all tasks and tests.	
Collecting – The learner is able to collect the correct and appropriate information and samples as per the instructions and procedures that he or she was taught.	
Communicating – The learner is able to communicate his or her knowledge orally and in writing, in a way that shows what knowledge he or she has gained.	
Science – The learner bases tasks and answers on scientific knowledge learnt in the module.	
Demonstrating – The learner is able to show and perform the tasks required correctly.	
Contributing – The learner is able to link the knowledge, skills and attitudes that he or she has acquired in this module of learning to specific duties in their job or in the community where he or she lives.	

Assessment Feedback Form			
	Comments / Remarks		
Feedback to learner on assessment and / or overall recommendations and action plan for competence			
Feedback from learner to assessor			
Assessment Judgement	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> You have been found: <input type="radio"/> Competent <input type="radio"/> Not yet competent in this unit standard </td> <td style="width: 50%; vertical-align: top;"> Actions to follow: <input type="radio"/> Assessor report to ETQA <input type="radio"/> Learner results and attendance certification issued </td> </tr> </table>	You have been found: <input type="radio"/> Competent <input type="radio"/> Not yet competent in this unit standard	Actions to follow: <input type="radio"/> Assessor report to ETQA <input type="radio"/> Learner results and attendance certification issued
You have been found: <input type="radio"/> Competent <input type="radio"/> Not yet competent in this unit standard	Actions to follow: <input type="radio"/> Assessor report to ETQA <input type="radio"/> Learner results and attendance certification issued		
Learner's Signature	Date:		
Assessor's Signature	Date:		
Moderator's Signature	Date:		

Step 8

Re-Assessment Procedures

- Note that only outcomes on which the learner was found not yet competent must be re-assessed.
- The same procedures in steps 6 and 7 are repeated.
- The tool must be adapted at discretion of the assessor. Best practice is not to present the exact same format and questions if possible.
- Use your expertise and judgement to ensure that the method of re-assessment remains integrated and relevant to the expected outcomes.

Step 9

Documentation

The following documentation is addressed in this step:

1. Learner and assessor information reports;
2. Assessor report and summative evidence collection summary;
3. Learner assessment re-actionnaire;
4. Assessor's assessment review and improvement document;
5. Assessment appeal form

1. Learner and Assessor Information Forms

The learner information form is in the assessment guide for learners. The assessor information form follows. These forms must be completed for each individual learner and placed in the learner's portfolio of evidence.

2. Assessor Report and Summative Evidence Collection Summary

This report follows after the information report. Use it to summarise the findings during assessment. Please complete the copy of this report that is in the learner assessment guide.

3. Learner Assessment Re-Actionnaire

A pro-forma for the learner assessment re-actionnaire is included in the learner assessment guide. Ask the learner to complete this form and sign it.

4. Assessor's Assessment Review and Improvement Document

The assessor is expected to complete the assessor review of the assessment process, using the pro-forma document of which an example follows. Please complete the copy of the document in the learner assessment guide. This document must be discussed with the learner and any learner commentary should be recorded.

5. Assessment Appeal Form

The assessment appeal form is also provided in the learner assessment guide. Assist the learner to complete the document if necessary.

The learner must be requested to sign-off all reports and documents before they are placed in the portfolio of evidence.

Assessor Information Form			
Unit Standard	116053		
Program Date(s)			
Surname			
First Name			
Company Name			
Job / Role Title			
Home Language			
Gender	Male		Female
Race	African	Coloured	Indian/Asian White
Employment	Permanent		Non-permanent
Disabled	Yes		No
Date of Birth			
ID Number			
Contact Telephone Numbers			
Email Address			
Postal Address			

Assessment Guide – Assessor and Facilitator

Skills Area: Soil fertility

Level: 2

Unit Standard: 116053

Assessor Report and Formative and Summative Evidence Collection Summary for Unit Standard 116053 – Level 2					
<i>Description</i>	<i>Evidence Gathered</i>		<i>Benchmark</i>	<i>Competent / Not yet Competent</i>	<i>Feedback and Comments</i>
	Foundational and Embedded Knowledge	Practical Skills, Underpinning Knowledge and Reflexive Competence			
<i>Specific Outcome 1:</i> Accurately prepare and measure the appropriate quantity and quality of required soil nutrient preparations.	Summative Questionnaire	Observation checklist of practical tasks integrated with knowledge and reflexive competence questionnaire	85% competence in all areas		
<i>Specific Outcome 2:</i> Take an appropriate sample for nutrient analysis.	Summative Questionnaire	Observation checklist of practical tasks integrated with knowledge and reflexive competence questionnaire	85% competence in all areas		
<i>Specific Outcome 3:</i> Understand the properties of soil and soil composition.	Summative Questionnaire	Observation checklist of practical tasks integrated with knowledge and reflexive competence questionnaire	85% competence in all areas		
<i>Specific Outcome 4:</i> Identify and interpret the basic symptoms of nutritional deficiencies in crops.	Summative Questionnaire	Observation checklist of practical tasks integrated with knowledge and reflexive competence questionnaire	85% competence in all areas		
<i>Embedded Knowledge:</i> The learner is able to demonstrate a basic knowledge	Summative Questionnaire	N/a	Overall minimum test score of 85%		

Assessment Guide – Assessor and Facilitator

Skills Area: Soil fertility

Level: 2

Unit Standard: 116053

Assessor Report and Formative and Summative Evidence Collection Summary for Unit Standard 116053 – Level 2					
Description	Evidence Gathered		Benchmark	Competent / Not yet Competent	Feedback and Comments
	Foundational and Embedded Knowledge	Practical Skills, Underpinning Knowledge and Reflexive Competence			
of: 1. Fertilisers, mixtures, single, where appropriate. 2. Nutrient sources such as organic, compost, etc. 3. Soil conservation 4. Soil preparation and improvement 5. Basic ecological principles 6. Sampling (soil, leaf, and fruit) 7. Basic soil properties					
Unit Standard CCFO's: <ul style="list-style-type: none"> • Identifying • Working in a Team • Organising • Collecting • Communication • Science • Demonstrating • Contributing 	N/a	Rating Scale	Minimum rating of 3:5 in each criteria or overall average of 3:5		

Assessor’s Assessment Review and Improvement Document	
<i>Issues</i>	<i>Comments</i>
Did the assessment go according to plan?	
Did anything unexpected happen?	
Were you pleased with the assessment decision; i.e. was it what you expected?	
How could the process have been carried out more efficiently?	
How could the process of assessing the knowledge be improved?	
How could the Performance Observation checklist be improved?	
Was the evidence you gathered sufficient to make a judgment of competence?	
Was the way you obtained feedback from the learner effective?	
Were you pleased with the way you communicated your decision to the learner? If not, how could this have been improved?	
How would you improve the assessment process?	

Any learner has the right of appeal against any not-yet-competent decision by the assessor. If the learner wishes to appeal, please assist him / her to complete the form below.

Appeal Form			
I hereby appeal against the outcome of my assessment.			
Date:			
Learner's Name:			
Assessors Name:			
Organisation:			
Assessment Details: Criteria, role, standards Used, etc.			
Issue to be Reviewed:			
Learner's Signature		Date:	
Assessor's Signature		Date:	

Step 10

Administration and Completion of Portfolio of Evidence

All the documents or copies thereof, as prescribed previously, must be kept on file as part of the learner portfolio of evidence.

Learner's portfolio of evidence must be readily available for internal and external moderation and verification by the appropriate practitioners, until after the verification process has taken place. The portfolio of evidence may then be kept or returned to the learner according to the service provider's policy.

The prescribed learner results form should be submitted to the ETQA or the National Learner Database as per the SETA procedure.