



NQF Level: 2 US No: 116053

Assessment Guide

Primary Agriculture

Understand Basic Soil Fertility and Plant Nutrition

Assessor:

Workplace / Company:

Commodity: Date:

Before we start...

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 whom 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 relevant Learner Workbook.

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 required during the application of this assessment are available on the website of the AgriSETA and should be strictly adhered to. The assessor must familiarise him/herself with this document before proceeding.

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

| | |
|-------------------|---|
| Title: | Understand basic soil fertility and plant nutrition |
| US No: | 116053 |
| NQF Level: | 2 |
| Credits: | 5 |

This unit standard is one of the building blocks in the qualification listed below. Please mark the qualification you are currently assessing, because that will be determined by the context of application:

| Title | ID Number | NQF Level | Credits | Mark |
|---|-----------|-----------|---------|--------------------------|
| National Certificate in Plant Production | 48975 | 2 | 120 | <input type="checkbox"/> |
| National Certificate in Animal Production | 48976 | 2 | 120 | <input type="checkbox"/> |
| National Certificate in Mixed Farming Systems | 48977 | 2 | 120 | <input type="checkbox"/> |

Please mark the learning program you are enrolled in:

| Are you enrolled in a: | Y | N |
|------------------------|--------------------------|--------------------------|
| Learnership? | <input type="checkbox"/> | <input type="checkbox"/> |
| Skills Program? | <input type="checkbox"/> | <input type="checkbox"/> |
| Short Course? | <input type="checkbox"/> | <input type="checkbox"/> |

Note to Assessor:

If you are assessing this module as part of a full qualification or learnership, please ensure that you have familiarized yourself with the content of the qualification.

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SO 1 AC 1-3

Instructions to learner:

Identify and research

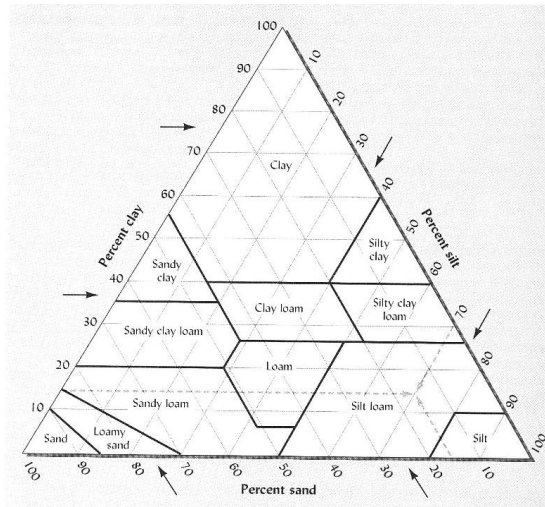
Learner Guide: Page 16

Facilitator Guide: Page 11

- 1 Take a handful of soil from the soil sample you have taken and mix it properly with water in a glass beaker. Let it stand for a day for the soil particles to settle down. Describe and explain your observation. Measure the layers in the beaker and determine the percentages of each. Use the textural triangle to determine the soil textural type. Write down your answer your Learner Guide.

Model Answer(s):

Student answer may differ from one below, and this is only to show how it is done.



1. Determine the percentage of particles (sand, silt and clay) by using the correct sizes of sieves. Say for instance it was 20% sand, 70% clay and 10% silt.
2. Draw a line across the triangle on the 20% sand, parallel to the arrow.
3. Do the same with the 70% clay and 10% silt.
4. The block (surrounded by the heavy lines) in which the three lines cross each other, will indicate the soil textural class, which is clay in this example.

Instructions to learner:

Explore and research.

Learner Guide: Page 25**Facilitator Guide: Page 12****1** Taking soil samples for analysis.

Study the procedures to take soil samples and use these in taking a representative soil sample of where your crop is growing and submit it for analysis. Request the lab to make recommendations for amendments.

Write a short report in your Learner Guide on the sampling performed and the recommendations which you received back from the lab.

Model Answer(s):

The student should be able to use a soil auger to take samples. The samples must then be placed in plastic bags and clearly marked with a permanent marker before packing it in a cardboard box for sending off to a laboratory for analysis. On the request form the student must clearly indicate which elements should be tested for (pH, P, K etc.) and it should also clearly be stated that recommendations should be supplied.

2 Taking leaf samples for analysis.

Study the procedures to take plant samples and use these in taking representative leaf samples of your crop and submit it for analysis. Request the lab to make recommendations for amendments.

Write a short report in your Learner Guide on the sampling performed and the recommendations which you received back from the lab.

Model Answer(s):

For the specific crop used, there are specific procedures to follow and the assessor must make sure the students are following the right methodology as to what plant part on what part of the plant of what age etc. should be taken. The samples must then be clearly marked with a permanent marker before packing it in a cardboard box for sending off to a laboratory for analysis. On the request form the student must clearly indicate which elements should be tested for (N, P, K etc.) and it should also clearly be stated that recommendations should be supplied.

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SO 1 AC 1-3

Instructions to learner:

Calculation. Identify and research.

Learner Guide: Page 39

Facilitator Guide: Page 14

- 4.1** The returned nutrient analysis suggests that the land require 185 kg of nitrogen, 37 kg of phosphate and 185 kg of potassium per hectare. Now draw up the ratios and decide between the two lots of fertiliser (2:3:2 (22) and 5:1:5 (25)) which one would best suit your need. And how many 50 kg bags you would require. Show all calculations and make short notes on what was done – write it in the Learner Guide.

Model Answer(s):

The ratio of fertilizer needed is 5:1:5. Therefore I would use the fertilizer mix 515 (25).

In a 100 kg 515 (25) there is 11.4 kg N and 11.4 kg K and 2.2 kg P.

To get 37 kg of P, I would need 1682 kg of 515 (25), thus I would need 34 x 50 kg bags of fertilizer per ha. In this case it is not the best fertilizer mixture for use as too much N and K would be added.

- 4.2** Making use of the information in Activity 1.1, work out how many kg of organic fertiliser would be required for the area. Remember that compost needs to be applied at about 30000 kg per hectare to supply an equivalent amount of 2:3:2 (26%). Show all calculations and make short notes on what was done – write it in the Learner Guide.

Model Answer(s):

There is 11.2 kg P in a 100 kg 232 (26). One would therefore need 330 kg of 232(26) which translate in a 100 ton compost. This amount would, however, not fulfil the N and K requirements and additional sources of N and K would be needed.

4.3 Go to the fertilizer shed and collect the following bags of commercial fertilizers:

- ◆ Limestone ammonium nitrate (28%)
- ◆ Potassium chloride (50%)
- ◆ Super-phosphate (21%)
- ◆ 2:3:2 (22%)

Now measure out 630 g of each type of commercial fertilizer with the aid of:

- ◆ A food tin, which contained baked beans/Pilchards fish or any other type of foodstuff weighing 210 g.
- ◆ A measuring scale.

How accurately is using a food tin instead of a measuring scale?

Write short notes in your workbook on what was done and also the outcome of the two ways of measuring.

Model Answer(s):

The student should be able to correctly identify the types of fertilizer and weigh of the right amounts of fertilizer.
There should not be a big difference between the two methods of measuring the weight of fertilizer needed. A food tin of known capacity can thus be used, but keep in mind that it is not as accurately as a measuring scale.

My Notes ...

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Assessment Feedback Form

| Comments / Remarks | |
|---|--------------|
| Feedback to learner on assessment: | |
| Feedback from learner to assessor: | |
| Learner's Signature: | Date: |
| Assessor's Signature: | Date: |

Summative Test and Attitude & Attribute Evaluation

Before the knowledge test 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, the **Preparation for Your Final Assessment** section in the learner workbook. Learners and assessor should sign off this section to acknowledge that this step was completed.

Please set up a knowledge test from the questions given as a guideline to learners and supply each learner with a test sheet.

Supply each report with the following heading:

| | | | |
|-----------------------|--------|-------------------|---|
| Unit Standard: | 116053 | NQF Level: | 2 |
| Learner Name: | | | |

| Questions | Model Answers |
|---|---|
| 1. Did you find it difficult to identify the different commercial fertilizers (Activity 4.3)? If yes, what problem(s) did you experience? | Show the ability to read the label/markings on a fertilizer bag and know what it means. Make sure the needed fertilizer is in stock in the shed. |
| 2. Did you find it difficult to measure the different commercial fertilizers (Activity 4.3)? If yes, what problem(s) did you experience? | Show the ability to work with a measuring scale. Show the ability to improvise if a measuring scale is not available – using a tin/container which contains a know amount. |
| 3. Were you able to calculate the required amounts of commercial and organic fertilizer (Activity 4.1 and 4.2)? If not, what problem(s) did you experience? | Basic knowledge on fertilizer calculation. Basic knowledge on the meaning of exp. 3:2:3 (25). |
| 4. Identify the tools necessary to apply nutrients to the crop field. Give some safety tips in handling and applying fertilizers. | Basic knowledge on the use of spades, etc. or tractor implements to incorporate fertilizer. Safety in handling fertilizers as not to harm man neither the propagation material. |

| Questions | Model Answers |
|---|--|
| <p>5. Explain the steps in taking a representative soil sample. From going to the field till sending off the soil sample for analysis.</p> | <p>Basic knowledge on taking of soil samples.</p> |
| <p>6. What instruments can be used in the taking of soil samples. How would you care for these instruments?</p> | <p>Know about a soil auger and be able to identify the different ones used in clay versus sandy soils. Importance of sharpening and cleaning of augers.</p> |
| <p>7. Explain the steps in taking a representative plant sample. From going to the field till sending off the plant sample for analysis.</p> | <p>Basic knowledge on taking of plant samples. Foliar or leaf analysis is a valuable tool for determining the nutritional status of the crop at any stage of development. It can be used to assess deficiency problems before the crop is really affected.</p> <p>The following steps should be followed. for taking leaf samples:</p> <ul style="list-style-type: none"> • Samples to be taken every 4-6 weeks. • Samples to be taken separately for each field. • Samples to be taken must represent the field. • For each crop receiving different treatment. • Mark individual plants or blocks in the field for repeated sampling • The laboratory will advise you on which leaves to take during sampling depending on the specific crop and stage of development. In general the golden rule is to take the youngest, mature and healthy leaves or parts of leaves, depending on their size and structure. • After fruiting the samples are shifted to the tertiary lateral shoots. <p>If there is nutrient or pesticide residue on the leaves they need to be washed off with distilled water and then dried with blotting paper before being placed in a paper envelope and delivered as soon as possible to the laboratory.</p> |
| <p>8. What other information should also be collected, which can be used when interpreting soil and plant analyses data? How can this information affect your interpretation?</p> | <p>Crop responses through the whole production cycle.</p> <p>Dates of watering.</p> <p>Fertilizer application.</p> <p>Pesticide application.</p> <p>And any other factors affecting growth.</p> |

| Questions | Model Answers |
|--|---|
| <p>9. Define soil structure. What is the importance of soil structure in crop production?</p> | <ul style="list-style-type: none"> • Soil structure refers to the grouping and arrangements of the particles that form in a soil. • Each soil has its own characteristic shapes and forms of these groups or aggregates of particles • These shapes and forms allow the movement of air and moisture to move in the soils. • Organic matter acts as the cement to hold the particles together with the chemical bonding between the elements in the soil. |
| <p>10. Explain the steps used in a simple test for determining soil structure, whilst in the crop field.</p> | <ul style="list-style-type: none"> • Tilth test - dig out a spade full of soil and drop it onto a hard surface. Watch how the soil breaks up. A good structure will fall apart easily into crumbs of specific dominant shapes of varying sizes. • Poor structure - when it falls it breaks up into small particles or clumps that are difficult to break by hand. |
| <p>11. Define soil texture. Give the different texture classes. What is the importance of soil texture in crop production.</p> | <ul style="list-style-type: none"> • Texture refers to the size distribution of particles that make up a soil. • These could be tiny clay particles (smaller than 0.002 mm), silt particles (between 0.002 and 0.02 mm), fine sand particles (between 0.02 and 0.2 mm) coarse sand particles (between 0.2 and 2mm) and even larger gravel particles. • Most soils contain a mix of clay, silt and sand and the percentages of each determine the soils texture. • Soil textural classes are defined by the percentages of clay, silt and sand. • Clay soils contain more than 40% clay particles. They are heavy and difficult to dig when wet and impossible to work when dry. Clay soils are usually high in minerals but the availability to the plant is limited. • Silty soils contain more than 40% silt and they are less compact than clay soils. Air and water does not move easily in these soils and they drain slowly, becoming powdery when dry. A silty soil is fairly high in minerals but is not always freely available to the plants. • Sandy soils contain more than 45% sand, they hold very little water and nutrients. They are easy to work but require lots of compost and fertilizer. |

| Questions | Model Answers |
|--|--|
| <p>12. Describe step by step how you would determine soil texture, whilst in the crop field?</p> | <ul style="list-style-type: none"> • Take a sample of the soil and moisten it with a bit of water. Work the soil until it no longer changes in feel. Now press the soil between your thumb and fingers, note the feel of the soil and try to squish the soil into a long thin strip. • Clay soil – would become like plasticine and would form a long, smooth ribbon – the longer and smoother the ribbon, the higher the percentage of clay. • Clay loam- they are like putty but tend to crack. Still feels smooth to the touch. • Silty loam- they hold together a bit but tends to crumble. This is still a smooth soil. • Fine sandy loams- these still tend to hold together but crumble very easily. The sand texture can be felt and tend to be greasy because of high organic matter. • Loamy sand soils- this does not easily stay together and tends to discolour the fingers. <p>Sand – falls apart and will not be moulded and the grains of sand can easily be felt.</p> |
| <p>13. Describe the method you would use to determine the soil texture in a laboratory.</p> | <p>Take a handful of soil from the soil sample you have taken and mix it properly with water in a glass beaker. Let it stand for a day for the soil particles to settle down. Describe and explain your observation. Measure the layers in the beaker and determine the percentages of each. Use the textural triangle to determine the soil textural type.</p> <p>The soil textural classes are defined by the percentages of clay, silt and sand in the soil according to the heavy boundary lines shown on the textural triangle> the triangle can be used to determine the soil textural size of a soil sample as follows:</p> <ul style="list-style-type: none"> • Determine the percentage of particles (sand, silt and clay) by using the correct sizes of sieves. Say for instance it was 20% sand, 70% clay and 10% silt • Draw a line across the triangle on the 20% clay, parallel to the arrow. • Do the same with the 70% clay and 10% silt. <p>The block (surrounded by the heavy lines) in which the three lines cross each other, will indicate the soil textural class.</p> |

Assessment Feedback Form

| Comments / Remarks | |
|---|---|
| <p>Feedback to learner on assessment and / or overall recommendations and action plan for competence:</p> | |
| <p>Feedback from learner to assessor:</p> | |
| <p>Assessment Judgement You have been found:</p> <p><input type="radio"/> Competent</p> <p><input type="radio"/> Not yet competent in this unit standard</p> | <p>Actions to follow:</p> <p><input type="radio"/> Assessor report to ETQA</p> <p><input type="radio"/> Learner results and attendance certification issued</p> |
| <p>Learner's Signature:</p> | <p>Date:</p> |
| <p>Assessor's Signature:</p> | <p>Date:</p> |
| <p>Moderator's Signature:</p> | <p>Date:</p> |