

## APPLY SOIL SCIENCE PRINCIPLES

UNIT CODE: 0811 551 08A

TVET CDACC UNIT CODE: AGR/OS/AP/CC/02/6/MA

### UNIT DESCRIPTION

This unit specifies the competencies required to apply soil science principles. It includes competencies for performing soil sampling and analysis and improving soil fertility.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i>Bold and italicized terms are elaborated in the range.</i>
1. Perform soil sampling	1.1 <i>Personal protective equipment</i> are worn as per work requirement 1.2 Soil sampling tools and soil testing equipment are assembled as per work requirement 1.3 Soil samples are obtained as per work procedure 1.4 Composite soil samples are prepared and recorded for analysis as per <i>sampling procedures</i>
2. Perform soil analysis	2.1 Personal protective equipment are worn as per work requirement 2.2 Soil analysis equipment and materials are assembled according to work requirement 2.3 Soil samples are processed based on test requirement 2.4 <i>Soil properties</i> are analysed in accordance to work requirement 2.5 Soil analysis report is prepared as per work procedure
3. Improve soil fertility	3.1 Personal protective equipment are worn as per work requirement 3.2 Tools, equipment and materials are assembled according to work requirement 3.3 <i>Fertilizers</i> are prepared as per soil analysis report 3.4 <i>Soil amendments</i> are applied as per soil analysis report

	3.5 <i>Soil conservation measures</i> are applied as per field condition
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**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

<b>VARIABLE</b>	<b>RANGE</b>
1. Soil sampling tools includes but not limited to:	<ul style="list-style-type: none"> <li>• Hoes</li> <li>• Machetes</li> <li>• Secateurs</li> <li>• Shovels</li> <li>• Soil augur</li> <li>• Panga</li> <li>• Hammer</li> <li>• Saw</li> <li>• Bucket</li> <li>• Shears</li> <li>• Dibbler</li> <li>• Pegs</li> </ul>
2. Soil testing equipment includes but not limited to:	<ul style="list-style-type: none"> <li>• Digestion block</li> <li>• Kjeldahl apparatus</li> <li>• UV-VIS Spectrophotometer</li> <li>• Atomic absorption spectrophotometer (AAS)</li> <li>• Flame photometer</li> <li>• pH meter</li> <li>• EC meter</li> <li>• TDS meter</li> <li>• Fume chamber</li> <li>• Measuring cylinders</li> <li>• Assorted glassware for routine laboratory procedures</li> <li>• Mechanical stirrer</li> </ul>

VARIABLE	RANGE
	<ul style="list-style-type: none"> <li>• Electric shaker</li> <li>• Eureka cans</li> <li>• Meteorological equipment</li> </ul>
<p>3. Personal protective equipment may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Gloves</li> <li>• Safety goggles</li> <li>• Safety boots</li> <li>• Overalls</li> <li>• Dust coat</li> <li>• Ear muffs</li> <li>• Face masks</li> </ul>
<p>4. Sampling procedures may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Field layout</li> <li>• Sample collection</li> <li>• Compositing</li> <li>• Packaging</li> <li>• Processing</li> <li>• Storage</li> </ul>
<p>5. Soil properties may include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Soil texture</li> <li>• Soil aggregation</li> <li>• Soil consistency</li> <li>• Soil colour</li> <li>• Soil moisture</li> <li>• Soil air</li> <li>• Soil bulk density</li> <li>• Water holding capacity</li> <li>• Soil pH</li> <li>• Soil EC</li> <li>• Cation exchange capacity</li> <li>• Percent base saturation</li> <li>• Salt index</li> <li>• Microbial activity</li> <li>• CN ratio</li> </ul>

<b>VARIABLE</b>	<b>RANGE</b>
	<ul style="list-style-type: none"> <li>• Nutrient's concentration</li> </ul>
6. Fertilizers may include but are not limited to:	<ul style="list-style-type: none"> <li>• Organic fertilizers</li> <li>• Inorganic fertilizers</li> </ul>
7. Soil amendments may include but are not limited to:	<ul style="list-style-type: none"> <li>• Fertilizers</li> <li>• Agricultural lime</li> <li>• Gypsum</li> </ul>
8. Soil conservation measures may include but are not limited to:	<ul style="list-style-type: none"> <li>• Cover cropping</li> <li>• Mulching</li> <li>• Strip cropping</li> <li>• Building of terraces</li> <li>• Minimum tillage</li> <li>• Contour ploughing</li> </ul>

### **REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

#### **Required knowledge**

The individual needs to demonstrate knowledge of:

- Essential plant nutrients
- Soil-plant relationship
- Types of fertilizers and their nutrition content
- Fertilizer formulation and use
- Sources of soil acidity
- Management of soil acidity
- Types of tools and equipment used in soil sampling and soil testing
- Soil sampling and testing
- Soil degradation
- Soil conservation
- Standard operating procedures
- Accounting principles
- Waste Management
- Occupational Safety and Health Procedures

## Required skills

The individual needs to demonstrate the following skills:

- Measuring
- Nutrient deficiency scouting
- Equipment calibration
- Technical Report writing
- Soil sampling
- Soil testing
- Plant tissue analysis
- Fertilizer recommendation
- Computation of lime requirement
- Observation
- Digital literacy

## EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"><li>1.1 Observed safety measures by using Personal Protective Equipment (PPE) and correct tools</li><li>1.2 Assemble soil sampling tools and soil testing equipment</li><li>1.3 Collected soil samples as per soil sampling procedures</li><li>1.4 Processed soil samples for laboratory analysis in accordance to work procedures</li><li>1.5 Analysed soil physical, chemical and biological properties in accordance to work procedures</li><li>1.6 Computed fertilizer application rates as per crop nutrient requirement</li><li>1.7 Computed lime requirement as per soil analysis report and agronomic requirement</li><li>1.8 Applied soil amendments as per soil analysis report</li></ul>
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<p>2. Resource Implications (required for assessment)</p>	<p>The following resources must be provided during assessment:</p> <ul style="list-style-type: none"> <li>2.1 Assessment location</li> <li>2.2 Equipped soil laboratory</li> <li>2.3 Soil laboratory manual</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Observation</li> <li>3.2 Written tests</li> <li>3.3 Practical report</li> <li>3.4 Oral questioning</li> <li>3.5 interviews</li> </ul>
<p>4. Context of Assessment</p>	<p>Competency may be assessed:</p> <ul style="list-style-type: none"> <li>4.1 Off-the-job</li> <li>4.2 On-the-job</li> <li>4.3 Work placement -attachment</li> </ul> <p>Off the job assessment must be undertaken in a closely simulated workplace environment.</p>
<p>5. Guidance information for assessment</p>	<p>Holistic assessment with other units relevant to the industry sector and workplace job role is recommended</p>