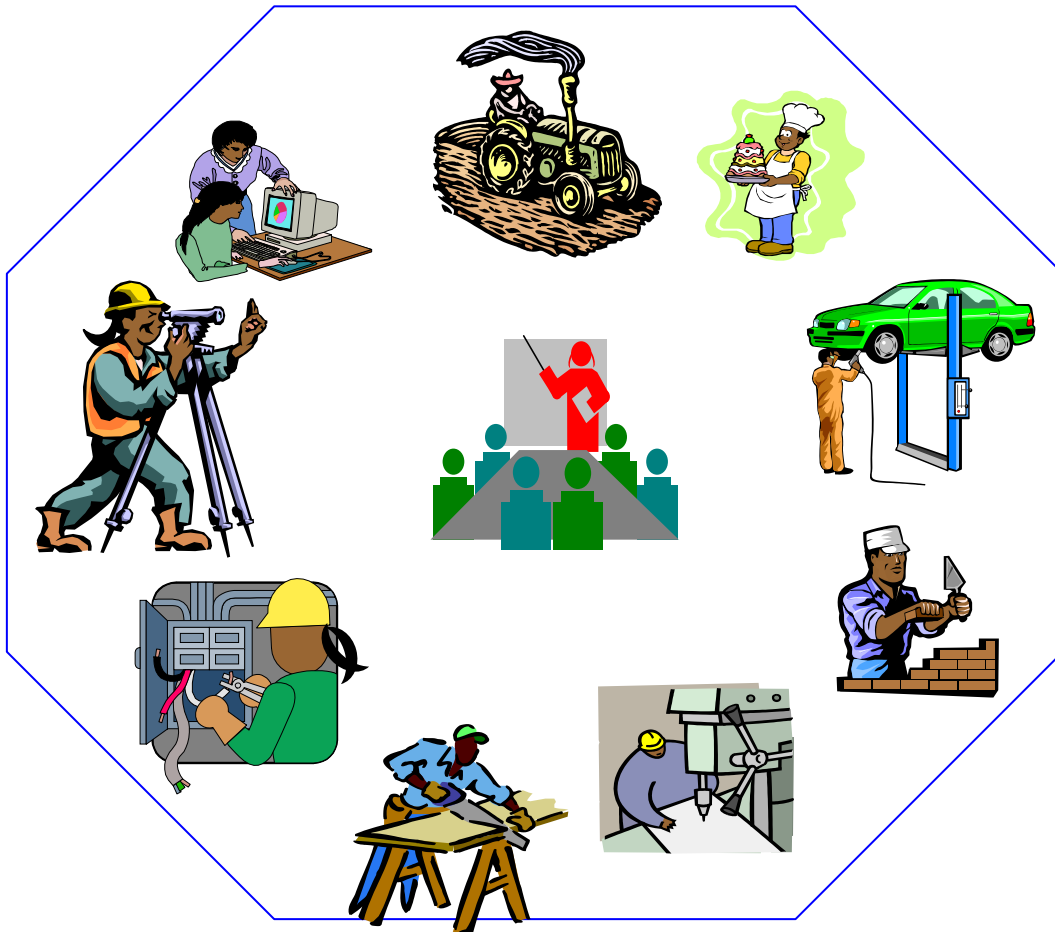


Federal Democratic Republic of Ethiopia  
OCCUPATIONAL STANDARD

CROP PRODUCTION

NTQF Level I-IV



*Ministry of Labour and Skill  
December 2021*

**Addis Ababa, Ethiopia**

**Introduction**

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Ethiopia has embarked on a process of reforming its TVET-System. Within the policies and strategies of the Ethiopian Government, technology transformation – by using international standards and international best practices as the basis, and, adopting, adapting and verifying them in the Ethiopian context – is a pivotal element. TVET is given an important role with regard to technology transfer. The new paradigm in the outcome-based TVET system is the orientation at the current and anticipated future demand of the economy and the labor market.

The Ethiopia Occupational Standards (EOS) is the core element of the Ethiopian National TVET-Strategy and an important factor within the context of the National TVET-Qualification Framework (NTQF). They are national Ethiopian standards, which define the occupational requirements and expected outcome related to a specific occupation without taking TVET delivery into account.

This document details the mandatory format, sequencing, wording and layout for the Ethiopia Occupational Standard which comprised of Units of Competence.

A Unit Title describes a distinct work activity. It is documented in a standard format that comprises:

- Occupational title and NTQF level
- Unit title
- Unit code
- Unit descriptor
- Elements and Performance Criteria
- Variables and Range
- Evidence guide

Together all the parts of a Unit Title guide the assessor in determining whether the candidate is competent.

The ensuing sections of this EOS document comprise a description of the occupation with all the key components of a Unit Title

- Chart with an overview of all Units of Competence for the respective level including the Unit Codes and the Unit Titles
- Contents of each Unit Title(competence standard)
- Occupational map providing the technical and vocational education and training (TVET) providers with information and important requirements to consider when designing training programs for this standard and for the individual, a career path.

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## Modification History

### *2.1 Occupational Title:*

This occupational Standard is set for Crop production Level I, II, III and IV. This occupational Standard is version3 and revised in December 2021.

### **2.2. Description of the Occupation**

#### **2.2.1 Level Description**

##### **Level I**

**In the previous version ( version 2); level I didn't specified for a single** occupation and had been entitled as 'Basic Agricultural production and Natural Resource Conservation 'which was customized as 'Crop Production' for the current revised version. Based on the NTQF and the guide lines of the new TVET policy formulated; the exiting occupation is reviewed by accepting, removing, shifting and modifying the name as well as its body. Moreover, the revisitation process again takes into consideration the benchmark from Australia and Philippine to be full and address its intended objective.

##### **Level II**

Breadth, depth and complexity of competences would cover selecting, adapting and transferring skills and knowledge to new environments and providing technical advice and some leadership in resolution of specified problems. This would be applied across a range of roles in a variety of contexts with some complexity in the extent and choice of options available.

Performance of a defined range of skilled operations, usually within a range of broader related activities involving known routines, methods and procedures, where some discretion and judgment is required in the selection of equipment, services or contingency measures and within known time constraints.

Applications may involve some responsibility for others. Participation in teams including group or team co-ordination may be involved.

##### **Level III**

Breadth, depth and complexity of knowledge and competencies would cover a broad range of varied activities or application in a wider variety of contexts most of which are complex and non-routine. Leadership and guidance are involved when organizing activities of self and others as well as contributing to technical solutions of a non-routine or contingency nature.

Performance of a broad range of skilled applications including the requirement to evaluate and analyse current practices, develop new criteria and procedures for performing current practices

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and provision of some leadership and guidance to others in the application and planning of the skills. Applications involve responsibility for, and limited organization of, others.

### **2.2.2 Occupant Performance Profile**

#### **Crop Production level**

Occupational standard for this level covers description of the competences (knowledge, skills and attitudes) to perform work activities to standard required at work places expressed as occupant performance profile listed on the chart

#### **Occupant Performance Profile**

#### **Crop Production level I**

Occupational standard for this level covers description of the competences (knowledge, skills and attitudes) to perform work activities to standard required at work places expressed as occupant performance profile listed on the chart

#### **Occupant Performance Profile**

#### **Crop Production level III**

Occupational standard for this level covers description of the competences (knowledge, skills and attitudes) to perform work activities to standard required at work places expressed as occupant performance profile listed on the chart:

#### **Occupant Performance Profile**

#### **Level IV**

#### **Crop Production level IV**

Occupational standard for this level covers description of the competences (knowledge, skills and attitudes) to perform work activities to standard required at work places expressed as occupant performance profile listed on the chart:

### **2.2.3. Unit Code:**

There are agreed conventions for the unit codes used for unit of competences organized for any specific occupational standard. Codes are given by considering international and national benchmarks.

#### **Example:**

Unit Title: Develop animal feed plan and conduct ration formulation

Unit Code: [AGR CRP4 01 1221](#)

Unit Coding is described here under:

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<b>Character</b>	<b>What it stands for:</b>
<b><u>AGR</u></b>	First three characters signify the priority/major industry/sector acronym. <b><u>AGR</u></b> represents Agriculture
<b><u>CRP4</u></b>	Four characters in the second group signify the acronym of the occupational title expressed as a work function and qualification level written in numerical form shows the unit belongs. <b><u>CRP4</u></b> represents Animal production and number <b>4</b> represents that the occupational standard serves for Level IV
<b>01</b>	Third group with two numbers signify the numerical order of the specific unit in the level occupational standard
<b><u>1221</u></b>	Fourth group of four characters signify the month and year of OS development. E.g. December <b>2020</b>

### 2.2.3 Version Change

This occupational standard is developed in the title of “**Crop production** ”for level I, II, III and IV. The title of the occupational standard for this version is maintained the existing title names (level I, II, III and IV), to which the relevant sector for the occupation- Agriculture sector belongs. Hence, units of competences considered from previous **Basic Agricultural production and Natural Resource conservation** (for level I 2018) and from **Crop Production** (level II, III and IV 2018)) and these versions are modified in to the above-mentioned occupations and can be considered as a new occupation by endorsing their own competency.

The version number for future revision will either be changed or not, depending on the extent of the change. Thus, those who are responsible to undertake competence assessment and provide training should check for the version number and review date of the document to confirm the latest version number before developing assessment tools and commence training respectively. Users are also advised to contact the agency for any doubts they have on the document or may refer to the website.

The development date is the time the document is prepared and validated by relevant industry experts and approved by relevant sector leading the industry. It indicates the effective date to use the document for training and assessment purposes and termination of use of the previous version for any purposes.

The endorsed occupational standards and their components may remain current up to five years from the date of development. This version is developed in **December 2021**.

<b>Previous Occupational Standard</b>	<b>Modified Occupational standard</b>
Name and Level: Basic Agricultural production and Natural Resource Conservation : Level I	Name and Level: Crop Production: Level I
Name and Level: Crop Production: Level II	Name and Level: Crop Production: Level II
Name and Level: Crop Production: Level III	Name and Level: Crop Production: Level III
Name and Level: Crop Production: Level IV	Name and Level: Crop Production: Level IV
Version: three	Version: four
Date of Development: October 2018	Date of Development: December 2021

## UNIT OF COMPETENCE CHART

Occupational Standard: Crop Production		
Occupational Code: <b>AGR CRP</b>		
<i>NTQF Level I</i>		
<a href="#"><u>AGR CRP1 01 0322</u></a> Perform Field Crop Production	<a href="#"><u>AGR CRP1 02 0322</u></a> Perform Horticultural Crop Production	<a href="#"><u>AGR CRP1 03 0322</u></a> Carryout Basic Nursery Work
<a href="#"><u>AGR CRP1 04 0322</u></a> Identify and determine Basic Properties of Soil	<a href="#"><u>AGR CRP1 05 0322</u></a> Prepare Compost	<a href="#"><u>AGR CRP1 06 0322</u></a> Apply Soil and water conservation practices
<a href="#"><u>AGR CRP1 07 0322</u></a> Identify important crop pests	<a href="#"><u>AGR CRP1 08 0322</u></a> Apply Chemicals and safety rules	<a href="#"><u>AGR CRP1 09 0322</u></a> Apply Agricultural Extension Communication
<a href="#"><u>AGR CRP1 10 0322</u></a> Implement Agribusiness Marketing	<a href="#"><u>AGR CRP1 11 0322</u></a> Apply Basics of Human Nutrition Practices	<a href="#"><u>AGR CRP1 12 0322</u></a> Apply 5S Procedures

## UNIT OF COMPETENCE CHART

<b>Occupational Standard: Crop Production Level - II</b>		
<b>Occupational Code: AGR CRP</b>		
<i>NTQF Level II</i>		
<a href="#"><u>AGR CRP2 01 0322</u></a> Field Crop Establishment and Maintenance	<a href="#"><u>AGR CRP2 02 0322</u></a> Perform Nursery Establishment and Management	<a href="#"><u>AGR CRP2 03 0322</u></a> Horticultural, Stimulants and Spice Crops Establishment and Maintenance
<a href="#"><u>AGR CRP2 04 0322</u></a> Determine crop pests and disorders	<a href="#"><u>AGR CRP2 05 0322</u></a> Operate Gravity Fed and Pressurized Irrigation Systems	<a href="#"><u>AGR CRP2 06 0322</u></a> Collect and Compile Crop Production data
<a href="#"><u>AGR CRP2 07 0322</u></a> Apply Interpreted weather Data and Minimize crop production risks	<a href="#"><u>AGR CRP2 08 0322</u></a> Perform post-harvest handling of stimulants and spices crops	<a href="#"><u>AGR CRP2 09 0322</u></a> Apply Agricultural Extension service for rural development
<a href="#"><u>AGR CRP2 10 0322</u></a> Prevent and Eliminate MUDA		



## UNIT OF COMPETENCE CHART

<b>Occupational Standard: Crop Production Level III</b>		
<b>Occupational Code: <a href="#">AGR CRP</a></b>		
<b><i>NTQF Level III</i></b>		
<p><b><a href="#">AGR CRP3 01 0322</a></b> Apply field Crops Establishment and Management</p>	<p><b><a href="#">AGR CRP3 02 0322</a></b> Horticultural Crops management and Propagation</p>	<p><b><a href="#">AGR CRP3 03 0322</a></b> Perform Irrigation Schedule and crop water requirement</p>
<p><b><a href="#">AGR CRP3 04 0322</a></b> Perform Soil test and apply integrated soil fertility management</p>	<p><b><a href="#">AGR CRP3 05 0322</a></b> Apply Plant Nutrition Program and Fertigation</p>	<p><b><a href="#">AGR CRP3 06 0322</a></b> Apply crop pest management and Disorders</p>
<p><b><a href="#">AGR CRP3 07 0322</a></b> Perform Post-Harvest management for Field Crops</p>	<p><b><a href="#">AGR CRP3 08 0322</a></b> Perform Post-Harvest management for Horticultural Crops</p>	<p><b><a href="#">AGR CRP3 09 0322</a></b> Apply Chemicals and Biological Agents for the Control of Pests</p>
<p><b><a href="#">AGR CRP3 10 0322</a></b> Apply Digital Technology in Agriculture</p>		



**Occupational Standard: Crop Production Level IV**

**Occupational Code: AGR CRP**

*NTQF Level IV*

**AGR CRP4 01 0322**

Manage Integrated Soil Fertility Management Technologies and Practices

**AGR CRP4 02 0322**

Develop Production Plans for Field Crops

**AGR CRP4 03 0322**

Develop Production Plans for Horticultural Crops

**AGR CRP4 04 0322**

Plan and implement organic farm production

**AGR CRP4 05 0322**

Plan Horticultural Crops Propagation Program

**AGR CRP4 06 0322**

Plan and Implement Crop Pest Management Practices

**AGR CRP4 07 0322**

Manage and implement quality standards in storage

**AGR CRP4 08 0322**

Demonstrate Improved Crop Technologies and Practices

**AGR CRP4 09 0322**

Seed multiplication and quality control

**AGR CRP4 10 0322**

Develop value chain analysis

# ***NTQF LEVEL- I***

<b>Occupational Standard: crop production Level I</b>	
<b>Unit Title</b>	<b>Perform Field Crop Production</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP1 01 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to Prepare tools and equipment for field crop production, under take field crop agronomic practices, clean up, store materials, equipment's, record and document.

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare inputs, tools and equipment for field crop production	<p>1.1. The required <i>inputs, tools and equipment's</i> are identified.</p> <p>1.2. Materials, tools and equipment's are checked with insufficient or faulty</p> <p>1.3. Correct manual handling and techniques for loading and unloading materials are used to minimize damage to the load, person and the vehicle.</p> <p>1.4. Suitable <i>Personal Protective Equipment (PPE)</i> are selected and checked.</p> <p>1.5. <i>OHS hazards</i> are identified and reported</p>
2. Undertake Field crop agronomic practices	<p>2.1. Safe and appropriate environmental conditions for <i>agronomic practices</i> are observed.</p> <p>2.2. Conduct field crop agronomic practices</p> <p>2.3. Workplace procedures in relation to workplace practices, handling and disposal of materials are observed.</p>
3. Clean up store, tools and equipment's	<p>3.1. <i>Waste material</i> produced during cropping work is stored in a designated area</p> <p>3.2. Tools, equipment and machinery are checked for wear/damage, and prepared for transporting/storage</p> <p>3.3. Materials, equipment and machinery are cleaned and stored in safe work site while completing cropping activities.</p>
4. Record and document	<p>4.1. Problems or difficulties in completing work to required standards and time lines are reported.</p> <p>4.2. Materials, equipment and machinery condition after work are</p>

	<p>recorded and reported</p> <p>4.3. Work activities and outputs are reported in standard format</p>
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Variable	Range
Inputs	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Seeds/planting materials</li> <li>• Inorganic Fertilizer</li> <li>• Bio-fertilizer</li> <li>• Compost</li> <li>• Pesticides</li> <li>• Lime</li> </ul>
Tools and equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Hand tools,</li> <li>• Knapsack</li> <li>• Machetes</li> <li>• Sickles</li> <li>• Sack truck</li> <li>• Fencing tools,</li> <li>• Augers,</li> <li>• Measuring tools,</li> <li>• Secateurs,</li> <li>• Spades,</li> <li>• Forks,</li> <li>• Hoes,</li> <li>• Packing equipment,</li> <li>• Box</li> </ul> <p>Water can</p>
Personal Protective Equipment (PPE)	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Steel capped boots/shoes, overalls, gloves, sun hat, safety goggles, face mask and ear protectors.</li> </ul>
OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Solar radiation, dust, noise,</li> <li>• Air- and soil-borne microorganisms,</li> <li>• Chemicals and hazardous substances,</li> <li>• Sharp hand tools and equipment,</li> <li>• Manual handling,</li> <li>• Holes, slippery and uneven surfaces</li> </ul>
Agronomic practices	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Site selection</li> <li>• Land preparation</li> </ul>

	<ul style="list-style-type: none"> <li>• Sowing</li> <li>• Input application</li> <li>• Weeding</li> <li>• Hoeing</li> <li>• Watering</li> <li>• Pest management</li> <li>• Harvesting</li> </ul>
Waste material	<p>May apply to:</p> <ul style="list-style-type: none"> <li>• Plant debris, litter and broken components,</li> <li>• Plastic, metal, or paper-based materials.</li> <li>• Straws,</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Prepare materials, tools and equipment for agronomic practices</li> <li>• Undertake field work</li> <li>• Apply safe work practices in repair and maintenance of structures.</li> <li>• Field preparation for crop establishment</li> <li>• Handle materials and equipment safely and</li> <li>• Carry out cleaning up on completion of work.</li> <li>• Collect, analyse and organize information, report and apply with further clarification</li> <li>• Plan and organize own activities in a logical sequence and in a timely manner.</li> <li>• Use mathematical ideas and skills and estimation relevant to cropping</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Safe work practices principles</li> <li>• Identify Materials, tools and equipment for cropping work</li> <li>• Field cropping work</li> <li>• Cropping materials and equipment</li> <li>• Cleaning work on completion</li> <li>• Information handling</li> <li>• Logical sequence of work activities in a timely manner</li> <li>• Mathematical ideas and estimation</li> </ul>
Required Skills	<p>Demonstrate Skills to:</p> <ul style="list-style-type: none"> <li>• Prepare materials, tools and equipment for cropping work</li> <li>• Undertake agronomic practices as directed</li> <li>• Clean up and handle materials and equipment on completion of</li> </ul>

	<p>work.</p> <ul style="list-style-type: none"> <li>• Communicate ideas and information about the job, tasks and problems</li> <li>• Apply technology in the use of farm tools and equipment</li> </ul>
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard: Crop production</b>	
<b>Unit Title</b>	<b>Perform Horticultural Crop Production</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP1 02 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to Prepare materials, tools and equipment for horticultural crop production work, undertake horticultural production work, Handle materials and equipment and record and document

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare materials, tools and equipment for horticultural production work	<p>1.1. The required <i>inputs</i>, materials, <i>tools and equipments</i> are identified.</p> <p>1.2. Materials, tools and equipments are checked with insufficient or faulty.</p> <p>1.3. Correct manual handling and techniques for loading and unloading materials are used to minimize damage to the load, person and the vehicle.</p> <p>1.4. Suitable Personal Protective Equipment (PPE) are selected and checked.</p> <p>1.5. OHS hazards are identified and reported</p>
2. Undertake horticultural production work	<p>2.1. <i>Horticultural crop work</i> is undertaken in a safe and environmentally appropriate manner according to workplace guidelines.</p> <p>2.2. Workplace policy and procedures in relation to workplace practices, handling and disposal of materials are observed and applied</p> <p>2.3. A clean and safe work site is maintained while working</p>



3.Handle materials and equipment	<p>3.1. <b>Waste material</b> generated during horticultural work is stored in a designated area</p> <p>3.2. Tools, equipment and machinery are checked for wear/damage, and prepared for storage according to workplace policy and procedures</p> <p>3.3. Materials, equipment and machinery are cleaned and stored</p>
4. Record and document	<p>4.1. Problems or difficulties in completing work to required standards of the industry are reported</p> <p>4.2. Materials, equipment and machinery condition after work is recorded and reported</p> <p>4.3. Work activities and outcomes are reported in standard format</p>

Variable	Range
Inputs	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Planting materials</li> <li>• Cutting</li> <li>• Buds</li> <li>• Bulbs</li> <li>• Corms</li> <li>• Seed</li> <li>• Fertilizers</li> <li>• Pesticides</li> </ul>
Tools and equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Knives,</li> <li>• Meter tape</li> <li>• Machete</li> <li>• Packing equipment,</li> <li>• Boxes,</li> <li>• Bins and buckets,</li> <li>• Hoses and hose fittings</li> <li>• Secateurs,</li> <li>• Spades,</li> <li>• Forks,</li> <li>• Ladders,</li> <li>• Hoes,</li> <li>• Drip irrigation,</li> <li>• Sprinklers,</li> </ul> <p>Knapsack sprayer</p>
	<p>My include, but not limited to:</p>

Horticultural crop work	<ul style="list-style-type: none"> <li>• Land clearing and preparation,</li> <li>• Seeding/planting,</li> <li>• Watering/Irrigating</li> <li>• Maintaining,</li> <li>• Loading and unloading,</li> <li>• Harvesting/picking,</li> <li>• Sorting, and packing.</li> </ul>
Waste materials	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Plant debris</li> <li>• Litter and broken components,</li> <li>• Plastic</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, skills and attitude to:</p> <ul style="list-style-type: none"> <li>• Identify and prepare required materials, tools and equipment for horticultural work</li> <li>• Explain and apply OHS requirements in horticultural work</li> <li>• Apply correct manual handling and lifting techniques</li> <li>• Undertake horticultural work in a safe and environmentally appropriate manner</li> <li>• Record and document horticultural work activities</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge of:</p> <ul style="list-style-type: none"> <li>• Safe work practices</li> <li>• Understand planting/transplanting/sowing, potting, weeding, hoeing, picking, packing,</li> <li>• Loading, unloading and transporting techniques</li> <li>• Identify horticultural tools and equipment</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Prepare and use materials, tools and equipment</li> <li>• Undertake horticultural crop management works (planting/transplanting/sowing, potting, weeding, hoeing, picking, packing, etc.)</li> <li>• Handle materials and equipment</li> <li>• Clean up on completion of work</li> <li>• Record and report.</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p>

	<ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crop Production Level I	
Unit Title	Carryout Basic Nursery Work
Unit Code	<a href="#">AGR CRP1 03 0322</a>
Unit Descriptor	This unit covers the knowledge, skills and attitude required to prepare materials, tools and equipment for nursery work, undertake nursery work activities, seed bed and pot preparation. Carry out planting/sowing Operations, Care for Seedlings, stockpile materials, clean up on completion of nursery work finally record and report.

Elements	Performance Criteria
1. Prepare materials, tools and equipment for nursery work	1.1 The required materials, <i>tools and equipments</i> are identified 1.2 Materials, tools and equipments are checked with insufficient or faulty items reported 1.3 Techniques used when loading and unloading materials demonstrate correct manual handling, and minimise damage 1.4 Suitable personal protective equipment (PPE) is selected and checked prior to use. 1.5 Nursery support is provided according to OHS requirements and <i>workplace information</i> . 1.6 Nursery work is undertaken in a safe and environmentally appropriate manner according to nursery working manual. 1.7 Instructions and directions provided by supervisor are followed 1.8 OHS hazards are identified and reported to the supervisor.
2. Prepare Seed bed and pots	2.1. The seed and transplanting blocks are ploughed according to the work guideline of the organization 2.2. The seed and transplanting blocks are pulverized using the appropriate farm tools according to the organizational work manual 2.3. The seed and transplanting blocks are levelled and are prepared for bed lay out according to organizational work manual 2.4. Appropriate pot materials are identified and prepared according to the specification 2.5. Suitable soil materials are selected and mixed based on the standard

	2.6.Suitable soil materials are filled and arranged according to the procedure
3. Carry out planting/sowing Operations	<p>3.1.<b>Planting material</b> is selected according to the type of Crop and enterprise quality standards.</p> <p>3.2.Planting material is treated according to the crop and based on the guidelines.</p> <p>3.3.Planting material is maintained under suitable conditions that will ensure maximum viability.</p> <p>3.4.Planting material is handled and transported to the site with no signs of transport damage.</p> <p>3.5.Planting is carried out according to the planting plan.</p>
4. Care for Seedlings	<p>4.1.<b>Treatments</b> are applied to plantings according to the supervisor's directions.</p> <p>4.2.Water is applied to plantings according to the irrigation Schedule and established sustainable farming practices.</p> <p>4.3.Seedlings are trained according to the supervisor's directions.</p>
5. Store and stockpile materials	<p>5.1.Plant debris and waste material produced during nursery activities are stored according to supervisor's instructions.</p> <p>5.2. Plant debris and waste materials are prepared and processed in an appropriate and safe manner according to supervisor's instructions.</p> <p>5.3. Surplus materials are stockpiled for removal according to supervisor's instructions.</p>
6. Clean up on completion of nursery work and Report	<p>6.1.Plants and materials are stored according to supervisor's instructions and OHS requirements.</p> <p>6.2. Tools and equipment are cleaned, maintained and stored according to manufacturer's specifications and supervisor's instructions.</p> <p>6.3.Nursery establishment and activities are recorded and documented in standard format</p> <p>6.4.Problems or difficulties in completing work to required standards or timelines are reported to supervisor.</p> <p>6.5.Materials, equipment and machinery condition after work is recorded and reported to supervisor</p> <p>6.6.Work completion and hazards information is communicated to work colleagues and the supervisor.</p> <p>6.7. Work outcomes are reported in standard format to the supervisor.</p>

Variable	Range statement
Tools and equipment	<p>May include but not limited:</p> <ul style="list-style-type: none"> <li>• Wheelbarrows,</li> <li>• Trolleys,</li> </ul>

	<ul style="list-style-type: none"> <li>• Scissors,</li> <li>• Cleaning equipment,</li> <li>• Secateurs,</li> <li>• knives,</li> <li>• Media trays</li> <li>• Tape</li> <li>• nylon rope,</li> <li>• pegs,</li> <li>• Machetes</li> <li>• rakes,</li> <li>• forks,</li> <li>• Spade,</li> <li>• shovel,</li> <li>• Saw,</li> <li>• hammer,</li> </ul>
Workplace information	<p>may include but not limited to:</p> <ul style="list-style-type: none"> <li>• Procedures for disposing of waste materials, work instructions or verbal instructions from the supervisor, OHS legislative requirements and relevant Codes of Practice.</li> </ul>
Planting materials	<p>May include but not limited to :</p> <ul style="list-style-type: none"> <li>• Compost</li> <li>• Seed</li> <li>• Seedling</li> <li>• Mother trees</li> <li>• Seed bed</li> <li>• Pot</li> <li>• Soli</li> <li>• Seedling tray</li> </ul>
treatment	<p>May include but not limited to :</p> <ul style="list-style-type: none"> <li>• Watering</li> <li>• Hardening of seedling</li> <li>• Pruning</li> <li>• Thinning</li> <li>• Weeding</li> <li>• Mulching</li> </ul>

Evidence Guide			
Critical Aspects of Competence	<p>Must demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Prepare materials, tools and equipment for nursery work.</li> <li>• Undertake basic nursery work as directed.</li> <li>• Store and stockpile materials.</li> <li>• Clean up on completion of nursery work.</li> <li>• Perform nursery plant maintenance activities such as taking care for young plants/Seedlings</li> <li>• Apply nursery Propagation techniques (Carry out planting/sowing)</li> <li>• Prepare Seed Bed and Pot</li> <li>• Implement procedures for the recording, reporting and maintenance of workplace records and information</li> <li>• Apply appropriate mathematical procedures for estimation and measurement</li> <li>• Communicate ideas and information about the job, tasks and problems with other members in the work team and the supervisor.</li> </ul>		
Required Knowledge and Attitudes	<p>Demonstrates knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>• Nursery hygiene and quality control.</li> <li>• Nursery maintenance (taking care for Seedlings and other works)</li> <li>• Nursery planting/sowing techniques</li> <li>• Important materials, tools and equipment for nursery work</li> <li>• Seed Bed and Pot preparation techniques</li> <li>• Recording, reporting and maintenance of workplace records and information</li> </ul>		
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Prepare materials, tools and equipment for nursery work.</li> <li>• Undertake basic nursery work</li> <li>• Cultivate and level the land</li> <li>• Prepare soil mix</li> <li>• Seed collection</li> <li>• Managing mother trees</li> <li>• Prepare Seed Bed</li> <li>• Prepare Pot</li> <li>• Carry out planting/sowing</li> <li>• Care for Seedlings</li> </ul>		
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<ul style="list-style-type: none"> <li>• Store and stockpile materials.</li> <li>• Clean up on completion of nursery work.</li> <li>• Use mathematical skills and techniques in counting, tallying and</li> </ul>			

	<p>estimation when handling plants or other nursery materials.</p> <ul style="list-style-type: none"> <li>• Use of nursery equipment and communication systems.</li> <li>• Perform recording, reporting and maintain workplace records and information</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation / Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard: Crops Production Level I</b>			
<b>Unit Title</b>		<b>Identify and Determine Basic Properties of Soil</b>	
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<b>Unit Title</b>		<b>Identify and Determine Basic Properties of Soil</b>	
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<b>Unit Code</b>	<a href="#"><u>AGR CRP1 04 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to prepare for soil sampling, collect soil samples for testing, identify soil profile and physical properties and assist soil testing operations.

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare for soil sampling	<p>1.1 <b>Tools, equipment and machinery</b> are selected according to site conditions and testing agency</p> <p>1.2 Soils sample techniques are identified according to site plans requirements</p> <p>1.3 Areas of homogeneous soil types are identified for sampling</p> <p>1.4 Suitable safety equipment and personal protective equipment (PPE) are selected and used</p> <p>1.5 A clean and safe work area is maintained throughout and on completion of work</p>
2. Collect soil samples for testing	<p>2.1 Tools and equipment for collecting soil samples are prepared.</p> <p>2.2 Area for soil sample collection is identified from workplace records or according to enterprise work procedures</p> <p>2.3 Holes are excavated and <b>Samples</b> are taken randomly from the designated area according to recognized sampling techniques</p> <p>2.4 OHS hazards are identified, risks assessed and controls implemented and reported to the supervisor.</p> <p>2.5. Suitable safety and PPE are selected, used and maintained.</p> <p>2.6. Samples for site and off-site testing are collected and prepared, packaged, accurately labelled, recorded and dispatched according to testing agency requirements and enterprise work procedures.</p>
3. Identify soil profile and physical properties of soil	<p>3.1. The <b>physical characteristics</b> of the soil are identified according to investigative requirements and best practice guidelines</p> <p>3.2. <b>Soil profile</b> is determined, where appropriate according the guidelines.</p> <p>3.3. Sampling and testing tools and equipment are cleaned of all residues and returned to storage according to manufacturer specifications and enterprise work procedures.</p>



	<p>3.4. All containers, leftover fluids and waste are disposed of safely and appropriately.</p> <p>3.5. Results are recorded in an established format according to enterprise work procedures</p>
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Variable	Range
Tools, equipment and machinery	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Spades,</li> <li>• Augers,</li> <li>• Soil sample storing</li> <li>• Recording materials,</li> <li>• Field test kits</li> <li>• PH meter</li> <li>• Litmus paper</li> <li>• Tape measure,</li> <li>• Polythene bags</li> </ul>
Samples	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Collecting,</li> <li>• Preparing,</li> <li>• Packaging and labelling soil samples for off-site testing and/or on-site testing and analysis.</li> </ul>
Physical characteristics of soil	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Color,</li> <li>• Texture,</li> <li>• Structure,</li> <li>• Depth of root zone and</li> <li>• Depth of water table.</li> </ul>
Soil profile	<p>May include but not limited to:</p> <p>Soil profile is defined as the vertical section of the soil from the ground surface downwards to where the soil meets the underlying rock.</p>

Evidence Guide	
Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• understand sampling techniques</li> </ul>

	<ul style="list-style-type: none"> <li>• Collect soil samples for testing</li> <li>• Identify soil profile and physical property</li> <li>• Perform soil tests and determine basic properties of soil by observation and using soil test kits</li> <li>• Sample, test soil samples and report in the required format on the soil characteristics identified</li> <li>• Communicate with work team members,</li> <li>• Recording techniques have been successfully and appropriately carried out</li> </ul>
Required Knowledge and Attitude	<p>Demonstrate knowledge and Attitude of:</p> <ul style="list-style-type: none"> <li>• Understand soil sampling techniques</li> <li>• Physical soil testing methods that may be used to identify and determine basic properties of soil intended to crop production purpose</li> <li>• Understand and identify soil profile</li> <li>• The capacity of soils to provide water to plants.</li> <li>• The importance of organic matter in soil in relation to the intended crop production use.</li> <li>• Soil-plant relationships</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Measure distance, depth and spacing, calculate area, volume</li> <li>• Collect soil samples</li> <li>• Perform basic physical soil tests</li> <li>• Identify soil profile</li> <li>• Communicate of ideas and information through reporting results of soil tests to supervisor or others orally or in writing</li> <li>• Collect, and organize information through recording from laboratory results</li> <li>• Use of mathematical ideas and techniques through the use of accepted soil tests</li> <li>• Apply problem-solving skills through identifying and resolving</li> </ul>

	<p>problems with the sampling process</p> <ul style="list-style-type: none"> <li>• Use technology to access and apply soil sampling techniques specifications, undertake soil basic properties identification activities communicate report and keep records.</li> <li>• Use of technology through the use of standard soil testing equipment</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard: Crop Production Level-I</b>	
<b>Unit Title</b>	<b>Prepare Compost</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP1 05 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to prepare raw materials for compost preparation, monitor composting process, manage crop residue/by-product, conduct quality control inspection and clean up

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Element	Performance Criteria
1. Prepare raw materials for compost preparation	1.1. <b>Raw materials</b> and <b>additives</b> are identified 1.2. Locally available materials are collected and checked to ensure compliance with <b>work procedures</b> 1.3. Assessment of physical <b>contamination</b> 1.4. <b>Composting technology and methods</b> to be used are confirmed as appropriate to raw material types and product requirements. 1.5. Raw materials are variously <b>pre-processed</b> into suitable forms for composting according to product requirements. 1.6. Pre-processed raw materials are mixed into suitable feedstock mixtures for composting according to documented recipes or batches. 1.7. <b>Crop residue/by-product</b> is separated, collected and stored in appropriate place from the crop in accordance with crop type 1.8. Suitable <b>Personal Protective Equipment (PPE)</b> and <b>OHS hazards</b> are selected and checked prior to use.
2. Prepare compost	2.1. select and clean site for compost preparation 2.2. Feedstock mixtures for composting are handled according to technology, appropriate method, and best practice and procedures. 2.3. Batch numbers or codes are assigned and <b>batch documentation</b> is created to enable tracking of batch through compost production cycle. 2.4. prepare compost according to the standards of the industry 2.5. Clean up area is maintained 2.6. Processing equipment is cleaned as required to avoid contamination between batches.
3. Monitor composting process	3.1 Composting batch is monitored by observation and use of <b>field-testing equipment</b> to maintain effective composting process and efficient compost production schedule. 3.2 <b>Processing and operations records</b> are maintained for process control and to track batch through the compost production cycle. 3.3 Faults or variations observed at any stage of process are reported and remedial action is taken to maintain effective and consistent compost production.
4. Conduct quality control inspection.	4.1. Finished compost are inspected and assessed for compliance with product requirements 4.2. Faults or variations observed are reported 4.3. Non-compliant product is further processed as directed to <b>processing technique; compost and faeces batch</b> management. 4.4. Compliance of compost with product quality requirements is confirmed.

	<p>4.5. Batch documentation are completed for compliant compost Sales and operational staff members are informed that product is suitable for sale and/or preparation of value-added products.</p> <p>4.6. Work outcomes are reported.</p> <p>4.7. Feedback on performance product is sought and any required improvements are noted for future action.</p>
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<b>Variable</b>	<b>Range</b>
Raw materials	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Animal mortalities</li> <li>• Bio solids such as sewage, sludge</li> <li>• Crop residuals</li> <li>• Dairy waste</li> <li>• Fats and oils</li> <li>• Food organics such as: <ul style="list-style-type: none"> <li>• food processing waste</li> <li>• food waste</li> <li>• kitchen waste</li> </ul> </li> <li>• forestry residuals</li> <li>• manures</li> <li>• organic sludge's</li> <li>• other organic waste or by-product of processing</li> <li>• paper mill wastes</li> <li>• paper-based materials</li> <li>• sawdust and wood shavings</li> <li>• sewage facility grit and screenings</li> <li>• Wood and timber (non-treated).</li> </ul>
Additives	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Biological inoculants that aid the processing of particular raw materials or manufacture of compost products with particular attributes</li> <li>• Ferrous sulphate or other chemical additives</li> <li>• Lime</li> <li>• Nutrients</li> <li>• Urea.</li> </ul>
Work Procedures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Forms</li> <li>• work orders and job sheets</li> <li>• Hazard</li> <li>• incident and non-conformance reporting processes</li> <li>• Management system documents</li> </ul>

	<ul style="list-style-type: none"> <li>• Policies</li> <li>• Work practices, procedures and work instructions.</li> </ul>
Contamination	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Biological contaminants such as pathogens</li> <li>• Chemical contaminants such as pesticides or heavy metals</li> <li>• Physical contaminants such as: <ul style="list-style-type: none"> <li>➤ glass</li> <li>➤ metals</li> <li>➤ plastics</li> <li>➤ rubble</li> <li>➤ stone and soil</li> <li>➤ sharps</li> <li>➤ Other non-biodegradable materials.</li> </ul> </li> </ul>
Composting technologies and methods.	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• In-vessel, such as: <ul style="list-style-type: none"> <li>➤ aerated turned trough</li> <li>➤ agitated bed</li> <li>➤ rotating drum</li> <li>➤ turned windrow composting</li> </ul> </li> <li>• Open, such as: <ul style="list-style-type: none"> <li>➤ aerated static pile</li> <li>➤ static pile</li> <li>➤ vermi-culture</li> </ul> </li> </ul>
Pre-processed	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Immediate incorporation with absorbent raw materials</li> <li>• Materials size reduction</li> <li>• Moisture adjustment through such things as addition of water</li> <li>• Particle size screening</li> <li>• Physical contaminant removal.</li> </ul>
Crop residue/by-product	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Saw dust,</li> <li>• coffee pulp,</li> <li>• coffee extract with mucilage</li> </ul> <p>Crop Straw</p>
Personal Protective Equipment (PPE)	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• masks/Respirator</li> <li>• Earmuffs</li> <li>• Fire extinguishers</li> <li>• Gloves</li> <li>• UV protection lotions</li> </ul>

	<ul style="list-style-type: none"> <li>• Hard hats</li> <li>• Protective clothing</li> <li>• Reflector high visibility vests</li> <li>• Safety footwear and</li> <li>• Goggle.</li> </ul>
OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Biological hazards associated with waste</li> <li>• Ergonomic hazards associated with manual handling</li> <li>• Physical hazards such as: <ul style="list-style-type: none"> <li>○ compressed air and water</li> <li>○ dust</li> <li>○ hammer mills and grinders</li> <li>○ hot or cold weather conditions</li> <li>○ noise</li> <li>○ shredders</li> <li>○ underfoot conditions</li> <li>○ vehicles and mobile machinery</li> <li>○ Sharps or other physical contaminants in materials.</li> </ul> </li> </ul>
Batch documentation	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Manual or electronic recording systems that enable tracking of product such as:</li> <li>• delivery of final product via the assignment of batch numbers</li> <li>• individual batch preparation and formation</li> <li>• Production process.</li> </ul>
Field testing equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Oxygen probe</li> <li>• Representative sampling protocol</li> <li>• Sample preparation: <ul style="list-style-type: none"> <li>○ sieving,</li> <li>○ weighing and drying</li> </ul> </li> <li>• Spade or fork</li> <li>• Test to assess moisture content</li> <li>• Temperature probe</li> <li>• Water Electrical Conductivity (EC) meter.</li> </ul>
Processing and operations records	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Manual and electronic tracking systems</li> <li>• Finished product manufacturing work order</li> <li>• Laboratory analysis results and reports</li> <li>• Non-conformance incident or customer complaint form and records</li> <li>• Product dispatch work order</li> </ul>

	<ul style="list-style-type: none"> <li>• Raw material received form and records</li> <li>• Windrow/batch construction</li> <li>• Windrow/batch data form and records</li> <li>• Windrow/batch recipe and work order</li> <li>• Windrow/batch release tags</li> <li>• Windrow/batch tags.</li> </ul>
Processing technique compost and faeces batch	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Action carried out to maintain effective and consistent compost production such as:</li> <li>• Adding water</li> <li>• Adjusting the air flow</li> <li>• Drying out</li> <li>• Turning</li> <li>• Action taken in response to problems identified by self or others, or at direction of manager.</li> </ul>

### Evidence Guide

Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Prepare raw materials for composting according to product requirements</li> <li>• Prepare batches for composting according to defined compost recipes</li> <li>• Conduct all work in a safe and efficient manner</li> <li>• Conduct basic compost tests according to specified procedures</li> <li>• Interpret basic compost test results to confirm effective processing and define intervention required to rectify composting processes</li> <li>• Establish and maintain appropriate compost batch documentation accurately and promptly.</li> </ul>
Required Knowledge and Attitude	<p>Demonstrate knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>• Awareness of compost quality standards</li> <li>• Basic principles of composting science as related to commercial compost production</li> <li>• Characteristics of a range of raw materials</li> <li>• Fundamental characteristics of compost quality</li> <li>• Key process control stages critical to consistent compost production</li> <li>• Overview of systems and technologies used in compost production, particularly as relevant to candidate's workplace</li> <li>• Range and characteristics of categories of compost product.</li> </ul>



Required Skills	Demonstrate skills in: <ul style="list-style-type: none"> <li>• Prepare compost batch documentation</li> <li>• Conducting basic compost test according to specified procedures</li> <li>• Identifying and handling raw materials and products</li> <li>• Preparing batches for composting according to defined compost recipes</li> <li>• Preparing raw materials in accordance with product requirements.</li> <li>• Preparing compost</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

<b>Occupational Standard: Crop Production Level-I</b>	
<b>Unit Title</b>	<b>Apply Soil and water conservation practices</b>
<b>Unit code</b>	<a href="#"><u>AGR CRP1 06 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to Identified and prepares for moisture conservation, under take moisture stress area conservation activity, undertake irrigated area, undertake farm land conservation, clean up and store materials and equipment, record and report work activities.

<b>Element</b>	<b>Performance Criteria</b>
1. Preparation for moisture conservation	1.1. The required <i>materials, tools and equipment</i> are identified 1.2. Checks are conducted on all materials, tools and equipment with insufficient or faulty items. 1.3. Correct manual handling and techniques for loading and unloading materials are used to minimize damage to the load

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	<p>and the vehicle</p> <p>1.4. Suitable <b>Personal Protective Equipment (PPE)</b> are selected and checked prior to use.</p> <p>1.5. <b>OHS hazards</b> are identified and provided according to OHS requirements and <b>workplace information</b>.</p>
2. Under take moisture stress area conservation activity	<p>2.1. Site selection and land preparation are identified according to production requirements</p> <p>2.2. <b>Moisture stress and other areas</b> establishment activities and <b>conservation methods</b> are identified</p> <p>2.3. Work <b>task</b> is undertaken in a safe and environmentally appropriate manner.</p> <p>2.4. Interactions with farmers and customers are carried out in a positive and professional manner.</p>
3. Undertake farm land conservation	<p>3.1. Indigenous soil and water conservation techniques are assessed.</p> <p>3.2. Conserve and maintain in-situ soil and water conservation</p> <p>3.3. Physical and biological soil and water conservation technique are prioritized.</p> <p>3.4. Community awareness and participation is enhanced.</p> <p>3.5. Types and species of trees are identified</p> <p>3.6. Physical soil and water conservation practice considering soil type slope and construction materials identified.</p>
4. Clean up and store materials and equipment	<p>4.1. Materials, equipment and machinery are handled and transported.</p> <p>4.2. <b>Waste material</b> produced during soil and water conservation practice establishment and conservation work is store or disposed of and recorded.</p> <p>4.3. Tools and equipment are cleaned, maintained and stored.</p>
5. Record and report work activities	<p>5.1. Activities accomplishment are recorded and documented</p> <p>5.2. Problems or difficulties in completing work to required standards or timelines are reported.</p> <p>5.3. Materials, tools and equipment damages are recorded.</p> <p>5.4. Work activities and outcomes are reported.</p>

Variable	Range
Materials, tools and equipment	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Rope,</li> <li>• empty sacks</li> <li>• plastic sheets</li> </ul>
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	<ul style="list-style-type: none"> <li>• Seed</li> <li>• Seedling</li> <li>• green forage,</li> <li>• Hoe</li> <li>• Plough</li> <li>• Harnesses</li> <li>• Sickle</li> <li>• Meter</li> <li>• axe/hammer</li> <li>• Moisture meter, etc.</li> <li>• Water pump,</li> <li>• watering can,</li> <li>• barrel</li> <li>• spade</li> <li>• Wheelbarrow</li> <li>• rack,</li> <li>• hayfork,</li> <li>• Silo/pit,</li> <li>• Store</li> <li>• Plant debris</li> <li>• Plant waste</li> </ul>
Personal Protective Equipments	May include, but not limited to plastic boots/shoes, overalls, gloves, sun hat, sunscreen lotion, safety goggles, face mask and ear protectors
OHS hazards	May include, but not limited to: <ul style="list-style-type: none"> <li>• Solar radiation, dust, noise, air- and soil-borne micro-organisms, fire hazard, chemicals and hazardous substances, sharp hand tools and equipment, manual handling, holes, and slippery and uneven surfaces.</li> </ul>
Work place information	May include, but not limited to: <ul style="list-style-type: none"> <li>• Procedures for disposing of waste materials,</li> <li>• Work instructions or verbal instructions from the supervisor.</li> </ul>
Moisture stress and other areas	May include, but not limited to: Most moisture stress falls into one of several categories—moisture deficiency, moisture excess, erosion, and physical damage.
Conservation methods	May include, but not limited to: <ul style="list-style-type: none"> <li>• Pond</li> <li>• Mulching</li> <li>• Runoff diversion</li> </ul>

	<ul style="list-style-type: none"> <li>• Basin irrigation</li> <li>• Contour farming</li> <li>• Soil bunds</li> <li>• Silage making and green chopping</li> </ul>
Waste material	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Plant debris</li> <li>• Plastic</li> <li>• Metal</li> <li>• Paper-based materials.</li> </ul>

<b>Evidence Guide</b>	
Critical Aspect of Competence	<p>Must demonstrate knowledge, attitude and skills competence to:</p> <ul style="list-style-type: none"> <li>• Identify, prepare and handle materials, tools and equipment for Soil and water conservation.</li> <li>• Describe soil and water conservation activities.</li> <li>• Understand soil and water conservation methods and principles</li> <li>• Demonstrate safe work practices in soil and water conservation activities</li> <li>• Demonstrate safe manual handling and lifting techniques</li> <li>• Apply appropriate and safe manner of using PPE</li> <li>• Clean up materials, tools and equipment on completion of work</li> <li>• Record, document and report in standard format and procedure appropriate to the level</li> </ul>
Required Knowledge	<p>Demonstrate knowledge requirements</p> <ul style="list-style-type: none"> <li>• Soil and water conservation methods and techniques</li> <li>• Types of materials, tools and equipment for Soil and water conservation and their uses</li> <li>• Application of safe working practices</li> <li>• Safe manual handling and lifting techniques</li> <li>• Recording, documenting and reporting procedures</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Prepare materials, tools and equipment for soil and water conservation work</li> <li>• Implement soil and water conservations practices</li> <li>• Demonstrate safe manual handling and lifting techniques</li> <li>• Demonstrate relevant clean technique on completion of work</li> <li>• Record, document and report in standard format and procedure</li> </ul>

Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assess through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard: Field Crop Production Level- I</b>	
<b>Unit Title</b>	<b>Identify Important crop pests</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP1 07 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to apply workplace requirements and instructions concerning crop pest identifications, conduct field assessment and recognize crop pest. This competency involves the application of knowledge and skills in recognizing common crop pests, sign and symptoms, recording the severity of the pest and relevant information.

<b>Element</b>	<b>Performance Criteria</b>
1. Apply workplace requirements and instructions concerning crop pest identifications	1.1 Roles and responsibilities of people in the workplace are identified under the control of the supervisor 1.2 Principles and guide lines in crop pest identifications are recognized and followed as required 1.3 Occupational health and safety hazards are identified and reported to the supervisor 1.4 Organizational procedures are followed
2. Conduct field assessment	2.1. <i>Equipment</i> is selected and prepared for scouting according to enterprise guidelines and manufacturers specifications

	<p>2.2. Field scouting carried out based on the principles and guidelines</p> <p>2.3. Observed <i>crop pests and disorders</i> reported to supervisor</p>
3. Recognize crop pest	<p>3.1 Crop pests are collected and identified using common and local names</p> <p>3.2. Identify <i>sign and symptoms</i> of common crop pests</p> <p>3.3. Distinguish sign and symptoms of common crop insect pests</p> <p>3.4. Recognize common crop weeds pests</p> <p>3.5. Identify soil born crop pests</p> <p>3.6. Identify vertebrate and migratory crop pests</p> <p>3.7 Suitable personal protective equipment (PPE) is selected use maintained and stored</p> <p>3.8 Records and reports are maintained</p>

Variable	Range
Equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Insect trap,</li> <li>• Pest identification chart,</li> <li>• Quadrant,</li> <li>• Sample collection materials</li> </ul>
Crop pests and disorders	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Crop pests include <ul style="list-style-type: none"> <li>✓ Nematode,</li> <li>✓ Fungi,</li> <li>✓ Viruses,</li> <li>✓ Bacteria</li> <li>✓ Insect</li> <li>✓ weed</li> </ul> </li> <li>• Crop disorders caused by biotic and/or abiotic factors include <ul style="list-style-type: none"> <li>✓ Color change</li> <li>✓ Stunted growth</li> <li>✓ Deformation</li> <li>✓ Malfunctioning</li> <li>✓ Wrinkled</li> <li>✓ Wilting</li> </ul> </li> </ul>
Sign and symptoms	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Physical evidence of the pathogen.</li> </ul>

	<ul style="list-style-type: none"> <li>• Fungal fruiting bodies,</li> <li>• Powdery mildew on plant leaf.</li> <li>• Detectable change in color,</li> <li>• Shape or function of the plant as it responds to the pathogen,</li> <li>• Leaf wilting, brown, necrotic lesions,...</li> </ul>
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<b>Evidence Guide</b>	
Critical Aspects of Competence	Demonstrates attitude, knowledge and skills to: <ul style="list-style-type: none"> <li>• Principles and guidelines in crop pest identifications</li> <li>• Recognize and prepared Scouting Equipments</li> <li>• Carried out field scouting based on the principles and guidelines</li> <li>• Observed common crop pests and disorders</li> <li>• Collect crop pests and identified using common and local names</li> <li>• Recognize sign and symptoms of common crop pests</li> <li>• Demonstrate OHS legislative requirements and Codes of Practice</li> <li>• Wear personal protective equipment appropriate to the task</li> <li>• Reporting and documentation</li> </ul>
Required Knowledge and Attitudes	Demonstrates knowledge and attitude of: <ul style="list-style-type: none"> <li>• Principles and guidelines in crop pest identifications</li> <li>• Recognize principles of field scouting</li> <li>• Understand sign and symptoms</li> <li>• Environmental considerations for plant pest, disease and disorder identification.</li> <li>• OHS legislative requirements and Codes of Practice.</li> </ul>
Required Skills	Demonstrates skills to: <ul style="list-style-type: none"> <li>• Prepare to identify plant pests and diseases.</li> <li>• Wear personal protective equipment.</li> <li>• Carry out crop pest sample collection operations.</li> <li>• Recognize crop pest common and local names</li> <li>• Distinguish sign and symptoms</li> <li>• Communicate ideas and information related to identifying plant pest, disease and disorder</li> <li>• Collect and organize information by inspecting the plant pest or disease and the information gained</li> <li>• Organize equipment, materials and work procedures for crop pest identification</li> </ul>

	<ul style="list-style-type: none"> <li>• Proper handling and storage of pest specimens</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard: Crop Production Level I</b>	
<b>Unit Title</b>	<b>Apply chemicals and Safety Rules</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP1 08 0322</u></a>
<b>Unit Descriptor</b>	This unit of competency covers the knowledge, skills and attitude to follow requirements and instructions concerning chemicals, recognize risks associated with chemicals, follow chemical handling and storage rules, check and maintain application and personal protective equipment, prepare Chemicals and calibrate equipment, apply chemicals, follow instructions to empty and clean equipment containers.

<b>Elements</b>	<b>Performance Criteria</b>
1. Follow requirements and instructions	1.1 Identify individuals <i>Roles and responsibilities</i> 1.2 Recognize and follow <i>Safety procedures</i> involved in chemical handling and use 1.3. Pesticides meaning and their Functions are recognized. 1.4. <i>Chemical labels</i> and hazards are identified 1.5. Risks associated with chemicals is identified 1.6. Pre and post operational checks and maintenance on <i>application equipment</i> is carried out according to manufacturer's specifications 1.7. Application and <i>personal protective equipments</i> are prepared and adjusted

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2. Follow chemical handling and storage rules	<p>2.1. Chemical handling and storage instructions on labels are followed</p> <p>2.2. Chemical storage locations are identified</p> <p>2.3. Instructions and Safety rules are followed for transport, handling and storage of chemicals</p> <p>2.4. Procedures are followed in the event of chemical accident and/or spillage</p>
3. Prepare Chemicals and calibrate equipment	<p>3.1. Measurement and decanting of chemicals comply with directions</p> <p><b>3.2.</b> Simple <i>Calibration</i> of equipment and chemicals based on the procedures and label recommendations is practiced.</p> <p>3.3. Safe working practices relevant to the situation are followed</p>
4. Apply chemicals	<p>4.1. Hazards are identified and associated risks recognised</p> <p>4.2. Follow requirements for application equipment to accurately and effectively apply the required dose of the chemical to the target</p> <p>4.3. Apply chemical on the target field</p> <p>4.4. Re-entry, withholding, plant back and restocking periods are observed as determined by label directions.</p>
5. Follow instructions to empty and clean equipment and containers	<p>5.1 Instructions for Emptying and clean-up equipment using appropriate tools and procedures are followed</p> <p>5.2 Instructions for disposal of containers and unused chemicals or biological agents are recognized</p> <p>5.3 Identify and dispose containers and unused chemicals</p>

Variable	Range
Roles and Responsibilities	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Own role and may include the supervisor,</li> <li>• Farm manager,</li> <li>• Team leader,</li> <li>• Owner or external contractor, and</li> <li>• External emergency contact organizations.</li> </ul>
Safety procedures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Compliance with safety instruction on the label,</li> <li>• Information contained in material safety data sheets (MSDSS)</li> <li>• Maintenance and storage of personal protective equipment,</li> <li>• First aid,</li> <li>• Systems of transport,</li> <li>• Storage and handling,</li> <li>• Procedures for the protection of environment and protection of others.</li> </ul>

Chemical labels	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Contains all the necessary information about a product –</li> <li>• Type of formulation,</li> <li>• Usage recommendations,</li> <li>• Safety advice,</li> <li>• Date of manufacture and expiry,</li> <li>• Manufacturer,</li> <li>• Registration number</li> </ul>
Application equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Knapsacks</li> <li>• Hand held pneumatic sprayers,</li> <li>• Drench guns</li> <li>• Spot on applicators</li> <li>• ULV</li> </ul>
Personal protective Equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Protective hats,</li> <li>• Face shields,</li> <li>• Goggles,</li> <li>• Respirators,</li> <li>• Overalls,</li> <li>• Aprons,</li> <li>• Chemical resistant gloves</li> <li>• Footwear.</li> </ul>
Calibration	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Checking and adjusting the application equipments</li> <li>• Determining the volume of water and pesticides required per a unit area.</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Use of chemicals &amp; why they are used,</li> <li>• How chemicals are stored and transported,</li> <li>• Level of hazard and the poisons classification</li> <li>• Personal protection equipment and when and how they should be used, stored and maintained.</li> <li>• Correct wearing/fit of personal protective equipment.</li> <li>• Environmental impacts of chemical use.</li> <li>• The safety requirements for handling chemicals</li> <li>• Basic occupational health &amp; safety rules required to work near and around chemicals.</li> </ul>

	<ul style="list-style-type: none"> <li>• Report concerns if unsafe practices, equipment or environmental conditions are observed.</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>• Basic Occupational Health &amp; Safety rules required to work near and around chemicals.</li> <li>• Level of hazard and the Poisons classification</li> <li>• Chemicals being used for the control of pests.</li> <li>• Personal protection equipment and when and how they should be used, stored and maintained.</li> <li>• Correct wearing/fit of personal protective equipment.</li> <li>• Environmental impacts of chemical use.</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Communicate information about spillages, accidents or deficiencies in procedures and practice.</li> <li>• Correct wearing/fit of personal protective equipment.</li> <li>• Correct use of chemicals &amp; why they are used,</li> <li>• where and how they stored</li> <li>• how they are transported,</li> <li>• Chemical safety rules</li> <li>• Calibration of application equipments and volume of water and pesticides</li> <li>• Follow correct pesticide application technique</li> <li>• Apply labels and instructions.</li> <li>• Follow instructions and directions from the chemical label.</li> <li>• Work with others when dealing with chemicals.</li> <li>• Use mathematical ideas and techniques to interpret volumes and measurement requirements on labels</li> </ul>
Resources Implication	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

Occupational Standard : Crop Production Level I	
Unit Title	Apply Agricultural Extension Service
Unit Code	<a href="#">AGR CRP1 09 0322</a>
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to understand the Concept and evolution of agricultural Extension, apply extension methods and Approaches, apply Agricultural extension Communication and facilitation for technology promotion, Conduct training and record and document data

Element	Performance Criteria
1. Understand the Concept and evolution of Agricultural Extension	<p>1.1 The <i>concept of Agricultural extension</i> is understood to gain relevant knowledge</p> <p>1.2 The <i>evolution and progress of agricultural extension</i> is expressed to understand the concept of Agricultural Extension</p> <p>1.3 The <i>role of extension</i> in agricultural development is understood to deliver effective extension services</p> <p>1.4 The <i>importance of Agricultural extension</i> is determined to have appropriate knowledge,</p> <p>1.5 <i>Extension planning</i> is understood to determine extension activities</p>
2. Apply Extension methods and Approaches	<p>2.1. <i>Extension methods</i> are understood to provide Extension services based on organizational standard, extension systems, extension strategy and extension guide lines</p> <p>2.2. <i>Extension approaches</i> are understood for implementation of extension services</p> <p>2.3. The <i>importance of extension methods and approaches</i> are understood for Agricultural extension service delivery</p> <p>2.4. Appropriate extension methods and approaches are applied to transfer agricultural technologies, based on organizational standard, extension systems, extension strategy and extension guide lines,</p>
3. Apply Agricultural Extension Communication and Facilitation for technology promotion	<p>3.1. The concept, <i>principle</i> and <i>type of communication</i> is understood to have good extension communication knowledge &amp; skill</p> <p>3.2. <i>Communication barriers</i> are identified, understood and solved to undertake effective communication</p> <p>3.3. <i>Elements of extension communication</i> are defined and used to create positive environment for communication</p> <p>3.4. <i>Audio visual techniques</i> are understood to provide Agricultural Extension and communication delivery services</p> <p>3.5. <i>Roles</i> and <i>characteristics of extension communicator</i> are</p>

	<p>recommended to improve the communicator's performance</p> <p>3.6. The <i>basic concept of facilitation</i> is understood to improve facilitation skills</p> <p>3.7. The <i>roles and responsibilities of a facilitator</i> is applied to progress facilitation skills</p> <p>3.8. Conflict resolution skill is understood to enhance homogeneity</p> <p>3.9. The <i>skills of a facilitator</i> are applied for communication &amp; technology promotion</p>
4. Conduct Training	<p>4.1. <i>Need assessment</i> is conducted to provide appropriate training</p> <p>4.2. <i>Preparation</i> is carried-out to facilitate the training process</p> <p>4.3. Implementation is conducted to capacitate trainees based on organizational training guide line</p> <p>4.4. <i>Evaluation is carried-out</i> to understand the outcome</p>
5. Record and Document Data	<p>5.1 <i>Data collecting formats</i> are developed</p> <p>5.2 Appropriate data are collected and organized</p> <p>5.3 Collected and organized data are documented and <i>reported</i></p>

Variable	Range
Concept of Agricultural Extension	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Definition of agricultural extension</li> <li>• Purpose of agricultural extension</li> </ul>
Evolution and progress of agricultural extension	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• National Agricultural Extension systems</li> <li>• Related reading materials</li> <li>• Professionals</li> <li>• Electronic mail</li> <li>• Briefing notes</li> <li>• Journal articles</li> <li>• Code of conduct</li> </ul>

Role of extension	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Situation analysis</li> <li>• Awareness creation</li> <li>• Training</li> <li>• Facilitation</li> <li>• Demonstrations</li> <li>• Field day exchange visit</li> <li>• Establish farmers group</li> <li>• Link farmers with relevant stakeholders</li> <li>• Monitoring and evaluation</li> <li>• Experience sharing</li> <li>• Assist and provide extension services for farmers</li> </ul>
Importance of Agricultural extension	<p>May include but not limited to;</p> <ul style="list-style-type: none"> <li>• Identify problem</li> <li>• Find solution</li> <li>• Bring behavioural change</li> <li>• Transfer of technology</li> <li>• Assist farmers to help themselves</li> </ul>
Extension planning	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Conduct survey</li> <li>• Identification of activities</li> <li>• Data collection</li> <li>• Development of formats</li> </ul>
Extension methods	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Individual</li> <li>• Group</li> <li>• Mass</li> </ul>
Extension approaches	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Participatory</li> <li>• Pluralistic</li> <li>• Farmers field school</li> <li>• Pastoral field school</li> <li>• Mobile extension</li> <li>• Model village</li> <li>• Cluster approaches</li> <li>• Scaling/up/out/down</li> </ul>

Importance of extension methods and approaches	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Information and technology dissemination</li> <li>• Deliver extension message effectively</li> <li>• Increase knowledge of farmers</li> <li>• Bring attitude change</li> <li>• Formation of opinion</li> <li>• Encourage farmers to raise issues</li> <li>• To get/provide possible alternative solutions</li> </ul>
Type of communication	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Intra personal communication</li> <li>• Inter personal communication</li> <li>• Organizational communication</li> </ul>
Principles of communication	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Awareness creation</li> <li>• Designed message with respect to objectives and respective audience</li> <li>• Message content should suite to the target audience</li> </ul>
Communication barriers	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The use of jargons words/terms</li> <li>• Cultural differences</li> <li>• Lack of attention, interest, distractions</li> <li>• Differences in perception and viewpoint</li> <li>• Physical disabilities</li> <li>• Physical barriers to non-verbal communication</li> <li>• Language differences and the difficulty in understanding unfamiliar accents</li> <li>• Expectations and prejudices</li> <li>• Emotional barriers and taboos</li> </ul>
Elements of extension communication	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Source</li> <li>• Sender</li> <li>• Message</li> <li>• Channel</li> <li>• Receiver</li> </ul>
Audio visual techniques	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Audio visual aids</li> <li>• Assembling</li> <li>• Character</li> <li>• Advantages</li> </ul>

Characteristics of extension communicator	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Confident</li> <li>• Friendly/ welcoming</li> <li>• Observant</li> <li>• Appreciative</li> <li>• Respectful</li> <li>• Organized</li> <li>• Good judgment</li> <li>• Consistent</li> <li>• Honest</li> </ul>
Role of extension communicator	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Create motivation and feeling</li> <li>• Be aware of problem of the local people</li> <li>• Priority of direct needs</li> <li>• Create self-belief in rural people</li> <li>• Emphasis on self-depend aces</li> <li>• Change in social attitude</li> <li>• Rebuilding of the village</li> <li>• Full uses of local resources</li> </ul>
Basic concept of facilitation	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Definition of facilitation</li> <li>• Purpose of facilitation</li> <li>• Evolution and progress of facilitation</li> </ul>
Role and responsibility of facilitator	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Does not evaluate group ideas</li> <li>• Helps the group focus its energies on a task</li> <li>• Suggests methods and procedures</li> <li>• Protects all members of the group from attack</li> <li>• Helps find win/win solutions</li> <li>• Makes sure that everyone has the opportunity to participate</li> <li>• Periodically summarizes the group consensus on issues to validate and clarify the progress of the discussion</li> </ul>
Conflict resolution skill	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Recognize</li> <li>• Resolve conflicting needs</li> <li>• Relieve stress</li> <li>• Recognize and manage emotions</li> <li>• Improve nonverbal communication skills</li> <li>• Use humour and play to deal with challenges</li> </ul>



Skill of facilitator	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Active Listening</li> <li>• Summarizing</li> <li>• Synthesis</li> <li>• Conflict resolution</li> </ul>
Need assessment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Identification of areas</li> <li>• Selection of respondents</li> <li>• Preparation of tools</li> <li>• Conduct the assessment</li> <li>• Organize data</li> </ul>
Preparation	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Identify trainees and trainers</li> <li>• Organize logistics</li> <li>• Select Venue</li> <li>• Selecting and organize training materials</li> <li>• Select and Organize training aids</li> <li>• Prepare schedule and others</li> </ul>
Evaluation	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Preparation of evaluating formats</li> <li>• Identify sample</li> <li>• Conduct evaluation</li> <li>• Organize result</li> <li>• Report</li> </ul>
Data collecting formats	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Recording formats</li> <li>• Writing formats</li> </ul>
Reporting	<p>May include but not limited:</p> <ul style="list-style-type: none"> <li>• Organizing</li> <li>• Writing</li> <li>• Submitting/transfer</li> </ul>

### Evidence Guide

Critical Aspects of Competence	<p>Demonstrates knowledge , attitude and skill of :</p> <ul style="list-style-type: none"> <li>• Understands the role of Agricultural Extension</li> <li>• Understands Evolution and progress of agricultural</li> <li>• Understands Extension method and Approaches</li> <li>• Understands Agricultural Extension Communication and Facilitation</li> <li>• Develops Extension planning</li> </ul>
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	<ul style="list-style-type: none"> <li>• Understands Conflict resolution</li> <li>• Understands collecting, recording, organizing and documenting of data</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge and attitude of :</p> <ul style="list-style-type: none"> <li>• Agricultural extension</li> <li>• Conflict resolution</li> <li>• Extension method and Approaches</li> <li>• Agricultural Extension Communication and Facilitation</li> <li>• collecting, recording, organizing and documenting of data</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>• Conflict resolution</li> <li>• Develops Extension planning</li> <li>• Extension method and Approaches</li> <li>• Agricultural Extension Communication and Facilitation</li> <li>• Collecting, recording, organizing and documenting of data</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and Occupational health and safety (OHS) practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Written Test, Interview, quiz, practical assignment</li> <li>• Observation, Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

Occupational Standard: Crop production Level I	
Unit Title	Implement Agribusiness Marketing
Unit Code	<a href="#">AGR CRP1 10 0322</a>
Unit Descriptor	This unit covers the knowledge, skills and attitude required to Understand concept of agricultural marketing Understand concepts of agribusiness Identify marketing targets for Agricultural products Implement marketing strategy . Establish contract farming, and Apply Agricultural marketing services.

Element	Performance Criteria
1. Understand concept of agricultural marketing	1.1 <b>.Concept of agricultural marketing</b> is understood for Agricultural marketing 1.2 Importance of agricultural marketing is understood to provide agricultural marketing services 1.3 <b>.Roles of agricultural market</b> -oriented service is identified and understood 1.4 <b>.Principles of agricultural marketing</b> and strategies are identified and understood 1.5 <b>Marketing mix</b> is understood to implement agricultural marketing activities 1.6 <b>Types of marketing</b> are understood and identified to implement the appropriate marketing services
2. Understand concepts of agribusiness	2.1. <b>Concept of agribusiness</b> is understood for Agricultural marketing 2.2 Importance of agribusiness is understood to provide agribusiness services 2.3 <b>Roles of agribusiness</b> -oriented service is identified and understood 2.4 <b>Principles of agribusiness</b> and strategies are identified and understood 2.5. <b>Characteristic of Agribusiness</b> are understood to implement Agribusiness 2.6. <b>Dimension and structures</b> of Agribusiness are understood and distinguished
3. Identify marketing targets for Agricultural products	3.1 <b>.Marketing targets</b> are identified for Agricultural products and services 3.2 <b>Approaches of agricultural market</b> are understood for agricultural market product and service. 3.3 <b>Segment descriptors</b> are used to display the targets of agricultural market 3.4 <b>Strategic of agricultural marketing options</b> are identified to develop agricultural <b>marketing plan</b> 3.5 Business plans are prepared to perform cost and benefit analysis
4. Implement marketing strategy	4.1 .Agricultural marketing functions strategy is designed to perform agriculture business. 4.2 <b>Action plan</b> is developed to implement Agricultural marketing strategies. 4.3 .Require resource are identified and coordinated to implement agricultural marketing 4.4 Marketing mix is implemented according to the strategy Agricultural.
5. Establish contract farming	5.1 Concept of <b>contract farming</b> is understood to enhance market oriented production 5.2 <b>Types of contract farming</b> are identified to select the appropriate approach 5.3 <b>Models of Contract</b> farming are understood and identified 5.4. Steps and procedures of contract farming establishments are identified 5.5 Contract farming <b>requirements</b> are identified and applied based on the

	<p>organizational standard</p> <p>5.6 Contract farming systems are established</p>
6. Apply Agricultural marketing services	<p>6.1 Agricultural products are identified to delivered provided marketing services</p> <p>6.2 Need assessment is conducted to identify <i>marketing conditions</i></p> <p>6.3 <i>Market strategies</i> are developed to implement the Agricultural marketing services</p> <p>6. 4Customer feedbacks are collected and organized to improve Agricultural marketing services</p> <p>6.5 Data is organized and documented to report the appropriate body.</p>

Variable	Range
Concept agricultural marketing	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Needs</li> <li>• Product</li> <li>• Demand</li> <li>• Value</li> <li>• Transaction</li> <li>• Satisfaction and Quality</li> <li>• Exchange</li> <li>• Market</li> </ul>
Roles marketing	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Determine price</li> <li>• Consumer choice</li> <li>• Increase efficiency</li> <li>• Improve scarcity</li> </ul>
Principles agricultural marketing	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Product</li> <li>• Price</li> <li>• promotion</li> <li>• Place</li> <li>• People</li> <li>• Process</li> </ul>
Marketing mix	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Price</li> <li>• Promotion</li> <li>• Place</li> </ul>

	<ul style="list-style-type: none"> <li>• Product</li> </ul>
Types of marketing	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Perfect competitive</li> <li>• Monopoly</li> <li>• Oligopoly</li> <li>• Monopolistic</li> </ul>
Concept of Agribusiness	<p>May include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Agricultural impute supply</li> <li>• Farmer producer</li> <li>• Process of wholesaler</li> <li>• Distribution and retailer</li> </ul>
Characteristic of Agribusiness	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Existence around production areas</li> <li>• Variety and size of Ag organization</li> <li>• Scale and type of competition</li> <li>• Conservativeness of Ag:</li> <li>• Decision making:</li> <li>• Community oriented business</li> </ul>
Dimension	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Agricultural sector and their interdependence</li> <li>• farm either private or government</li> <li>• Market oriented.</li> <li>• Dynamic sector and continuously meets current demands of consumers</li> <li>• Provides forward and backward linkages</li> </ul>
Structures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Input sector:</li> <li>• Farm/production sector:</li> <li>• Product sector:</li> </ul>
Marketing targets	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Demographic</li> <li>• Geographic</li> <li>• Psychographic</li> <li>• Behaviours pattern</li> </ul>
Marketing conditions	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Government</li> <li>• International transaction</li> <li>• Speculation and expectation</li> <li>• Supply and demand</li> </ul>

Agricultural Market strategies	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>Analyse agricultural market</li> <li>Analyse competition</li> <li>Define market mix</li> <li>Determine position</li> <li>Marketing budget</li> <li>Execution plan understand potential customers</li> </ul>
Approaches for agricultural market	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>Functional</li> <li>Institution</li> <li>Commodity</li> <li>Behavioral</li> </ul>
Segment descriptors	<p>May include, but not limited to:</p> <p>Demographic Behavioral Geographic Psychographic</p>
Marketing plans	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>Function of marketing</li> <li>Market program</li> <li>Achieve the market objectives</li> </ul>
Action plan	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>Resource</li> <li>Budget</li> <li>Times</li> <li>Output</li> </ul>
Contract farming	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>Agreement between buyer and seller</li> <li>Farmer and processing making firms for production</li> <li>Supplies of agricultural product</li> </ul>
Types of contract farming	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>Market specifying</li> <li>Recourse providing</li> <li>Production management</li> </ul>
Models of Contract	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>Full model contract farming</li> <li>Specific</li> </ul>

Requirements	<ul style="list-style-type: none"> <li>• Traceability</li> <li>• Site history and management</li> <li>• Propagation material</li> <li>• Soil/substrate management</li> <li>• Fertilizer use</li> <li>• Irrigation</li> <li>• Crop protection</li> </ul>
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<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Candidate must demonstrate the ability knowledge attitude and skill to:</p> <ul style="list-style-type: none"> <li>• Understand Concept of agribusiness to apply agribusiness marketing</li> <li>• Identify Principles of agribusiness and strategies to implement Agribusiness marketing</li> <li>• Determine Agricultural Marketing targets for provide products and services</li> <li>• Develop Action plan to implement Agricultural marketing strategies.</li> <li>• Prepare Business plans to perform cost and benefit analysis</li> <li>• Apply marketing conditions to conducted Need assessment for products and service</li> <li>• Understand concept of contract farming to enhance market oriented production</li> <li>• Apply appropriate models to established contract farming</li> <li>• Contract farming requirements are identified and applied based on the organizational guide line</li> <li>• Established Contract farming systems based on the organizational standard</li> </ul>
Required Knowledge and Attitude	<p>A candidate must demonstrate the knowledge and attitude to :</p> <ul style="list-style-type: none"> <li>• Identify Principles agricultural marketing to implement marketing strategy</li> <li>• Understand Concept of agribusiness to apply agribusiness marketing</li> <li>• Analyze the roles of agribusiness to perform agricultural marketing.</li> <li>• Identify Principles of agribusiness and strategies to implement Agribusiness marketing</li> <li>• Identified Agricultural Marketing targets provide products and services</li> <li>• Identify Require resource to implement agricultural marketing</li> <li>• Understand concept of contract farming to enhance market oriented production</li> <li>• Identify appropriate models to established contract farming</li> <li>• Recognize Contract farming systems based on the organizational standard</li> </ul>
Required Skills	<p>A candidate must demonstrate the Skills to :</p> <ul style="list-style-type: none"> <li>• Determine marketing options to design marketing plan</li> </ul>

	<ul style="list-style-type: none"> <li>• Implement Agricultural marketing strategies develop action plan</li> <li>• Identified Agricultural Marketing targets for provide products and services</li> <li>• Select Approaches of agricultural market to implement product and service.</li> <li>• Use segment descriptors to display the targets of agricultural market</li> <li>• Develop Action plan to implement Agricultural marketing strategies.</li> <li>• Prepare Business plans to perform cost and benefit analysis</li> <li>• Apply marketing conditions to conducted Need assessment for products and service</li> <li>• Organize customer feedbacks to improve Agricultural marketing services</li> <li>• Apply appropriate models to established contract farming</li> <li>• Contract farming requirements to applied based on the organizational guide line</li> <li>• Established Contract farming systems based on the organizational standard</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.



Occupational Standard: Crop production Level I	
Unit Title	Apply Basics of Human Nutrition Practices
Unit Code	<a href="#">AGR CRP1 11 0322</a>
Unit Descriptor	This unit covers the knowledge, skill and attitude required to categorize agricultural foods items, recognize malnutrition in the community, identify the role of agriculture in nutrition and contribute to the awareness creation of the community in utilization of agricultural products.

Element	Performance Criteria
1. Identify Categories of agricultural foods items	<p>1.1. Basic <i>terminologies and concepts</i> in nutrition are identified and explained</p> <p>1.2. <i>Food groups, nutrient and their sources</i> of balanced diet are identified and explained</p> <p>1.3. <i>Origin</i> and composition of food stuffs are identified and described</p> <p>1.4. <i>Energy dense</i> and <i>nutrient dense</i> food sources are identified and explained</p>
2. Recognize malnutrition in the community	<p>2.1. Physical signs of malnutrition are identified and explained</p> <p>2.2. Forms, causes and consequences of <i>malnutrition</i> in different groups of community are identified</p> <p>2.3. Measures to overcome malnutrition, importance of maintenance of adequate and balanced diet are promoted</p> <p>2.4. Contribution is made in elders, family heads and women awareness creation programs</p>
3. Identify the role of agriculture in nutrition	<p>3.1. The role of agriculture as source of variety foods is recognized and promoted</p> <p>3.2. The contribution of agriculture sector in nutrition sensitive intervention is described</p> <p>3.3. <i>Nutrition sensitive agricultural practices</i> are identified and communicated as per the nutrition program guideline</p>
4. Demonstrate diversified Agricultural food production and consumption techniques	<p>4.1. Importance of diet diversification is identified and discussed with family holds and community according to the program guideline</p> <p>4.2. Techniques of diversified food production are identified and demonstrated to farmers and family members</p> <p>4.3. <i>Techniques of enhancing</i> the nutrient content of family foods are assessed and implemented according to the program guideline and cultural requirements of the rural community</p>

	<p>4.4. Utensils are identified and cooking techniques demonstrated for specific agricultural products</p> <p>4.5. PPE are selected and used in accordance to OHS requirement and code of ethics</p> <p>4.6. Balanced and nutrient dense diet preparation is demonstrated using food stuff ingredients</p>
5.Perform proper handling and storage of agricultural food products	<p>5.1. Importance of <i>hygiene</i> for nutrition is explained</p> <p>5.2. <i>Storage facilities</i> are identified and family holds supported in construction.</p> <p>5.3. Agricultural products are <i>safely handled and stored</i></p> <p>5.4. Methods and techniques of safely handling and storing agricultural products are demonstrated in accordance products requirement</p>
6.Document and report food production, consumption and difficulties	<p>6.1. Diversified food production and consumption activities are documented</p> <p>6.2. Difficulties happened in the processes are reported to the respective authorities.</p>

Variable	Range
Terminologies and concepts	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Food</li> <li>• Diet</li> <li>• Nutrient</li> <li>• Balanced Diet</li> <li>• Nutritious food</li> <li>• Hidden hunger</li> <li>• Malnutrition</li> <li>• Stunting</li> <li>• Underweight</li> <li>• Overweight</li> <li>• Nutrition</li> <li>• Diversification</li> <li>• Body growth</li> <li>• Body Development</li> <li>• Food fortification</li> <li>• Bioavailability</li> <li>• Food taboos</li> <li>• Window of opportunity</li> <li>• Fortification</li> <li>• Food security</li> <li>• Nutrition security</li> <li>• Small holder farmer</li> <li>• Cretinism</li> </ul>

Food groups	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Vegetables food group</li> <li>• Fruits food group</li> <li>• Legumes and nuts food group</li> <li>• Animal source food group</li> <li>• Fats oils and sweets food group</li> <li>• Staples food group</li> </ul>
Nutrient and their sources	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Carbohydrates</li> <li>• Lipids/Fats</li> <li>• Proteins</li> <li>• Minerals</li> <li>• Vitamins</li> </ul>
Food origin	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Animal</li> <li>• Plant</li> </ul>
Energy dense	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Calories</li> <li>• Nutrient</li> </ul>
Nutrient dense	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Vitamins</li> <li>• Minerals</li> <li>• Fibbers</li> </ul>
Malnutrition	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Under nutrition may be: <ul style="list-style-type: none"> <li>➢ stunting</li> <li>➢ wasting</li> <li>➢ underweight</li> </ul> </li> <li>• Over nutrition may be: <ul style="list-style-type: none"> <li>➢ obesity</li> <li>➢ overweight</li> </ul> </li> </ul>
Nutrition sensitive agricultural practices	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Nutrition sensitive agricultural intervention</li> <li>• Diversification in: <ul style="list-style-type: none"> <li>➢ Production of fruits, vegetable, nutritious roots, cereals, pulse, and mushroom</li> <li>➢ Animal source foods (Dairy, poultry, shoat, fish)</li> </ul> </li> </ul>
Techniques of enhancing	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Fortification,</li> <li>• Germination,</li> <li>• Fermentation,</li> <li>• Roasting and Cooking</li> </ul>
Hygiene	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Food hygiene</li> <li>• Personal hygiene</li> <li>• Environmental hygiene</li> </ul>

Storage facilities	May include, but not limited to: <ul style="list-style-type: none"> <li>• Bins</li> <li>• Refrigerator</li> <li>• Shelf</li> <li>• Rack and Barn</li> </ul>
Safely handling and storing	May include, but not limited to: <ul style="list-style-type: none"> <li>• Sanitation</li> <li>• Ventilation</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	Demonstrate knowledge and skills to: <ul style="list-style-type: none"> <li>• Use utensils and prepare balanced nutrition</li> <li>• Distinguish and demonstrate energy dense and nutrients- dense foods and preparation techniques</li> <li>• Demonstrate food storing and preserving techniques</li> <li>• Explain the need for variety and diversification of foods</li> <li>• Explain agricultural food types, and sources</li> <li>• Describe forms, causes and consequences of excess or deficient intake of certain food types</li> <li>• Maintain personal hygiene to minimize risk to food product safety</li> </ul>
Required Knowledge and Attitude	Demonstrate knowledge of: <ul style="list-style-type: none"> <li>• Terminologies and concepts of nutrition</li> <li>• OHS requirements</li> <li>• Food groups and nutrient composition and diet requirement</li> <li>• Adequate and balanced diets</li> <li>• Agricultural food types, and sources</li> <li>• Need for variety and diversification of family diet with a variety of agricultural food products</li> <li>• Basic principles of producing quality/ nutritious agricultural products</li> <li>• Effect of food production and /or preparation on nutrient content of a variety of energy- dense and nutrients- dense foods</li> <li>• Child and maternal nutrition</li> <li>• Forms, causes and consequences of malnutrition</li> <li>• Basic food safety principles and requirements</li> <li>• Hygiene and food safety procedures</li> <li>• food safety recording requirements</li> <li>• Common hazards and sources of contamination in area of work</li> <li>• Legal and regulatory requirements pertaining to food production, storage, handling and packaging relevant to area of work</li> <li>• Personal hygiene practices and clothing requirements relevant to area of work.</li> </ul>

Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Categorize agricultural food items into major food groups based on their nutrient contents</li> <li>• Identify local varieties of animal and plant products,</li> <li>• Demonstrate production and /or preparation of nutrient rich diets</li> <li>• Communicate appropriate information with regard to diversified foods for pregnant women and children</li> <li>• Demonstrate various methods of integrated nutritious agricultural products production</li> <li>• Identify the consequences of excess or deficient intake of certain food types</li> <li>• Demonstrate how to enhance nutrient content using different food groups</li> <li>• Handle food products to prevent damage, spoilage and waste</li> <li>• Identify hazards, contaminants and risks or control points</li> <li>• Document and report food safety hazards and risks to appropriate personnel</li> <li>• Store food products in appropriate areas at correct temperatures</li> </ul>
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Prop production Level I	
Unit Title	Apply 5S Procedures
Unit Code	<a href="#">AGR CRP1 12 0322</a>
Unit Descriptor	This unit covers the skills, attitudes and knowledge required by an employee or worker to apply 5S procedures (structured approach to housekeeping) to their own job and work area and maintains the housekeeping and other standards set by 5S. The unit assumes the employee or worker has a particular job and an allocated work area and that processes in the work area are known by the individual.

Elements	Performance Criteria
1. Develop understanding of quality system	1.1 Discuss quality assurance procedures of the enterprise or organization 1.2 Understand the relationship of quality system and continuous improvement in the workplace 1.3 Identify and relate to workplace requirements the purpose and <i>elements</i> of quality assurance (QA) system 1.4 Explain the <i>5S system</i> as part of the quality assurance of the work organization
2. Sort needed items from unneeded	2.1 Identify all <i>items</i> in the work area 2.2 Distinguish between essential and non-essential items 2.3 Sort items to achieve deliverables and value expected by downstream and final customers 2.4 Sort items required for regulatory or other required purposes 2.5 Place any non-essential item in a appropriate place other than the workplace 2.6 Regularly check that only essential items are in the work area
3. Set workplace in order	3.1 Identify the best location for each essential item 3.2 Place each essential item in its assigned location 3.3 After use immediately return each essential item to its assigned location 3.4 Regularly check that each essential item is in its assigned location
4. Shine work area	4.1 Keep the work area clean and tidy at all times 4.2 Conduct regular housekeeping activities during shift 4.3 Ensure the work area is neat, clean and tidy at both beginning and end of shift
5. Standardize activities	5.1 Follow <i>procedures</i> 5.2 Follow checklists for activities, where available 5.3 Keep the work area to specified standard

6. Sustain 5S system	6.1 Clean up after completion of job and before commencing next job or end of shift 6.2 Identify situations where compliance to standards is unlikely and take actions specified in procedures 6.3 Inspect work area regularly for compliance to specified standard 6.4 Recommend improvements to lift the level of compliance in the workplace
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Variable	Range
Elements of QA system	<ul style="list-style-type: none"> <li>• corrective action</li> <li>• mission statements</li> <li>• monitoring procedures</li> <li>• SOPs</li> <li>• work instructions</li> <li>• PDCA concept</li> </ul>
5S	<p>5S is a system of work organization originally developed in Japan based around housekeeping principles. A close translation of the five stages in the housekeeping approach is:</p> <ul style="list-style-type: none"> <li>• Sort</li> <li>• Set in order</li> <li>• Shine</li> <li>• Standardize</li> <li>• Sustain</li> </ul> <p>Japanese terms:</p> <ul style="list-style-type: none"> <li>• Seiri - eliminating everything not required for the work being performed (sort)</li> <li>• Seiton - efficient placement and arrangement of equipment and material (set in order)</li> <li>• Seison - tidiness and cleanliness (shine)</li> <li>• Seiketsu – on going, standardized, continually improving seiri,</li> <li>• Seiton, seison</li> <li>• Shitsuke - discipline with leadership</li> </ul>
Items in the work area	<p>Includes:</p> <ul style="list-style-type: none"> <li>• Tools</li> <li>• Jigs/fixtures</li> <li>• Materials/components</li> <li>• Plant and equipment</li> <li>• Manuals</li> <li>• Personal items (e.g. Bags, lunch boxes and posters)</li> </ul>

	<ul style="list-style-type: none"> <li>• Safety equipment and personal protective equipment</li> <li>• Other items which happen to be in the work area</li> </ul>
Sort	Sort involves keeping only what is absolutely necessary for the
Set in order	<p>After removing unnecessary materials, the remaining materials must be those that are required immediately for either the machine or the job at hand. All of these materials/change/parts etc must have an assigned location on the production floor.</p> <p>Locations should be clearly marked and labeled to show what belongs where. assigning required equipment and materials appropriate locations in the work area</p>
Shine	<p>includes:</p> <ul style="list-style-type: none"> <li>• keeping the work area clean at all times</li> <li>• this should be carried out to a regular daily schedule against allowed time and, on most occasions, at the end of a job</li> </ul>
Standardize	<p>Once 5S is established, standardizing activities help maintain the order and the housekeeping standards. Standardizing may use procedures and checklists developed from a procedure.</p> <p>Standardizing includes:</p> <ul style="list-style-type: none"> <li>• Activities that help maintain the order and the housekeeping standards</li> <li>• Using procedures and checklists developed from a procedure</li> <li>• OHS measures such as signage, symbols / coding and labeling of work area and equipment</li> </ul>
Procedures	<p>Procedures may include:</p> <ul style="list-style-type: none"> <li>• work instructions</li> <li>• standard operating procedures</li> <li>• formulas/recipes</li> <li>• batch sheets</li> <li>• temporary instructions and similar instructions provided for the operation of the plant</li> <li>• good operating practice as may be defined by industry codes of practice (e.g. good manufacturing practice (GMP) and responsible care) and government regulations procedures may be:</li> <li>• written, verbal, computer based or in some other format</li> </ul>
Sustain	<p>includes:</p> <ul style="list-style-type: none"> <li>• making sure that daily activities are completed every day regardless of circumstance</li> <li>• cleaning up after a job</li> <li>• undertaking inspections, including: <ul style="list-style-type: none"> <li>– informal inspections carried out often, at least weekly</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>– formal inspections carried out at least monthly</li> <li>• generating continuous improvement actions from daily activities</li> <li>• following up specific actions to generate continuous improvement</li> </ul>
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<b>Evidence Guide</b>	
<b>Critical Aspects of Competence</b>	<p>A person who demonstrates competence in this unit must be able to provide evidence of the ability to:</p> <ul style="list-style-type: none"> <li>• Identify own tasks and responsibilities and relate them to organization and customer requirements</li> <li>• Identify and explain the stages of 5s</li> <li>• Implement 5s in own work area</li> <li>• Identify waste (MUDA) in the work area</li> <li>• Routine practice of 5S as part of their job</li> </ul>
<b>Required Knowledge and Attitudes</b>	<p>Demonstrates knowledge of:</p> <ul style="list-style-type: none"> <li>• Operations and processes relevant to own job</li> <li>• Basic principle of quality assurance system and its elements</li> <li>• Quality procedures and continuous improvement (kaizen)</li> <li>• Meaning and application of 5s steps to own job and work area</li> <li>• Principles of efficient workplace organization</li> <li>• Purposes of 5s</li> <li>• Methods of making/recommending improvements</li> </ul>
<b>Required Skills</b>	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>• Communicate with others to clarify issues during 5S implementation, communicate results and contribute suggestions for improvement</li> <li>• Visualize operations in terms of flow and contribution to customer outcomes</li> <li>• Plan own tasks in implementation of 5S</li> <li>• Implement 5S in own work area according to instructions</li> <li>• Identify waste (MUDA)</li> <li>• Organize, prioritizing activities and items</li> <li>• Read and interpret documents describing procedures</li> <li>• Record activities and results against templates and other prescribed formats</li> <li>• Working with others</li> <li>• Solving problems</li> </ul>
<b>Resources Implication</b>	<p>Access may be required to:</p> <ul style="list-style-type: none"> <li>• Workplace procedures and plans relevant to work area</li> <li>• Specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and</li> </ul>

	<p>procedures relevant to the candidate</p> <ul style="list-style-type: none"> <li>• Documentation and information in relation to production, waste, overheads and hazard control/management</li> <li>• Reports from supervisors/managers</li> <li>• Case studies and scenarios to assess responses to contingencies</li> </ul>
Methods of Assessment	<p>A holistic approach should be taken to the assessment.</p> <p>Competence in this unit may be assessed by using a combination of the following to generate evidence:</p> <ul style="list-style-type: none"> <li>• Demonstration in the workplace</li> <li>• Workplace projects</li> <li>• Suitable simulation</li> <li>• Case studies/scenarios (particularly for assessment of contingencies, improvement scenarios, and so on)</li> </ul> <p>2.1. Targeted questioning</p> <p>In all cases it is expected that practical assessment will be combined with targeted questioning to assess underpinning knowledge.</p>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting. Assessment of performance must be undertaken in a workplace using or implementing 5S as competitive systems and practices.</p>

# *NTQF L- II*

Occupational Standard: Crops Production Level II	
Unit Title	Field Crop Establishment and Maintenance
Unit Code	<a href="#">AGR CRP2 01 0322</a>
Unit Descriptor	This unit covers the knowledge, skills and attitude required to establish and manage field crops. Establishment operations include prepare the site, carry out establishment operations and complete establishment operations. In addition, this unit covers purpose, methods and implementing of field crop maintenances operations.

Element	Performance Criteria
1. Prepare field crop establishment operations	<p>1.1 Identify and collect <i>Inputs for field crop</i> establishment</p> <p>1.2 <i>Machinery, equipment and tools</i> are selected and prepared for the task being undertaken.</p> <p>1.3 <i>OHS hazards</i> are identified, risks assessed and reported</p> <p>1.4 The <i>environmental implications</i> of the crop production Plan is identified.</p> <p>1.5. Suitable <i>personal protective equipment</i> is selected, used and maintained.</p>
2. Prepare the site for crop establishment	<p>2.1 Plant debris and other waste materials are removed <b>Pre-treated</b> the soil before crop establishment.</p> <p>2.2 <i>Soil treatment/amendments</i> are applied according to soil test results.</p> <p>2.3 Site is worked according to the crop production plan.</p> <p>2.4 Appropriate plant spacing is implemented according to the crop type.</p> <p>2.5 The planting pattern is marked out according to the crop Production plan.</p> <p>2.6 Machinery, equipment and tools are operated and checked according to guidelines.</p>
3. Carry out filed crop establishment operations	<p>3.1 Planting material is selected according to the type of Crop and seed quality standards.</p> <p>3.2 Planting material is <i>treated</i> according to the crop type.</p> <p>3.3 Planting material is handled and transported to the site.</p> <p>3.4 Planting is carried out according to the planting plan.</p>
4. Complete filed crop establishment operations	<p>4.1 Tools and equipment are cleaned and sterilized according to the manufacturer's specifications, enterprise procedures and regulations.</p> <p>4.2 All containers, leftover fluids, waste and debris are disposed of safely and appropriately.</p> <p>4.3 All required workplace records are completed accurately and promptly in accordance with enterprise requirements.</p>

5. Prepare for field crop maintenance operations	<p>5.1 Crop fields that require maintenance are identified according to <b><i>organisation work procedures</i></b> and the crop regulation program.</p> <p>5.2 The <b><i>purpose and methods of maintenances</i></b> are determined and clarified according to organisation work procedures.</p> <p>5.3 The environmental implications of the field crop maintenance plan are identified</p> <p>5.4 Pest control measures are identified and collected</p> <p>5.5 Suitable personal protective equipment and OHS hazards are identified, risks assessed and reported.</p> <p>5.6 Machinery, equipment and tools are selected and prepared for the task being undertaken.</p> <p>5.7 Pre-operational and safety checks are carried out on equipment and machinery according to manufacturer’s specifications and organisation work procedures</p>
6. Undertake crop maintenance operations	<p>6.1 <b><i>Agronomic practice</i></b> and Instructions about <b><i>field crop maintenance</i></b> activities are applied</p> <p>6.2 The crop maintenance operations are undertaken according to principles and OHS requirements.</p> <p>6.3 Crop pest management activities are identified and applied</p> <p>6.4 Crop regulation tools, equipment and machinery are operated safely and effectively.</p> <p>6.5 Suitable personal protective equipment used and maintained.</p>
7. Complete maintenance operations	<p>7.1 Waste material removed from the site is disposed of in an environmentally aware and safe manner according to procedures.</p> <p>7.2 Correct manual handling techniques are used when lifting or moving heavy loads.</p> <p>7.3 Tools and equipment are cleaned, maintained, sterilised and stored according to the manufacturer’s specifications, procedures and regulations.</p> <p>7.4 A clean and safe work area is maintained throughout and on completion of work.</p> <p>7.5 All required workplace records are completed accurately and promptly, and reported.</p>

Variable	Range
Inputs for field crop	May include but not limited to: <ul style="list-style-type: none"> <li>• Seeds or planting materials</li> <li>• Fertilizers.</li> <li>• Pesticide</li> </ul>
Machinery, equipment and tools	May include but not limited to: <ul style="list-style-type: none"> <li>• Tractors and associated land preparation and seeding equipment,</li> </ul>

	<ul style="list-style-type: none"> <li>• Cultivators,</li> <li>• Fertilizer spreaders,</li> <li>• Seeding or planting machinery bagged or bulk seed,</li> <li>• Field tool box</li> <li>• Planter</li> <li>• Spade.</li> <li>• Mattock</li> <li>• Machetes</li> <li>• Broad bed maker (BBM)</li> <li>• Ridger</li> </ul>
<b><i>OHS hazards</i></b>	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Chemicals and hazardous substances</li> </ul>
Environmental implications	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The contamination of off-site ground water or soils from solids, debris, nutrients or chemicals; land disturbance, spread of noxious weeds and water run-off.</li> </ul>
personal protective equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Hat, boots, overalls, gloves, goggles, respirator or face mask, hearing protection, and sunscreen lotion, face guard.</li> </ul>
Pre-treated	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Fungicide dips</li> <li>• Fungicide dusts for seeds.</li> <li>• Round up</li> <li>• Glyphosate</li> <li>• Solar treatment</li> </ul>
Soil treatment/amendments	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Alkalinity</li> <li>• Acidity</li> <li>• salinity</li> <li>• Gypsum,</li> <li>• Lime,</li> <li>• Organic matter</li> <li>• Fertilizers,</li> <li>• Leaching</li> <li>• Permanent cover crop.</li> </ul>
Treated	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• insect pest</li> <li>• Pest control</li> <li>• Disease prevention and control,</li> </ul>

	<ul style="list-style-type: none"> <li>• Weed prevention and control,</li> <li>• Irrigation</li> <li>• Rodent</li> <li>• Physical treatment</li> </ul>
organisation work procedures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Supervisors oral or written instructions,</li> <li>• The crop regulation program,</li> <li>• Enterprise standard operating procedures (sops),</li> <li>• Specifications, routine maintenance schedules,</li> <li>• Work notes;</li> <li>• Manufacturers service specifications and</li> <li>• Operators manuals;</li> <li>• Waste disposal;</li> <li>• Ohs procedures</li> </ul>
Agronomic practice	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Site selection</li> <li>• Land preparation</li> <li>• Sowing</li> <li>• Mulching</li> <li>• Fertilizing</li> <li>• Hoeing</li> <li>• Weeding</li> <li>• Pest control</li> <li>• Watering or irrigation</li> <li>• Harvesting</li> <li>• Spraying,</li> <li>• Thinning</li> <li>• Avoid deformed plant</li> </ul>
Crop protection	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Wind protection</li> <li>• Mulch,</li> <li>• Spacing</li> <li>• Chemicals application</li> <li>• Biological control</li> <li>• Cultural control</li> </ul>
purpose and methods of maintenances	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Cultural practices,</li> <li>• Prevent disease and physical damaged</li> <li>• control growth,</li> </ul>

	<ul style="list-style-type: none"> <li>• Promote health,</li> <li>• Enhance crop capacity and vigour,</li> <li>• Enhance crop tillering or branching capacity</li> <li>• Manage the canopy and seed and flower production,</li> <li>• Control yield and quality to meet market requirements.</li> <li>• Enhance the yield of crop</li> </ul>
Field crop maintenance	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• crop maintenance tasks such as: <ul style="list-style-type: none"> <li>➤ Fertilizer application,</li> <li>➤ Irrigation</li> <li>➤ Hand weeding</li> <li>➤ Chemical control.</li> <li>➤ Mulching</li> <li>➤ Hoeing</li> </ul> </li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, attitude and skill to:</p> <ul style="list-style-type: none"> <li>• Clear the site</li> <li>• Prepare the soil and site for plantings</li> <li>• Prepare planting materials</li> <li>• Identify and plan the appropriate time of agronomic practices</li> <li>• Sowing/planting the crop and maintenance activity.</li> <li>• Prepare machinery, equipment and tools to maintain crops</li> <li>• Identify cropping duties including control weed, insect, disease and apply crop nutrition</li> <li>• Report the presence of weeds, pests and disease in crops</li> <li>• Record the details of crop maintenance</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>• Importance of field hygiene and quality control in regard to crop establishment and maintenance</li> <li>• Understanding pre and post harvesting handling</li> <li>• Operations of a range of crop machinery</li> <li>• The importance of correct timing and procedures for crop planting</li> <li>• Range of pre-planting soil treatments and their importance</li> <li>• Methods of waste disposal causing minimal impact on the environment</li> <li>• The importance of correct timing and procedures for crop maintenance</li> <li>• Weed control in crops</li> </ul>



	<ul style="list-style-type: none"> <li>• Pest and disease control</li> <li>• Crop nutrition</li> <li>• Environmental impacts of crop maintenance</li> </ul>
Required skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Calibrate equipment</li> <li>• Measure quantities of treatment</li> <li>• Determine spacing and planting patterns</li> <li>• Operate machinery to manufacturers specifications and enterprise procedures</li> <li>• Safely apply appropriate field crop chemicals</li> <li>• Identify hazards and follow safety directions at work</li> <li>• Use literacy skills to follow sequenced written instructions and record information accurately and legibly</li> <li>• Use numeracy skills to estimate, calculate and record routine workplace measures</li> <li>• Use interpersonal skills to relate to people from a range of social, cultural and ethnic backgrounds and with a range of physical and mental abilities.</li> </ul>
Resources Implication	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>• Access is required to real or appropriately simulated situations, including work areas, materials and equipment,</li> <li>• Documentation and information on workplace practices and OHS practices.</li> </ul>
Methods of Assessment	<p>Competence may be accessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test / Oral Questioning</li> <li>• Observation / Demonstration</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting</p>

Occupational Standard: Crop Production Level II	
Unit Title	Perform Nursery Establishment and Management
Unit Code	<a href="#">AGR CRP2 02 0322</a>
Unit Descriptor	This unit covers the knowledge, skills and attitude required to Select nursery site, prepare nursery beds, establish nursery, Maintain the nursery environment& plants and Complete nursery plant maintenance operations

Element	Performance Criteria
1. Select nursery site	<p>1.1. Site is selected according to <i>site selection criteria</i> and nursery guidelines</p> <p>1.2. Design the nursery site location and conducted survey</p> <p>1.3. Land is cleared from any vegetation according to nursery guidelines</p>
2. Establish nursery site	<p>2.1. Nursery Site is established according to nursery site establishment criteria and nursery guidelines</p> <p>2.2. Area closure for the established nursery site</p> <p>2.3. Infrastructures are facilitated in the nursery site</p> <p>2.4. Nursery is established according to market requirements and enterprise guidelines</p> <p>2.5. Clonal garden is established in the nursery</p>
3. Prepare nursery inputs	<p>3.1. <i>Planting media</i> is prepared according to the climatic condition</p> <p>3.2. <i>Planting material</i> is prepared according to the requirement</p> <p>3.3. Sowing/Planting is done according to the requirement</p>
4. Maintain the nursery environment and infrastructures	<p>4.1. <i>OHS hazards</i> in the <i>nursery environment</i> are identified, risks assessed.</p> <p>4.2. <i>Tools and equipment</i> are selected and used for plant maintenance.</p> <p>4.3. <i>Plant growth and health requirements</i> are clarified.</p> <p>4.4. Nursery operations are undertaken according to <i>OHS requirements</i>.</p> <p>4.5. <i>Irrigation system components</i> are serviced and faulty parts are repaired or replaced.</p> <p>4.6. <i>Treatments</i> are applied to assist plant growth as directed by the supervisor.</p> <p>4.7. Seedling <i>hardening off</i> practice is undertaken at the required</p>

	time
5. Complete nursery plant maintenance operations	<p>5.1. <b>Workplace information</b> is recorded in the appropriate format.</p> <p>5.2. <b>Waste</b> is collected and disposed of or recycled to minimize damage to the <b>external environment</b>.</p> <p>5.3. Tools and equipment are cleaned and stored</p> <p>5.4. <b>Nursery hygiene practices</b> are followed to minimize risk of contamination.</p>

Variable	Range
Site selection criteria	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Slope</li> <li>• Climatic conditions</li> <li>• Water availability</li> <li>• Road and infrastructures</li> <li>• Proximity to working place</li> <li>• Market availability</li> </ul>
Planting media	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Bare soil nursery</li> <li>• Container</li> <li>• Sand</li> <li>• Potting media</li> <li>• Sow dust</li> <li>• Straw</li> <li>• Compost</li> </ul>
Planting materials	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Seeds</li> <li>• Cuttings</li> <li>• Grafts</li> <li>• Buds</li> </ul>
OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The use of chemicals and hazardous substances</li> <li>• Sharp tools</li> <li>• Manual handling, solar radiation and operating spray equipment.</li> </ul>
Nursery environment	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Glasshouses</li> <li>• Shade houses and hardening-off areas.</li> </ul>
Tools and equipment	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Secateurs</li> </ul>

	<ul style="list-style-type: none"> <li>• Water spray containers</li> <li>• Dibblers, sprayers, plant supports, ties and rubbish bins.</li> <li>• spade</li> <li>• Forks</li> <li>• Rake</li> <li>• wheelbarrow</li> <li>• Machete</li> <li>• Watering can</li> <li>• Pickaxe</li> <li>• Measuring tape</li> <li>• Hammer</li> <li>• Back sow</li> </ul>
Plant growth and health requirements	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Watering, light levels, fertilizer regime, pruning and shaping, re potting, and staking.</li> </ul>
OHS requirements	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Identifying hazards,</li> <li>• Assessing and reporting risks,</li> <li>• Cleaning, maintaining and storing tools and equipment,</li> <li>• Appropriate use of PPE including: <ul style="list-style-type: none"> <li>➤ sun protection,</li> <li>➤ safe operation of tools and equipment,</li> <li>➤ safe handling,</li> <li>➤ use and storage of chemicals and hazardous substances, correct manual handling,</li> <li>➤ basic first aid,</li> <li>➤ Personal hygiene and reporting problems to supervisors.</li> </ul> </li> </ul>
Irrigation system components	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Pumps, lines, pipes, sprinklers, sprinkler heads, solenoids, filters, controllers, sprayers and drippers.</li> </ul>
Treatments	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Pesticides</li> <li>• Fungicides</li> <li>• Fertilizer</li> <li>• Mulching</li> <li>• Removing weeds</li> <li>• Removing dead material</li> <li>• Tip pruning</li> <li>• Formative pruning</li> <li>• Aeration, staking, tying, spacing and thinning.</li> </ul>

Hardening off	May include, but not limited to: <ul style="list-style-type: none"> <li>Exposing the seedlings to harsh environmental conditions by gradual decrease in watering and shade</li> </ul>
Workplace information	May include, but not limited to: <ul style="list-style-type: none"> <li>Environmental parameters, date of treatments, type of treatment and rate of treatment.</li> </ul>
Waste	May include, but not limited to: <ul style="list-style-type: none"> <li>Left over treatments, unused containers, plant debris or faulty irrigation components.</li> </ul>
External environment	May include, but not limited to: <ul style="list-style-type: none"> <li>The contamination of off-site ground water or soils from solids, nursery debris, nutrients or chemicals.</li> </ul>
Nursery hygiene practices	May include, but not limited to: <ul style="list-style-type: none"> <li>Practices removing weeds, dead or diseased plant material;</li> <li>Washing the work area on transfer of plants;</li> <li>Disinfecting tools, equipment and work areas, and using foot baths on entry to different work areas.</li> </ul>

### Evidence Guide

Critical Aspects of Competence	Demonstrate knowledge, attitude and skills to: <ul style="list-style-type: none"> <li>Nursery establishment site selection principles and guidelines</li> <li>Maintain nursery environment</li> <li>Design the nursery site location</li> <li>Market and infrastructures requirements for nursery site</li> <li>Understand Planting media preparation</li> <li>Planting material selection requirements</li> <li>Familiar with Plant growth and health requirements</li> <li>Nursery operations are undertaken according to OHS requirements.</li> <li>Serviced and repairing Irrigation system components in the nursery</li> <li>Apply daily water requirements</li> <li>Treat plants and record workplace information</li> <li>Prepare land and seed bed</li> <li>Sow seeds/plant cuttings and Harden off seedlings</li> </ul>
Required Knowledge and Attitude	Demonstrate knowledge and Attitude of: <ul style="list-style-type: none"> <li>Environmental requirements of a range of containerized plants</li> </ul>

	<p>growing in a nursery setting</p> <ul style="list-style-type: none"> <li>• The importance of hygiene and quality control when tending nursery plants</li> <li>• Common problems that may occur with containerized plants in a controlled environment and their treatment</li> <li>• Nursery site selection</li> <li>• Principles and operations of a range of irrigation systems used in nurseries</li> <li>• Methods of disposing of waste to minimize damage to the external environment.</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Select nursery site</li> <li>• Prepare nursery beds and pots</li> <li>• Prepare materials, tools and equipment for nursery activities</li> <li>• Undertake nursery work</li> <li>• Testing potting media</li> <li>• Participate in teams and co-coordinate work activities with other members of the work team and contribute to team objectives</li> <li>• Read and interpret enterprise work procedures</li> <li>• Communicate ideas and information effectively with team members and supervisor</li> <li>• Apply mathematical ideas and techniques to measure quantities and calibrate spray equipment and determining quantities and application rates for treatment of nursery plants.</li> <li>• Minimize noise, dust and water run-off to prevent nuisance-level environmental disturbance.</li> <li>• Collect, analyse and organize information</li> <li>• Enterprise work procedures, such as a daily watering plan.</li> <li>• Solve problems relating to maintenance of the nursery environment, the nursery plants, treatments, watering, tools and equipment, workplace safety and other team members may arise during the maintenance of nursery plants.</li> <li>• Use of technology in the preparation, use and maintenance of equipment and machinery.</li> </ul>
Resources Implication	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>

Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.
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Occupational Standard: Crop Production Level II	
Unit Title	Horticultural, Stimulants and Spice Crops Establishment and Maintenance
Unit Code	<a href="#">AGR CRP2 03 0322</a>
Unit Descriptor	This unit covers the Knowledge, Skills and attitude required for Horticultural, Stimulants and Spice crop establishment operations. Includes site selection, prepare the site for planting, carry out planting operations, care for young plants, complete crop establishment and management operations.

Elements	Performance Criteria
1. Prepare for Horticultural, Stimulants and Spice crops establishment operations	<p>1.1. <b>Inputs</b> are collected for <i>horticultural, Stimulants and Spice crops</i> establishment.</p> <p>1.2. <b>Machinery, equipment and tools</b> are selected and prepared for the task being undertaken.</p> <p>1.3. <b>OHS hazards</b> are identified, risks assessed and reported.</p> <p>1.4. The <b>environmental implications</b> of the horticultural, Stimulants and spice crop establishment program are identified</p> <p>1.5. Suitable <b>personal protective equipment (PPE)</b> is selected, used and maintained.</p>
2. Prepare the site for crop establishment	<p>2.1 Old crops and other waste materials are removed and <b>disposition</b> in full consideration of environmental implications.</p> <p>2.2 Site is cleared and watered prior to transplanting/sowing</p> <p>2.3. Growing media is prepared according to the establishment plan.</p> <p>2.4. Site is worked according to the Horticultural, Stimulants and Spice crop production plan</p> <p>2.5 <b>Horticultural, Stimulants and Spice crops protection</b> is implemented according to organization guidelines.</p> <p>2.6 Machinery Equipment and tools are operated according to organization guidelines.</p>
3. Prepare horticulture crop Planting material	<p>3.1. Transplanting plans/instructions are obtained and confirmed with the supervisor</p> <p>3.2. <b>Planting material</b> is selected according to the type of crop and organization quality standards.</p> <p>3.3. Planting materials are stored, handled and transported to the site.</p>

	<p>3.4. Instructions about sowing and seedling preparation for transplanting of the crop are applied</p> <p>3.5. Tools and equipment appropriate to the task being undertaken are prepared and used according to supervisors' instructions and manufacturers' guidelines</p>
4. Carry out planting operations	<p>4.1. Planting material is <b>treated</b> according to the horticultural crop nature and identified problems.</p> <p>4.2. Planting is carried out according to the planting plan.</p> <p>4.3. Transplanting depth is confirmed according to the needs of the crop type</p> <p>4.4. Plants are watered in and any post planting treatments applied.</p> <p>4.5. Appropriate drainage is incorporated to ensure root system survival according to the needs of the crop and conditions of the planting site.</p> <p>4.6. Plant support devices are installed according to the supervisor's instructions plan.</p>
5. Complete planting and care for young plants	<p>5.1. Transplanted plant is maintained with regular aftercare activities appropriate to the requirements of the species.</p> <p>5.2. <b>Treatments</b> are applied to plants according to the nature of the horticultural crops.</p> <p>5.3. <b>Water is applied</b> to plantings according to the irrigation schedule and established sustainable farming practices.</p> <p>5.4. Plantings are <b>trained</b> according to the nature of the horticultural, Stimulants and Spice crops.</p> <p>5.5. Waste is collected and disposed of or recycled to minimize damage to the external environment.</p> <p>5.6. Tools and equipment are cleaned, maintained and stored according to enterprise guidelines.</p> <p>5.7. All containers, leftover fluids, <i>waste</i> and debris are disposed of safely and appropriately in accordance with organization requirements.</p> <p>5.8. Records of transplant are maintained in the appropriate format.</p>

Variable	Range statement
Inputs	<p>May include but not to limited to:</p> <ul style="list-style-type: none"> <li>• In organic Fertilizer</li> <li>• Organic fertilizer</li> <li>• Pesticides</li> <li>• Growth regulators</li> <li>• Compost</li> </ul>



Horticulture crop	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Vegetable</li> <li>• Fruit</li> <li>• Eneset, Root and tuber crop</li> </ul> <p>Herb</p>
Stimulant and spice crop	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Coffee</li> <li>• Tea</li> <li>• Spices</li> </ul>
Machinery, Equipment and tools	<p>May include but not to limited to:</p> <ul style="list-style-type: none"> <li>• Tractors</li> <li>• Tools land preparation and planting equipment's</li> <li>• Rotary hoes</li> <li>• Tap meters</li> <li>• Cultivators</li> <li>• Drip irrigation</li> <li>• Sprinkler</li> <li>• Surveying and measuring equipment</li> <li>• Seeding or planting machinery equipment.</li> <li>• Field tool boxes and planting trailers</li> </ul>
OHS hazards	<p>May include but not to limited to:</p> <ul style="list-style-type: none"> <li>• Falling trees and plant debris</li> <li>• Chemicals and hazardous substances</li> <li>• manual handling,</li> <li>• Solar radiation</li> <li>• Dust</li> <li>• Noise</li> <li>• Identified through visual inspection of the area</li> <li>• sharp tools and equipment</li> <li>• Uneven surfaces,</li> <li>• Flying and falling objects</li> </ul>
Environmental implications	<p>May include but not to limited to:</p> <ul style="list-style-type: none"> <li>• The contamination of off-site ground water or soils from solids</li> <li>• Debris</li> <li>• Chemicals</li> <li>• land disturbance</li> <li>• spread of noxious weeds</li> <li>• Run-off</li> </ul>
Personal Protective Equipments (PPE)	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Hat</li> </ul>

	<ul style="list-style-type: none"> <li>• Boots</li> <li>• Overalls</li> <li>• Gloves</li> <li>• Goggles,</li> <li>• Respirator or face mask</li> <li>• Hearing protection</li> <li>• Sunscreen lotion and hardhat.</li> </ul>
Disposition	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Disinfestations</li> <li>• ploughing organic waste into the soil</li> <li>• mulching or composting of plant material</li> <li>• Bagging and removal of seed heads</li> <li>• Disposing of noxious or poisonous material at approved disposal sites</li> </ul>
Horticultural, Stimulants and Spice Crop protection	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Wind protection</li> <li>• Mulching</li> <li>• Pesticides</li> <li>• Mechanical control</li> <li>• Resistance and well adapted varieties</li> <li>• Hoeing</li> </ul>
Planting material	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Seeds</li> <li>• Seedlings</li> <li>• Runners</li> <li>• Cuttings</li> <li>• Bare rooted trees.</li> <li>• Root stock</li> <li>• Scion</li> </ul>
Treated	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Fungicide dips</li> <li>• Fungicide dusts for seeds</li> <li>• Root trimming</li> <li>• Shoot trimming</li> <li>• Crown gall dips and anti-transparent.</li> </ul>
Treatment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Seed treatments</li> <li>• Soil treatments</li> <li>• Cutting treatments</li> <li>• Dipping</li> </ul>

	<ul style="list-style-type: none"> <li>• Solar treatment</li> </ul>
Trained	<p>May include but not limited to:</p> <p>It is a practice in which tree growth is directed into a desired shape, size and form which is essential for proper tree development.</p>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills competence to:</p> <ul style="list-style-type: none"> <li>• Interpret a site map and site selection</li> <li>• Clear the site of old plantings</li> <li>• Prepare the soil and site for plantings</li> <li>• Prepare the planting materials, plant/sowing and maintain the new Horticulture crops.</li> <li>• Understand principles of horticultural crop establishment and maintenance</li> <li>• Principles and operations of a range of irrigation systems use for horticultural, stimulant and spice crop</li> <li>• The importance of correct timing and procedures for stimulant and spice crops planting</li> <li>• Prepare soil or growing media for planting</li> <li>• Apply pre-planting soil and plant treatments</li> <li>• Remove seedling from original environments without damage</li> <li>• Implement pest control measures</li> <li>• Record keeping and documentation</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• Principles of sustainable horticultural, stimulant and spice crop practices</li> <li>• Importance of field hygiene and quality control in regard to horticulture, stimulant and spice crops establishment</li> <li>• Principles and operations of a range of irrigation systems use for horticultural, stimulant and spice crop</li> <li>• Nutritional, water and other requirements of the horticulture, stimulant and spice crops</li> <li>• The importance of correct timing and procedures for horticulture, stimulant and spice crops planting</li> <li>• Range of pre-planting soil treatments and their importance</li> <li>• Methods of waste disposal causing minimal impact on the environment.</li> <li>• Read and interpret a range of workplace information</li> </ul>

Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Conduct pre-planting of soil and plant treatments</li> <li>• Carry out planting/Transplant/sowing seedling</li> <li>• Carry out transplanting</li> <li>• Communicate ideas and information relating to preparation planting and stimulant and spice crops care, and problems encountered with other members</li> <li>• Calculate spacing and planting patterns, measure quantities of treatment</li> <li>• Calibrate spray equipment and determining quantities and application rates for treatment.</li> <li>• Operate machinery to manufacturers tools and equipment's specifications and organization procedures</li> <li>• Apply principles and operations of a range of irrigation systems use for horticultural, stimulant and spice crop</li> <li>• Safely apply appropriate agricultural chemicals</li> <li>• Collect, analyse and organize information based on working procedures, such as a daily planting plan, mulching, fertilizing and water requirements of horticultural, stimulant and spice crops(all agronomy practices)</li> <li>• Solve problems relating to site preparation, stimulant and spice crop planting, treatments, watering, machinery tools and equipment, workplace safety,</li> <li>• Use technology, equipment and machinery in the preparation and maintenance of horticultural, stimulant and spice crops.</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crops Production Level II	
Unit Title	Determine crop pests and disorders
Unit Code	<a href="#">AGR CRP2 04 0322</a>
Unit Descriptor	This unit of competency covers the knowledge, skills and attitude to Understand the main agriculturally important crop biotic and a biotic factors. Identify the major agriculturally crop pest and disorders, assess pest occurrence and take sample. Furthermore, able to record and report pest occurrence to the organization.

Element	Performance Criteria
1. Understand the main agriculturally important crop biotic and a biotic factors	1.1. Understand classification of <i>biotic and a biotic factors</i> 1.2. Identify causes of biotic factors 1.3. Identify means of biotic factors disseminations and sources of infections 1.4. Understand biotic factors favourable environmental condition and crop preference 1.5. Understand biotic factors means of over wintering.
2. Identify the major agriculturally crop pest and disorders.	2.1 Identify common names of <i>disorders</i> and <i>crop pests</i> which impact on <i>Agricultural crops</i> . 2.2 Identify agriculturally important <i>crop pest behaviour</i> 2.3 Understand agriculturally important insect pests' favourable environmental condition & crop preference 2.4. Details of the plant pests and disorder occurrence are recorded and reported 2.5. <i>Equipments</i> are checked, selected and prepared for use according to the guidelines and manufacturers specifications 2.6. Suitable personal protective equipment(PPE) is selected, checked prior to use, maintained (if any), utilized, cleaned and stored appropriately 2.7. <i>Occupational Health and Safety hazards</i> are identified, <i>Risk</i> assessed and reported
3. Assess pests and take sample	3.1. Differentiate assessment/scouting techniques/methods 3.2. Understand <i>sampling methods</i> 3.3. Take sample of different crop pests. 3.4. Occupational Health and Safety hazards are identified, Risk assessed and reported
4. Record and Report pest occurrence	4.1 Materials and format Prepared for record pest occurrence 4.2. Record and document the identified pest based on procedures 4.3 Reported the pest occurrence to the organizations

Variable	Range
biotic and a biotic factors	<p>This may include but not limited to:</p> <ul style="list-style-type: none"> <li>➤ Biotic factors are those which are caused by living organisms infection, such as: <ul style="list-style-type: none"> <li>• Fungus</li> <li>• Bacteria</li> <li>• Virus/Viroids</li> </ul> </li> <li>➤ A biotic factors are those which are caused by non-living organisms, such as: <ul style="list-style-type: none"> <li>• Environmental factors, such as:</li> <li>• Shortage of moisture</li> <li>• Hail damage</li> <li>• Wind damage</li> <li>• Misapplication of agricultural chemicals</li> </ul> </li> </ul>
Disorders	<p>This may include but not limited to:</p> <p>Any change observed in the crop caused by biotic and/or a biotic factors:</p> <ul style="list-style-type: none"> <li>• Edaphic factors</li> <li>• Pollution (air, soil, water)</li> <li>• Misapplication of pesticides</li> <li>• Hail damage</li> <li>• Wind damage, etc</li> </ul>
Crop pests	<p>This may include but not limited to:</p> <ul style="list-style-type: none"> <li>➤ Plant pests such as: <ul style="list-style-type: none"> <li>➤ Insects</li> <li>➤ Weeds</li> <li>➤ Nematodes</li> <li>➤ Micro-organisms including <ul style="list-style-type: none"> <li>➤ Virus and Viroid's</li> <li>➤ Fungus</li> <li>➤ Bacteria</li> </ul> </li> </ul> </li> </ul>
Agricultural crops	<p>This may include but not limited to:</p> <ul style="list-style-type: none"> <li>• Field crops (cereal. pulse, oil crops and fiber crops , etc)</li> <li>• Vegetables (Cabbage, Tomato, Onion. etc)</li> <li>• Root crops(carrot potato sweet potato, beat root, etc)</li> <li>• Fruit crops(Citrus crops, Avocado, Mango, Apple, etc)</li> <li>• stimulant crops ( coffee&amp; tea)</li> <li>• Spice crops(Cumin, black-seed,</li> </ul>
Crop pests behaviour	<p>This may include but not limited to:</p> <ul style="list-style-type: none"> <li>• Feeding <ul style="list-style-type: none"> <li>• Chewing</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Sucking</li> <li>• Reproduction <ul style="list-style-type: none"> <li>• Complete metamorphosis</li> <li>• Incomplete metamorphosis</li> </ul> </li> <li>• Parthenogenesis</li> <li>• Signals</li> </ul>
Equipments	<p>This may include but not limited to:</p> <ul style="list-style-type: none"> <li>• Pheromone traps,</li> <li>• Baits</li> <li>• Sweep trap</li> <li>• Aspirator</li> <li>• Yellow board,</li> <li>• Light trap</li> <li>• Insect killing jar,</li> <li>• pressing board</li> <li>• Hand lenses</li> <li>• Weed pressing board</li> </ul>
Occupational Health and Safety hazards	<p>This may include but not limited to:</p> <ul style="list-style-type: none"> <li>• Inappropriate use of insect traps/sampling equipments</li> <li>• Biting/stinging from insect pests</li> <li>• Solar radiation.</li> </ul>
Risk	<p>This may include but not limited to:</p> <ul style="list-style-type: none"> <li>• Dissemination of pests to new area due to miss handling of collected samples</li> <li>• Chemical damage to working personnel and the environment.</li> </ul>
Sampling methods	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Random sampling</li> <li>• Travers</li> <li>• Purposive sampling</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrates attitude, knowledge and skills to:</p> <ul style="list-style-type: none"> <li>• Understand biotic and a biotic factors</li> <li>• Identify common plant pests and disorders</li> <li>• Identification of agriculturally important crop pest behaviour</li> <li>• Understand agriculturally important crop pest favourable environmental condition &amp; crop preference.</li> <li>• Identify agriculturally important crop pest means of disseminations &amp; overwintering.</li> <li>• Differentiate assessment/scouting techniques/methods</li> <li>• Understand sampling methods</li> </ul>

	<ul style="list-style-type: none"> <li>• Take sample of different crop pests.</li> <li>• Demonstrate OHS legislative requirements and Codes of Practice</li> <li>• Wear personal protective equipment appropriate to the task</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge of:</p> <ul style="list-style-type: none"> <li>• Recognize biotic and a biotic factors</li> <li>• Identification of common plant pests and disorders for a particular situation.</li> <li>• Differentiate assessment/scouting techniques/methods</li> <li>• Understand sampling methods</li> <li>• OHS responsibilities.</li> <li>• OHS legislative requirements and Codes of Practice.</li> <li>• Correct wearing/fit of personal protective equipment.</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>• Differentiate biotic and a biotic factors</li> <li>• Collect crop pests and diseases sample.</li> <li>• Apply assessment/scouting techniques/methods</li> <li>• Wear personal protective equipment appropriate to task.</li> <li>• Communicate ideas and information relating to plant pest, disease and disorder.</li> <li>• Collect and organize information by inspecting the plant pest or disease and the information gained</li> <li>• Plan and organize equipment, materials and work procedures.</li> <li>• Reporting and documentation</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.



<b>Occupational Standard: Crops Production Level II</b>	
<b>Unit Title</b>	<b>Operate Gravity Fed and Pressurized Irrigation Systems</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP2 05 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to set up of movable irrigation components and field for gravity fed irrigation, carry out gravity fed irrigation operations, carry out pressurized irrigation operations, monitor and control weed growth on drainage systems and clean and store irrigation equipments.

<b>Element</b>	<b>Performance Criteria</b>
1. Set up of movable irrigation components	<p>1.1. Irrigation equipments are handled safely in accordance with OHS practices.</p> <p>1.2. Irrigation equipments are positioned, if necessary, in accordance with <i>organization requirements</i>.</p> <p>1.3. <i>Irrigation components</i> are checked and action taken, as required, in accordance with enterprise policy and procedures.</p> <p>1.4. Irrigation system components are assembled and joined, where required.</p> <p>1.5. Water <i>outlets</i> are checked in accordance with organization practices.</p>
2. Set up field for gravity fed irrigation	<p>2.1. <i>Irrigation equipments</i> are handled safely in accordance with OHS practices.</p> <p>2.2. Irrigation equipments are positioned in accordance with enterprise requirements.</p> <p>2.3. Water source area is checked for irrigation set up and action taken as required in accordance with enterprise policy and procedures.</p> <p>2.4. Pumps, bores and other water delivery mechanisms are checked for irrigation set up and action taken, as required in accordance with enterprise policy and procedures.</p> <p>2.5. Tarpaulins or other water control devices are positioned and secured as required in accordance with enterprise procedures.</p>
3. Carry out gravity fed irrigation operations	<p>3.1. Gates and/or valves are opened and shut as necessary in accordance with enterprise procedures.</p> <p>3.2. Required head and water levels in head ditch are achieved and maintained to ensure sufficient water flow and availability to crops.</p> <p>3.3. Required number of siphons is started/opened in accordance with enterprise procedures.</p> <p>3.4. Progress of water flow in furrows is monitored in accordance with enterprise procedures.</p> <p>3.5. Siphons are lifted where irrigation is complete in accordance with</p>

	<p>enterprise procedures.</p> <p>3.6. Irrigation change is carried out and marked, as required.</p> <p>3.7. Irrigation equipments are shifted, as required.</p> <p>3.8. Water flow from outlets is checked, as necessary, to verify freedom from blockage.</p>
4. Carry out pressurized irrigation operations	<p>4.1. Valves are opened and shut, as necessary, in accordance with enterprise procedures.</p> <p>4.2. Required pressures and water flows are achieved and maintained to ensure sufficient water availability.</p> <p>4.3. Equipments are relocated, if necessary, in accordance with working procedures and guidelines.</p> <p>4.4. Water flow from outlets is checked, as necessary, to verify freedom from blockage.</p>
5. Carry out routine maintenance activities on gravity fed irrigation delivery systems	<p>5.1. All maintenance activities are carried out according to the maintenance program, based on requirements and the manufacturers' specifications.</p> <p>5.2. Mechanical equipment is serviced in accordance with the operators' manual or as directed.</p> <p>5.3. Supply and distribution system is flushed and cleaned as directed.</p> <p>5.4. System inlets, outlets, structures and fittings are maintained as directed.</p> <p>5.5. System is checked for smooth running and is free of damage, leaks and blockages in channels, drains and outlets, as necessary, in accordance with design specifications and enterprise procedures.</p> <p>5.6. Silt is cleared from channels, drains, sumps and crossings with no disruption to gradients and levels, as necessary.</p> <p>5.7. Adverse environmental impacts of the irrigation system are identified and reported.</p> <p>5.8. Appropriate materials are used for backfilling and building/repairing banks in accordance with standards.</p>
6. Carry out routine maintenance activities on drainage systems	<p>6.1. All <b>maintenance</b> activities are carried out according to the maintenance program</p> <p>6.2. <b>Drainage system</b> is flushed and cleaned with simple components replaced as directed.</p> <p>6.3. Drainage system is visually inspected for leaks and operating faults, and observations are recorded in the maintenance book.</p>
7. Monitor and control weed growth on drainage systems	<p>7.1. System checks ensure a weed free and unobstructed water flow from outlets as necessary.</p> <p>7.2. Damage to plants, structures and fittings is minimized through the use of recognized mechanical and chemical methods of weed control</p> <p>7.3. Operation area is maintained in a clean and safe condition.</p>

Variable	Range
Organization requirements	May include, but not limited to: <ul style="list-style-type: none"> <li>• Manual handling,</li> <li>• Prevention of electrical injury,</li> <li>• Handling, transportation, protection against chemical residues, including that in/on foliage, water, soil and other items,</li> <li>• The use and maintenance of relevant personal protective clothing and equipment.</li> </ul>
Irrigation components	May include, but not limited to: <ul style="list-style-type: none"> <li>• Pumps, pipes, valves (including solenoids), and</li> <li>• Sprinkler irrigation components.</li> <li>• Drip irrigation components.</li> </ul>
Outlets	May include, but not limited to: <ul style="list-style-type: none"> <li>• Drip lines, pipes, risers, valves, sprinklers and emitters</li> </ul>
Irrigation equipments	May include, but not limited to: Irrigation equipment includes <ul style="list-style-type: none"> <li>• Pivots</li> <li>• Linear</li> <li>• Pumps</li> <li>• Engines</li> <li>• Generators</li> <li>• Pipes</li> <li>• Wheelies</li> <li>• Hose reel</li> <li>• Travellers</li> </ul>
Maintenance	May include but not limited:  Maintenance is crucial for all types of irrigation systems. It is to insure the most efficient use of water and prevent minor and major damage to the irrigation equipments. Maintenance includes: <ul style="list-style-type: none"> <li>• checking nozzles</li> <li>• Adjusting sprinklers regularly to ensure optimal water distribution.</li> </ul>
Drainage system	May include but not limited: <ul style="list-style-type: none"> <li>• Surface drains</li> <li>• Culverts</li> <li>• Mole drains</li> <li>• Sand slit</li> </ul>

	<ul style="list-style-type: none"> <li>• Sub-surface traps</li> </ul>
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<b>Evidence Guide</b>
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<p>Critical Aspects of Competence</p>	<p>Must demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Set up fields for irrigation</li> <li>• irrigation times for crop fields to deliver sufficient water volume without over watering</li> <li>• Operate, check, clean and store irrigation equipment,</li> <li>• Carry out all basic activities involved in irrigating crops</li> <li>• Apply drainage system cleaning procedures</li> <li>• Inspect, repair and replace simple drainage system components,</li> <li>• Monitor and control weeds and silt build up,</li> <li>• Carry out routine maintenance activities on drainage systems</li> <li>• Use hand or powered equipment to control weeds</li> <li>• Follow OHS procedures relating to drainage system</li> </ul>
<p>Required Knowledge and Attitude</p>	<p>Demonstrate knowledge and Attitude of:</p> <ul style="list-style-type: none"> <li>• Understand basic operation of gravity fed irrigation system</li> <li>• Irrigation time on fields to deliver sufficient volume without over watering</li> <li>• Components of a gravity fed irrigation system including cleaning and storage requirements</li> <li>• Manual handling procedures</li> <li>• Understand required head and water levels in head ditch</li> <li>• OHS procedures relating to general activities involved in irrigating crops using gravity fed irrigation and drainage system maintenance</li> <li>• Principles and practices of pressurized irrigation system operation</li> <li>• Critical measures for moisture availability including evapo transpiration, field capacity, infiltration rates, readily available water, water holding capacity and wilting point</li> <li>• Environmental impacts of irrigation using water from any ground or underground source</li> <li>• General irrigation methods for low volume systems</li> <li>• Main components of low volume and sprinkler irrigation systems</li> </ul>

	<ul style="list-style-type: none"> <li>• Principles of irrigation and the water cycle</li> <li>• Operate irrigation systems</li> <li>• Shutdown sequence and flushing procedures</li> <li>• Soil characteristics</li> <li>• Soil, plant and water relationships</li> <li>• Water requirements of plants and crops consistent with environmental management</li> <li>• Drainage system cleaning procedures</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Operate irrigation systems</li> <li>• Regulate system to achieve and maintain correct operating pressures and water flows</li> <li>• Estimate water levels and volumes/flow</li> <li>• Start up and close down the system</li> <li>• Monitor progress of water flow</li> <li>• Clean and store system components</li> <li>• Identify Water draining methods</li> <li>• Carry out routine maintenance activities on drainage systems</li> <li>• Monitor and control weed growth</li> <li>• Follow OHS procedures relating to general activities involved in irrigating crops using gravity fed irrigation systems</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crop Production - Level II	
Unit Title	Collect and Compile Crop Production data
Unit Code	<a href="#">AGR CRP2 06 0322</a>
Unit Descriptor	This unit covers the knowledge, skills and attitude required to identify data to be collected, collect and organize production data, compile and interpret data, present and document production data.
Element	Performance Criteria
1. Identify data to be collected.	<p>1.1 Specific requirements of the <i>data</i> to be collected are determined by discussion with the supervisor or by reading work instructions.</p> <p>1.2 Materials or tools required for data collected are- obtained, and where necessary calibrated.</p> <p>1.3 Difficulties that may be encountered in collecting the data are identified and advice sought from the supervisor if needed.</p> <p>1.4 A dice about proposed data collection is communicated to others as required.</p> <p>1.5 Suitable <i>personal protective equipment (PPE)</i> is selected, used and maintained where required.</p> <p>1.6 Checks are made to determine whether notices relating to site quarantine are in effect and, where required, site quarantine procedures are followed.</p>
2. Collect and organize production data	<p>2.1 Information is collected and organized in a format suitable for compile and interpretation in accordance with <i>sector requirements</i>.</p> <p>2.2 Information held by the production unit is assessed for accuracy and relevance in line with requirements.</p> <p>2.3 Methods of collecting data are reliable and make efficient use of Crop management practice</p> <p>2.4 Basic equipment is used to access, organize and monitor data in accordance with crop production requirements.</p> <p>2.5 Information is updated, modified, maintained and stored in accordance with crop production requirements.</p>
3. Compile and interpret data	<p>3.1 Objectives of data compilations are clearly defined and consistent with enterprise requirements.</p> <p>3.2 <i>Methods of data compilation</i> are reliable and suitable to research and other purposes.</p> <p>3.3 Assumptions used in compilations are clear, justified and consistent with <i>plant parameters</i>.</p> <p>3.4 Conclusions are supported by evidence and contribute to the achievement of sector objectives.</p>

4. Present and document production data.	<p>4.1 Data are prepared in an appropriate format, style and structure using suitable technology.</p> <p>4.2 Structure and format of reports are clear and conform to sector requirements.</p> <p>4.3 Findings are reported and distributed in accordance with sector requirements.</p> <p>4.4 Feedback and comments on suitability and sufficiency of findings is obtained in accordance with sector requirements.</p>
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Variable	Range
Data	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Agronomic practices (site selection, land preparation, input application, weeding, harvesting)</li> <li>• crop phenology</li> <li>• soil sampling</li> </ul>
personal protective equipment (PPE)	<p>May include but not limited to:</p> <p>hat, boots, overalls, gloves, apron, waterproof clothing, spray clothing, goggles, respirator or face mask, face guard, hearing protection, sunscreen lotion and hard hat.</p>
Sector requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Quality assurance and/or procedures manuals,</li> <li>• Bio security requirements,</li> <li>• Crop production procedures for updating records</li> <li>• OHS policies,</li> <li>• Procedures and programs,</li> <li>• Production plans,</li> <li>• Systems and processes, and</li> <li>• Defined resource parameters.</li> </ul>
Methods of data compilation	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Feedback on results,</li> <li>• Review of previous data and production figures,</li> <li>• Peer review,</li> <li>• Data sampling and compilations.</li> </ul>
Plant Parameters	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Phenology <ul style="list-style-type: none"> <li>➤ Days to emergence</li> <li>➤ Days to tasselling and heading</li> <li>➤ Days to first flowering for pulse crops</li> <li>➤ Days to first pod set for pulse crops</li> <li>➤ Days to first peg for peanut crop</li> <li>➤ Days to anthesis</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Shoot parameters <ul style="list-style-type: none"> <li>➤ Stand count</li> <li>➤ Number of tillers</li> <li>➤ Maximum green leaf area</li> <li>➤ Plant height</li> <li>➤ Number of nodules per plant</li> <li>➤ Leaf number per stem</li> </ul> </li> <li>• Yield components <ul style="list-style-type: none"> <li>➤ Number of cobs per plant</li> <li>➤ Cob/ear weight</li> <li>➤ Number of spikelet's per spike</li> <li>➤ Head weight</li> </ul> </li> </ul>
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<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge and skills competence to:</p> <ul style="list-style-type: none"> <li>• Collect and organize production data</li> <li>• Compile and interpret data</li> <li>• Describe purposes for which the recorded data might be used</li> <li>• Use software programs used for recording or storing data.</li> <li>• Collect production data from required sources.</li> <li>• Describe methods to collect and compile production data</li> <li>• Describe data management systems and methods</li> </ul>
Required Knowledge and attitudes	<p>Demonstrates knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• Data collection methods and procedures</li> <li>• Agronomic practice and Soil data parameters</li> <li>• Data handling and sharing</li> <li>• Sector record keeping and recording practices</li> <li>• Sector policies and procedures relating to collection and maintenance of production data</li> <li>• Methods to collect and compile production data</li> <li>• Data management systems and methods</li> <li>• Understand software programs used for recording or storing data</li> <li>• Principles of report writing and data presentation.</li> </ul>
Required Skills	<p>Demonstrate skills of:</p> <ul style="list-style-type: none"> <li>• collect and organize production data</li> <li>• compile and interpret data</li> <li>• Record and Present data.</li> <li>• Rearranging data collection activities to fit in with other planned or unplanned production activities.</li> <li>• Using data loggers and personal computers to record and store data.</li> <li>• Use software programs for recording or storing data</li> </ul>



Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

### Occupational Standard: Crop Production Level II

<b>Unit competence</b>	<b>Apply interpreted weather Data and Minimize crop production risks</b>
<b>Code</b>	<a href="#"><u>AGR CRP2 07 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to assess weather and production data, identify weather and crop production data risk and opportunities.

<b>Elements</b>	<b>Performance Criteria</b>
1. Assess weather and production data	<p>1.1 Historical weather data is obtained and interpreted from a range of sources.</p> <p>1.2 <b>Weather and crop production risk factors</b> are identified.</p> <p>1.3 Information on normal and <b>significant weather events</b> and their impact on natural and rural system are collected.</p> <p>1.4 Current and historical property and <b>crop production situation</b> is detailed according to sector guidelines.</p> <p>1.5 Short- and long-term sector goals are reviewed.</p> <p>1.6 Weather and production data is sourced, presented and updated according to sector requirements.</p>
2. Identify weather and crop production data risk and opportunities	<p>2.1 Forecasted chances of seasonal weather data are collected and feedback given.</p> <p>2.2 <b>Weather opportunity</b> risks are identified.</p> <p>2.3 Impact on production of different weather and production risk factors are determined according to sector requirements.</p> <p>2.4 Qualitative and quantitative risk and opportunity factors are identified and developed.</p> <p>2.5 Importance of weather variability and significant production events is evaluated.</p> <p>2.6 Tactics to address a range of different weather variability and</p>

	<p>production risks and opportunities are outlined according to sector requirements</p> <p>2.7 <b>Contingency options</b> for production and the risk factors are identified.</p>
3. Prepare weather and crop production risk management	<p>3.1 Weather variability and seasonal weather forecasts are collected.</p> <p>3.2 Insurance and other options are addressed.</p> <p>3.3 Major weather risk factors are addressed.</p> <p>3.4 Impacts on the environment, <b>property value</b> and equity are predicted.</p> <p>3.5 Preferred crop production, weather risks or alternative solution are reviewed, and options selected</p> <p>3.6 A planned solution to cope with variable weather and crop production risk management is presented</p>

Variable	Range
Weather and crop production risk factors	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Flood</li> <li>• Land slide</li> <li>• Soil erosion,</li> <li>• Tree cover/shading,</li> <li>• Drought,</li> <li>• Wild fire,</li> <li>• Pests /weeds, insects, disease, nematodes, migratory pests/</li> <li>• Changing nutrient levels,</li> </ul>
Significant weather events	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Floods,</li> <li>• Droughts,</li> <li>• Hail,</li> <li>• Periods of extreme temperature</li> </ul>
Crop production risk factors	<p>May include but not limited to :</p> <ul style="list-style-type: none"> <li>• Crop pests,</li> <li>• Landslides,</li> <li>• Crop failed,</li> <li>• Wild fire,</li> <li>• Soil erosion,</li> <li>• Growing season.</li> <li>• Nutrient deficiency</li> </ul>

weather Opportunities	<p>May include but not limited to :</p> <ul style="list-style-type: none"> <li>• Above average production,</li> <li>• Market opportunities,</li> <li>• Refining sector mix decisions, and</li> <li>• Alternative production approaches.</li> </ul>
Contingency options	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Marketing, cropping strategies,</li> <li>• Crop produce reserve,</li> <li>• Irrigation</li> <li>• Provision of food supplements,</li> <li>• Changing production system, and other emergency planning</li> <li>• Food reserve</li> </ul>
Property values	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Economic, production sustainability,</li> <li>• Improvement in natural resource base</li> <li>• Other benefits.</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrate knowledge and skills competence to:</p> <ul style="list-style-type: none"> <li>• Assess, collect and interpret weather and crop production data</li> <li>• Explain direct and indirect impacts of weather variability on crop production, land management and sustainability</li> <li>• Explain potential impacts of greenhouse warming on land and natural resource management</li> <li>• Identify strategic options and planning in response to weather and production variability for a range of seasons (normal, drier or wetter than normal), and other risks and opportunities</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• The impact of weather and climate phenomena on rainfall, plant growth and yields</li> <li>• Causes of general patterns of weather and climate</li> <li>• Weather variability and climate change</li> <li>• Direct and indirect impacts of weather variability on crop production, land management and sustainability</li> <li>• Property and crop production management decisions affected by the weather variable</li> <li>• Understand weather and crop production risks and opportunities</li> <li>• Apply forecasted seasonal weather data</li> <li>• Climate and weather issues pertaining to sustainable agriculture</li> <li>• Potential impacts of greenhouse warming on land and natural</li> </ul>

	<p>resource management</p> <ul style="list-style-type: none"> <li>• Other options and planning in response to weather variability for a range of seasons (normal, drier or wetter than normal), and other risks and opportunities</li> <li>• calculating financial returns for different strategic options</li> <li>• computer applications and Internet to access, record and compile data</li> <li>• Principles of decision-making based on the variable weather and seasonal climate forecasts.</li> </ul>
Required Skills	<p>Demonstrate skills to</p> <ul style="list-style-type: none"> <li>• Collect weather and crop production data from primary or secondary sources</li> <li>• Compile and interpret weather and crop production data</li> <li>• Prepare risk management strategies</li> <li>• Integrate weather risk, and opportunities and management strategies crop production management level.</li> <li>• Plan drought mitigations measures</li> <li>• Plan flood mitigations measures</li> </ul>
Resources Implication	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

Occupational Standard-Crop Production	
Unit of Competence	Perform post-harvest handling of stimulants and spices crops
Unit Code	<a href="#">AGR CRP2 08 0322</a>
Unit Descriptor	This unit competence covers skill, knowledge & attitude to carry out harvesting, dry the harvested product, process spice crops, prepare dry coffee, Perform Hulling, Prepare Washed/semi-washed coffee, and store stimulant & spice products

Element	Performance Criteria
1. Dry the harvested product	1.1. Drying place is identified based on type of the spice crop 1.2. Suitable drying equipments are prepared as per the crop requirement. 1.3 Moisture content is checked by using moisture tester.
2. Process spice crops	2.1 Processing equipments and machineries are identified based on the type and purpose of processing. 2.2 Processing seeds, fruits, leaves, bark and rhizomes is performed 2.3 Grading the processed spices is performed based on size, quality and market demand.
3. Prepare dry coffee	3.1 Drying place is identified according to pre-set criteria. 3.2 Appropriateness of the drying floor and table is inspected and maintained to fulfil the required standard. 3.3 Moisture condition for dry coffee is inspected according to the required level. 3.4 Drying should be spread in a thin layer according to the standard should be turned frequently to avoid fungus development. 3.5. Storing dry coffee is carried out using sacks.
4 Perform Hulling	4.1 Foreign materials are sorted out to keep the smooth running of hulling machine. 4.2 Minor machine adjustment and filling the hopper is performed. 4.3 Hulling is performed with the required standard. 4.4. <i>Pea berries, elephant beans</i> and broken beans are sorted out. 4.5. Clean beans are stored following the suitable storage procedure 4.6. <i>Husk</i> is taken to appropriate place for reuse.
5 Prepare Washed/semi-washed Coffee	5.1 Minor machine adjustment and calibration is performed. 5.2 Pulping operation is carried out to get <i>parchment</i> coffee 5.3 Fermentation process is inspected and time of fermentation is checked. 5.4 Washing process is carried out in accordance with the standard for

	<p>parchment coffee.</p> <p>5.5 Drying operation is performed using solar radiation or artificial drier.</p> <p>5.6. Damaged, immature and over fermented parchment coffee is sorted out.</p> <p>5.7. Appropriate moisture content is checked by using appropriate techniques.</p> <p>5.8. Dried coffee is stored according to coffee storage procedures.</p>
6. Store stimulant & spice products	<p>6.1. Storage places and structures are identified based on the type and time of storage</p> <p>6.2 Processed stimulant &amp; spice products are transported to the storage area.</p> <p>6.3 Stimulant &amp; Spice products are stored with suitable temperature and relative humidity</p> <p>6.4 Regular inspection is performed to control the quality of the stored spice products.</p>

Variables	Range Statement
Pea berries:	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>Coffee bean resulted from the development of a single seed in the fruit.</li> </ul>
Elephant Bean:	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>An oversized coffee bean.</li> </ul>
Husk:	<p>May include but not limited to:</p> <p>External envelope of dried coffee</p>
Parchment:	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>The last internal covering above silver skin of green coffee bean.</li> </ul>

<b>Evidence Guide</b>	
Critical aspects of competence	<p>Demonstrate knowledge, attitude and skill to:</p> <ul style="list-style-type: none"> <li>Understand purpose of drying and suitable drying equipments based on type of the spice and stimulant crop</li> <li>Determine moisture content</li> <li>Identify processing equipments and machineries for processing.</li> <li>Understand the processed/economically important portion of the crop (seeds, fruits, leaves, bark and rhizomes)</li> <li>Drying type, procedures and principles</li> <li>Principles and guidelines of grading spices and stimulant crops.</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand principles of coffee drying, processing and storage.</li> <li>• Storage and transportation of spice and stimulant</li> <li>• Understand extraction of essential oils from the seeds spice and stimulant products</li> </ul>
Required knowledge	<p>Demonstrate knowledge and attitude to:</p> <ul style="list-style-type: none"> <li>• Understand purpose of drying and suitable drying equipments based on type of the spice and stimulant crop</li> <li>• Identify processing equipments and machineries for processing.</li> <li>• Understand the processed/economically important portion of the crop (seeds, fruits, leaves, bark and rhizomes)</li> <li>• Recognize trying type, procedures and principles</li> <li>• processing techniques</li> </ul>
Required skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Determine moisture content</li> <li>• Operating and maintaining processing machineries.</li> <li>• Dry the harvested product</li> <li>• Process spice crops</li> <li>• Extract <i>essential oils</i></li> <li>• Store spice and stimulant products</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard : Crop production Level II</b>	
<b>Unit Title</b>	<b>Apply Agricultural Extension service for Rural development</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP2 09 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitudes required to promote the use of digital technology agricultural extension, understand adult learning, Integrated gender agricultural extension and Recognize Indigenous Knowledge

<b>Element</b>	<b>Performance Criteria</b>
1. Promote the use of digital technology in Agricultural Extension	<p>1.1 The <i>use of Digital technology in Agricultural extension</i> is introduced to familiarize its importance</p> <p>1.2 <i>Skills in using digital technology</i> is built to strengthen agricultural extension services</p> <p>1.3 The <i>role of digital technologies in agricultural extension</i> services is understood to enhance agricultural development.</p>
2. Understand Adult Learning	<p>2.1 The <i>concept of adult learning</i> is understood to bring behavioural changes</p> <p>2.2 <i>Principles of Adult learning</i> is determined for the implementation of extension services</p> <p>2.3 The <i>importance of Adult learning</i> in Agricultural Extension is understood to enhance agricultural extension services</p> <p>2.4 <i>Adult learning methods</i> are understood to enhance the knowledge and skills of extension beneficiaries</p> <p>2.5 <i>The role of adult learning</i> is understood to allow farmers develop knowledge and skills</p>
3. Integrate Gender in Agricultural Extension	<p>3.1 The <i>concept of gender</i> is understood to provide inclusive agricultural extension services</p> <p>3.2 Gender awareness and sensitization is created to increase the contribution of gender in agricultural development</p> <p>3.3 The <i>role of gender in agriculture</i> is determined to enhance agricultural development.</p> <p>3.4 <i>Gender mainstreaming</i> is implemented for effective outcome of extension services</p>
4. Recognize Indigenous Knowledge	<p>4.1. The <i>concept of indigenous knowledge</i> is understood to strengthen the service of agricultural extension</p>



	<p>4.2. <i>Characters of indigenous knowledge</i> are understood to promote local experience</p> <p>4.3. <i>Exchange of indigenous knowledge</i> is promoted to enhance community development</p> <p>4.4. The <i>importance of indigenous knowledge</i> is understood to facilitate its contribution to the development processes.</p> <p>4.5. The <i>controversial issues of the debate on indigenous knowledge</i> are further studied to propose the urgent need, to document, learn, preserve, and exchange indigenous knowledge</p>
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Variable	Range
Use of Digital technology in Agricultural extension	May include but not limited to: <ul style="list-style-type: none"> <li>• Define Digital Technology</li> <li>• Evolution and progress of digital technologies</li> <li>• Digital technology for Agricultural Extension</li> <li>• Tools for digital technology</li> <li>• Utilization of digital technologies</li> </ul>
Skills in using digital technology	May include but not limited to: <ul style="list-style-type: none"> <li>• Demonstrate digital technologies</li> <li>• Practice digital technologies</li> <li>• Apply digital technologies</li> <li>• Maintain and manage digital technologies</li> </ul>
Role of digital technologies in agricultural extension	May include but not limited to: <ul style="list-style-type: none"> <li>• Provide diverse knowledge to beneficiaries</li> <li>• Supply Efficient information products</li> <li>• Provide technology-related advice</li> <li>• provide location-specific market information</li> <li>• enhance technology adoption in agriculture</li> </ul>
Concept of adult learning	May include but not limited to: <ul style="list-style-type: none"> <li>• Adult learning theories</li> <li>• Characteristics</li> <li>• Adult learning approaches</li> <li>• Purpose of Adult learn</li> <li>• Adult learning practices</li> </ul>

Principles of Adult learning	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Self-directed</li> <li>• Experiential</li> <li>• Problem-centered</li> <li>• Motivated to learn</li> <li>• Learner oriented</li> <li>• Practice Oriented</li> <li>• looks for help and mentorship</li> <li>• Open for modern ways of learning</li> <li>• Choose how to learn</li> </ul>
Importance of Adult learning	<p>May include but not limited to;</p> <ul style="list-style-type: none"> <li>• Increase effective participation in decision making</li> <li>• Improves individuals' technology utilization</li> <li>• Enhances working efficiency,</li> <li>• Keep up with the growing economic competition</li> <li>• Self-improvement</li> <li>• Financial growth and benefit</li> </ul>
Adult learning methods	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Visual Aids</li> <li>• Audio</li> <li>• Print Media</li> <li>• Tactile</li> <li>• Interactive</li> </ul>
The role of adult learning	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Behavioral change</li> <li>• Enhance to acquire new skills and knowledge</li> <li>• Access disadvantaged groups</li> <li>• Promote Participatory decision making</li> </ul>
Concept of gender	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Definition of Gender</li> <li>• Historical development of Gender</li> <li>• Importance of Gender</li> <li>• Gender awareness and sensitization</li> </ul>
Role of gender in agriculture	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Women's contribution in Agricultural Production</li> <li>• Women's participations in rural labor market</li> <li>• Women's participation in Agricultural Extension</li> <li>• Gender difference in rural labor markets</li> <li>• Impact of gender role in Agricultural Extension services</li> </ul>

Gender mainstreaming	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Understanding of gender equality</li> <li>• Mainstreaming strategy</li> <li>• Steps of gender mainstreaming</li> </ul>
Concept of indigenous knowledge	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Definition of Indigenous knowledge</li> <li>• Historical development of indigenous knowledge</li> <li>• Importance of indigenous knowledge for development processes</li> </ul>
Characters of indigenous knowledge	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Experiences</li> <li>• its compatibility with indigenous environment and culture</li> <li>• insufficient knowledge of rural people</li> <li>• combination of culture, belief and religion</li> </ul>
Exchange of indigenous knowledge	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Recognition and identification</li> <li>• Validation of indigenous knowledge</li> <li>• Recording and document indigenous knowledge</li> <li>• Storage in retrievable repositories</li> <li>• Dissemination of indigenous knowledge</li> <li>• Utilization of indigenous knowledge</li> </ul>
Importance of indigenous knowledge	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Problem solving strategies</li> <li>• Important component of global knowledge</li> <li>• Resource in the development processes</li> <li>• Understanding of local conditions</li> <li>• Increase responsiveness of client</li> <li>• Enhance cross cultural understanding</li> </ul>
Controversial issues of the debate on indigenous knowledge	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Discrimination,</li> <li>• Exploitation,</li> <li>• Dispossession</li> <li>• Miss-Used And</li> <li>• Miss- Appropriation</li> <li>• Violation Of The Right Of Indigenous People</li> </ul>

### Evidence Guide

Critical Aspects of Competence	<p>Demonstrate knowledge attitude and skill to:</p> <ul style="list-style-type: none"> <li>• Use of Digital technology in Agricultural extension</li> <li>• Applies the role of digital technologies in agricultural extension</li> </ul>
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	<ul style="list-style-type: none"> <li>• Implements Adult learning methods</li> <li>• Implements Gender mainstreaming</li> <li>• Facilitates the Exchange of indigenous knowledge</li> <li>• Understands the controversial issues of the debate on indigenous knowledge</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge of -</p> <ul style="list-style-type: none"> <li>• Understands concept of adult learning</li> <li>• Recognize the Principles of Adult learning</li> <li>• Appreciates the importance of Adult learning</li> <li>• Understands the concept of gender</li> <li>• Understands the concept of indigenous knowledge</li> <li>• Understand the Characters of indigenous knowledge</li> <li>• Appreciates the importance of indigenous knowledge</li> <li>• Understands the controversial issues of the debate on indigenous knowledge</li> </ul>
Required Skills	<p>Demonstrates skills:</p> <ul style="list-style-type: none"> <li>• Demonstrates the use of Digital technology in Agricultural extension</li> <li>• Applies the role of digital technologies in agricultural extension</li> <li>• Implements the Adult learning methods</li> <li>• Understands and implements the role of adult learning</li> <li>• Understands and implement the role of gender in agriculture</li> <li>• Implements Gender mainstreaming</li> <li>• Facilitates the Exchange of indigenous knowledge</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and Occupational health and safety (OHS) practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Written Test, Interview, Quiz, Practical assignment</li> <li>• Observation and Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

<b>Occupational Standard: Crop production Level II</b>	
<b>Unit Title</b>	<b>Prevent and Eliminate MUDA</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP2 10 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required by a worker to prevent and eliminate MUDA/wastes in his/her workplace by applying scientific problem-solving techniques and tools to enhance quality, productivity and other kaizen elements on continual basis. It covers responsibility for the day-to-day operation of the work and ensures Kaizen Elements are continuously improved and institutionalized.

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare for work.	<p>1.1. Work instructions are used to determine job requirements, including method, material and equipment.</p> <p>1.2. Job specifications are read and interpreted following working manual.</p> <p>1.3. <i>OHS requirements</i>, including dust and fume collection, breathing apparatus and eye and ear personal protection needs are observed throughout the work.</p> <p>1.4. Appropriate material is selected for work.</p> <p>1.5. <i>Safety equipment and tools</i> are identified and checked for safe and effective operation.</p>

<p>2. Identify MUDA and problem</p>	<p>2.1 Plan of MUDA and problem identification is prepared and implemented.</p> <p>2.2 Causes and effects of MUDA are discussed.</p> <p>2.3 All possible problems related to the process /Kaizen elements are listed using <i>statistical tools and techniques</i>.</p> <p>2.4 All possible problems related to kaizen elements are identified</p> <p>2.5 are used to draw and analyze current and listed on Visual Management Board/Kaizen Board.</p> <p>2.6 <i>Tools and techniques</i> situation of the work place.</p> <p>2.7 Wastes/MUDA are identified and measured based on <i>relevant procedures</i>.</p> <p>2.8 Identified and measured wastes are reported to relevant personnel.</p>
<p>3. Analyze causes of a problem.</p>	<p>3.1 All possible causes of a problem are listed.</p> <p>3.2 Cause relationships are analyzed using <i>4MIE</i>.</p> <p>3.3 Causes of the problems are identified.</p> <p>3.4 The root cause which is most directly related to the problem is selected.</p> <p>3.5 All possible ways are listed using <i>creative idea generation</i> to eliminate the most critical root cause.</p> <p>3.6 The suggested solutions are carefully tested and evaluated for potential complications.</p> <p>3.7 Detailed summaries of the action plan are prepared to implement the suggested solution.</p>
<p>4. Eliminate MUDA and Assess effectiveness of the solution.</p>	<p>4.1. Plan of MUDA elimination is prepared and implemented by <i>medium KPT</i> members.</p> <p>4.2. Necessary attitude and the <i>ten basic principles</i> for improvement are adopted to eliminate waste/MUDA.</p> <p>4.3. Tools and techniques are used to eliminate wastes/MUDA based on the procedures and OHS.</p> <p>4.4. Wastes/MUDA are reduced and eliminated in accordance with OHS and organizational requirements.</p> <p>4.5. <i>Tangible and intangible results</i> are identified.</p> <p>4.6. Tangible results are compared with targets using <i>various types of diagrams</i>.</p> <p>4.7. Improvements gained by elimination of waste/MUDA are reported to relevant bodies.</p>
<p>5. Prevent occurrence of wastes and sustain operation.</p>	<p>5.1. Plan of MUDA prevention is prepared and implemented.</p> <p>5.2. Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement are discussed and prepared.</p> <p>5.3. Occurrences of wastes/MUDA are prevented by using <i>visual and</i></p>

	<p><b>auditory control methods.</b></p> <p>5.4. Waste-free workplace is created using <b>5W and 1H</b> sheet.</p> <p>5.5. The completion of required operation is done in accordance with standard procedures and practices.</p> <p>5.6. The updating of standard procedures and practices is facilitated.</p> <p>5.7. The capability of the work team that aligns with the requirements of the procedure is ensured and trained on the new <b>Standard Operating Procedures (SOPs)</b>.</p>
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Variable	Range
OHS requirements	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Are to be in accordance with legislation/ regulations/codes of practice and enterprise safety policies and procedures. This may include protective clothing and equipment, use of tooling and equipment, workplace environment and safety, handling of material, use of fire fighting equipment, enterprise first aid, hazard control and hazardous materials and substances.</li> <li>• PPE are to include that prescribed under legislation/regulations/codes of practice and workplace policies and practices.</li> <li>• Safe operating procedures are to include, but are not limited to the conduct of operational risk assessment and treatments associated with workplace organization.</li> <li>• Emergency procedures related to this unit are to include but may not be limited to emergency shutdown and stopping of equipment, extinguishing fires, enterprise first aid requirements and site evacuation.</li> </ul>
Safety equipment and tools	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Dust masks/goggles</li> <li>• Glove</li> <li>• Working cloth</li> <li>• First aid and</li> <li>• Safety shoes</li> </ul>
Statistical tools and techniques	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• 7 QC tools May include, but not limited to: <ul style="list-style-type: none"> <li>➤ Stratification</li> <li>➤ Pareto Diagram</li> <li>➤ Cause and Effect Diagram</li> <li>➤ Check Sheet</li> <li>➤ Control Chart/Graph</li> <li>➤ Histogram and Scatter Diagram</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• QC techniques May include, but not limited to: <ul style="list-style-type: none"> <li>➤ Brain storming</li> <li>➤ Why analysis</li> <li>➤ What if analysis</li> <li>➤ 5W1H</li> </ul> </li> </ul>
Tools and techniques	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Plant Layout</li> <li>• Process flow</li> <li>• Other Analysis tools</li> <li>• Do time study by work element</li> <li>• Measure Travel distance</li> <li>• Take a photo of workplace</li> <li>• Measure Total steps</li> <li>• Make list of items/products, who produces them and who uses them &amp; those in warehouses, storages etc.</li> <li>• Focal points to Check and find out existing problems</li> <li>• 5S</li> <li>• Layout improvement</li> <li>• Brainstorming</li> <li>• And on</li> <li>• U-line</li> <li>• In-lining</li> <li>• Unification</li> <li>• Multi-process handling &amp; Multi-skilled operators</li> <li>• A.B. control (Two point control)</li> <li>• Cell production line</li> <li>• TPM (Total Productive Maintenance)</li> </ul>
Relevant procedures	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Make waste visible</li> <li>• Be conscious of the waste</li> <li>• Be accountable for the waste and measure the waste.</li> </ul>
4M1E	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Man</li> <li>• Machine</li> <li>• Method</li> </ul> <p>Material and Environment</p>
Creative idea generation	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Brainstorming</li> <li>• Exploring and examining ideas in varied ways</li> <li>• Elaborating and extrapolating</li> </ul>



	<ul style="list-style-type: none"> <li>• Conceptualizing</li> </ul>
Medium KPT	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• 5S</li> <li>• 4M (Machine, Method, Material and Man)</li> <li>• 4p (Policy, Procedures, People and Plant)</li> <li>• PDCA cycle</li> </ul> <p>Basics of IE tools and techniques</p>
The ten basic principles for improvement	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Throw out all of your fixed ideas about how to do things.</li> <li>• Think of how the new method will work- not how it won.</li> <li>• Don't accept excuses. Totally deny the status quo.</li> <li>• Don't seek perfection. A 50 percent implementation rate is fine as long as it's done on the spot.</li> <li>• Correct mistakes the moment they are found.</li> <li>• Don't spend a lot of money on improvements.</li> <li>• Problems give you a chance to use your brain.</li> <li>• Ask "why?" At least five times until you find the ultimate cause.</li> <li>• Ten people's ideas are better than one person's.</li> <li>• Improvement knows no limits.</li> </ul>
Tangible and intangible results	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Tangible result may include quantifiable data</li> <li>• Intangible result may include qualitative data</li> </ul>
various types of diagrams.	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Line graph</li> <li>• Bar graph</li> <li>• Pie-chart</li> <li>• Scatter diagrams</li> <li>• Affinity diagrams</li> </ul>
Visual and auditory control methods	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Red Tagging</li> <li>• Sign boards</li> <li>• Outlining</li> <li>• And ones</li> <li>• Kanban, etc.</li> </ul>
5W and 1H	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Who</li> <li>• What</li> <li>• Where</li> <li>• When</li> <li>• Why and</li> </ul>

	<ul style="list-style-type: none"> <li>• How</li> </ul>
Standard Operating Procedures (SOPs).	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• The customer demands</li> <li>• The most efficient work routine (steps)</li> <li>• The cycle times required to complete work elements</li> <li>• All process quality checks required to minimize defects/errors</li> <li>• The exact amount of work in process required</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrate knowledge and skills to:</p> <ul style="list-style-type: none"> <li>• Discuss why wastes occur in the workplace</li> <li>• Discuss causes and effects of wastes/MUDA in the workplace</li> <li>• Analyze the current situation of the workplace by using appropriate tools and techniques</li> <li>• Identify, measure, eliminate and prevent occurrence of wastes by using appropriate tools and techniques</li> <li>• Use 5W and 1H sheet to prevent</li> <li>• Detect non-conforming products/services in the work area</li> <li>• Apply effective problem-solving approaches/strategies.</li> <li>• Implement and monitor improved practices and procedures</li> <li>• Apply statistical quality control tools and techniques.</li> </ul>
Required Knowledge and Attitude	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Targets of customers and manufacturer/service provider</li> <li>• Traditional and kaizen thinking of price setting</li> <li>• Kaizen thinking in relation to targets of manufacturer/service provider and customer</li> <li>• value</li> <li>• The three categories of operations</li> <li>• the 3“MU”</li> <li>• wastes occur in the workplace</li> <li>• The 7 types of MUDA</li> <li>• QC story/PDCA cycle/</li> <li>• QC story/ Problem solving steps</li> <li>• QCC techniques</li> <li>• 7 QC tools</li> <li>• The Benefits of identifying and eliminating waste</li> <li>• Causes and effects of 7 MUDA</li> <li>• Procedures to identify MUDA</li> <li>• Necessary attitude and the ten basic principles for improvement</li> <li>• Procedures to eliminate MUDA</li> </ul>

	<ul style="list-style-type: none"> <li>• Prevention of wastes</li> <li>• Methods of waste prevention</li> <li>• Definition and purpose of standardization</li> <li>• Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement</li> <li>• Methods of visual and auditory control</li> <li>• TPM concept and its pillars.</li> <li>• Relevant OHS and environment requirements</li> <li>• Method and Lines of communication</li> <li>• Methods of making/recommending improvements.</li> <li>• Reporting procedures</li> <li>• Workplace procedures associated with the candidate's regular technical duties</li> <li>• organizational structure of the enterprise</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Draw &amp; analyze current situation of the work place</li> <li>• Use measurement apparatus (stop watch, tape, etc.)</li> <li>• Calculate volume and area</li> <li>• Apply statistical analysis tools</li> <li>• Use and follow checklists to identify, measure and eliminate wastes/MUDA</li> <li>• Identify and measure wastes/MUDA in accordance with OHS and procedures</li> <li>• Use tools and techniques to eliminate wastes/MUDA in accordance with OHS procedure.</li> <li>• Apply 5W and 1H sheet</li> <li>• Update and use standard procedures for completion of required operation</li> <li>• Apply Visual Management Board/Kaizen Board.</li> <li>• Detect non-conforming products or services in the work area</li> <li>• Work with others</li> <li>• Read and interpret documents</li> <li>• Observe situations</li> <li>• Solve problems</li> <li>• Communicate information</li> <li>• Gather evidence by using different means</li> <li>• Report activities and results using report formats</li> <li>• Implement and monitor improved practices and procedures</li> </ul>

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.



# *NTQF L- III*

<b>Occupational Standard: Crop Production Level III</b>	
<b>Unit title</b>	<b>Apply Field Crops Establishment and Management</b>
<b>Unit Code</b>	<b><u><a href="#">AGR CRP3 01 03221</a></u></b>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to prepare basic machinery and equipment, assess field crop condition, growth and requirements, prepare for field crop establishment, seeding/sowing the crop, apply fertilizer and amendments, monitor crop maturity requirements, and complete cleaning and hygiene operations.

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare basic machinery and equipment	<p>1.1. Basic <i>Machinery and equipment</i> are selected and confirmed against the <i>work plan</i> and prepared to manufacturer's specifications.</p> <p>1.2. Equipment securely attached and calibrated for operation to manufacturer's specifications.</p> <p>1.3. Existing and <i>potential OHS hazards</i> in the workplace are identified, risks assessed and controlled in line with <i>organization requirements</i>.</p>
2. Assess Field crop condition, growth and requirements	<p>2.1 Crops are <i>monitored to assess moisture and their needs</i> and observations are recorded and reported.</p> <p>2.2 <i>Pest survey and control</i> alternatives are identified in line with crop type and level of infestation present and taking into account expert advice if obtained.</p> <p>2.3 Sites for regular measurement of soil moisture are established in consultation with survey advice.</p> <p>2.4 Soil probe is used to measure moisture levels and soil water moisture percentage calculated.</p> <p>2.5 Water requirements are calculated in line with standing crop and forecast weather conditions.</p>
3. Prepare for Field crop establishment	<p>3.1. Soil and weather conditions are monitored for <i>optimal seeding/sowing conditions</i>.</p> <p>3.2. <b>Soil and water conservation practices</b> are applied before crop establishment.</p> <p>3.3. Seeding, fertilizer, and pest control requirements are confirmed against the work plan and prepared to manufacturers specifications using safe handling procedures.</p>

	<p>3.4. Crop calendar for crops establishment is identified</p> <p>3.5. Irrigation type and method for crop establishment is identified</p> <p>3.6. Contingency plans are prepared for unusual seasonal Conditions.</p>
4. Planting/sowing the crop	<p>4.1 Suitable <b>personal protective clothing and equipment</b> are selected, used and maintained in seeding/sowing operation in accordance with <b>OHS requirements</b>.</p> <p>4.2 Planting/sowing and fertilizer applications are carried out in line with the work plan.</p> <p>4.3 The <b>planting pattern</b> marked and land equivalent ratio is calculated</p> <p>4.4 Pest and weed control and seed treatment is coordinated with planting and fertilizer applications as required.</p> <p>4.5 <b>Environmental implications</b> associated with planting/sowing operations are identified, assessed and controlled in line with organization requirements.</p>
5. Apply fertilizer and soil amendments	<p>5.1. <b>Fertilizer and soil amendments</b> are selected and applied based on recommendations for growth stages and taking into account expertise advice if obtained.</p> <p>5.2. Economic threshold data is identified in line with <b>action</b> targets.</p> <p>5.3. Crop growth stages are assessed, recorded and reported.</p> <p>5.4. Water is applied according to the identified need and the requirement.</p> <p>5.5. Fertilizer application principles are recognised and implemented</p> <p>5.6. The type and amount of soil amendments are applied.</p> <p>5.7. All fertilizer applications are undertaken in the full consideration of adverse environmental impacts.</p>
6. Monitor crop maturity requirements	<p>6.1. Crop growth stages are assessed, recorded and reported</p> <p>6.2. Crop maturity is monitored and the need for further applications is determined.</p> <p>6.3. The <b>crop maturity indicators</b> are identified.</p> <p>6.4. The timing and method of harvest is determined.</p>
7. Complete cleaning and	7.1. Equipment is cleaned in accordance with manufacturer's



hygiene operations	<p>specifications, organizational procedures and regulations.</p> <p>7.2. All containers, leftover fluids, waste and debris from the maintenance and servicing work are disposed of safely and appropriately.</p> <p>7.3. All required records and documentation are completed accurately and promptly in accordance with organizational requirements.</p>
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Variable	Range
Machinery and equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Seed drills</li> <li>• Air seeders</li> <li>• Plough</li> <li>• Harrows</li> <li>• Cultivators</li> <li>• Augers and bins</li> <li>• Row planters</li> <li>• Row maker</li> <li>• Ditcher, ridge maker</li> <li>• Sprayer equipment</li> <li>• Fertilizer applicator or spreader</li> <li>• Chipping hoe</li> <li>• Cultivation equipment and irrigation equipment</li> <li>• Broad bed maker (BBM)</li> <li>• Lime spreader</li> </ul>
Work plan	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Location</li> <li>• Crop type (cereals, pulses, legumes, cotton, oil crops seeds, pasture forage crops seeds) and seeding method</li> <li>• Soil condition (structure, moisture, texture) and soil reaction (acidity, alkalinity)</li> <li>• Seeding Sowing practices (sowing time, sowing seed rate, optimal depth of sowing, seed dressing, tilth to match seed size)</li> <li>• Fertilizer type and method of application</li> <li>• Pest and weed control type and application method</li> <li>• Machinery and equipment</li> </ul>

	<ul style="list-style-type: none"> <li>• reporting and documentation.</li> <li>• Monitoring and evaluation</li> </ul>
Potential OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Exposure to loud noise and fumes,</li> <li>• Solar radiation,</li> <li>• Dust,</li> <li>• Ergonomic hazards associated with posture and vibration,</li> <li>• Hazardous substances,</li> <li>• The presence of bystanders,</li> <li>• Slippery or uneven terrain, potholes, stumps, ditches, gullies,</li> <li>• Embankments, obstacles (rocks, logs, fences, débris),</li> <li>• Adverse weather conditions,</li> <li>• Mechanical malfunctions and exposed moving parts,</li> </ul>
Organization requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Standard operating procedure (SOPs)</li> <li>• Material safety data sheet (MSDs)</li> <li>• Industry standards</li> <li>• Production schedules</li> <li>• Work notes, product labels</li> <li>• Manufacturer’s specifications</li> <li>• Operators’ manuals</li> <li>• Organization policies and procedures (including waste disposal, recycling and re-use guidelines)</li> <li>• OHS procedures</li> <li>• Supervisors oral or written instructions</li> <li>• Work plans.</li> </ul>
Monitoring to assess moisture and their needs	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• They will be monitored using an evaporation pan, rain gauge or other methods.</li> <li>• Visual observation</li> <li>• Moisture tester</li> <li>• Soil probe</li> </ul>

Pest survey and control	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Pest survey refers to watch on the detection of pests for their population dynamics, distribution, incidence, abundance and damage to take up timely crop protection measures</li> <li>• Management/control methods include <ul style="list-style-type: none"> <li>✓ Integrated Pest Management</li> <li>✓ Mechanical methods</li> <li>✓ Cultural methods</li> <li>✓ Physical methods</li> <li>✓ Pesticides applications including <ul style="list-style-type: none"> <li>• Insecticides</li> <li>• Herbicides</li> <li>• Bactericides</li> <li>• Fungicides</li> <li>• Nematocides</li> <li>• Viricides</li> <li>• Avicides</li> </ul> </li> </ul> </li> </ul>
Action	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• All chemical usage and soil amendment practices should be recorded as well as any necessary recording of farm tool and equipment use in logbooks.</li> <li>• Additionally, any assessment of pests and weeds, quality and yield.</li> <li>• Record keeping systems used may be either paper-based or digital and information will be recorded into logbooks or other records.</li> </ul>
Optimal seeding planting/sowing conditions	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Based on the history of seasonal weather providing a reasonable risk for dry seeding/sowing</li> <li>• Soil moisture conditions appropriate for grains crop germination.</li> <li>• Soil temperature appropriate for grains crop germination.</li> </ul>
Soil and water conservation Practices	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Conservation tillage</li> <li>• Contour Farming</li> <li>• Strip Cropping</li> <li>• Windbreaks</li> <li>• Crop Rotation</li> <li>• Cover Crops.</li> </ul>

	<ul style="list-style-type: none"> <li>• Buffer Strips.</li> <li>• Grassed Waterways</li> </ul>
Personal protective clothing and equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Boots, hat/hard hat, overalls, gloves, protective eyewear,</li> <li>• Hearing protection, respirator or face mask, and sun protection (sun hat, sunscreen).</li> </ul>
OHS requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The safe operation and maintenance of machinery and</li> <li>• Equipment including hydraulics and guarding of exposed</li> <li>• Moving parts.</li> <li>• Identify hazards, assessing and reporting risks.</li> <li>• Emergency operating procedures.</li> <li>• Safe lifting, carrying and handling techniques.</li> <li>• Manual handling systems and procedures, handling and</li> <li>• Storage of hazardous substances and grain, and the appropriate use of personal protective clothing and equipment.</li> <li>• Safe systems and procedures for outdoor work including: <ul style="list-style-type: none"> <li>➤ protection from solar radiation,</li> <li>• protection of people in the workplace,</li> <li>• protection from hazardous noise, mechanical</li> <li>• vibration, organic and other dusts,</li> <li>• Protection from fire risk.</li> </ul> </li> </ul>
Planting pattern	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Mono cropping</li> <li>• Mixed cropping</li> <li>• Inter cropping</li> <li>• Alley cropping</li> <li>• Relay cropping</li> <li>• Double cropping</li> </ul>
Environmental implications	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Positive environmental impacts may result from the conduct of sustainable land use practices including stubble retention, minimum tillage, and contour sowing to reduce erosion risks. It may also include the use of non-chemical alternatives for pesticides and cleaning agents, effective water re-use systems and the reduction of noise and exhaust emissions.</li> <li>• Negative environmental impacts may result from high activity vehicle traffic and over-cultivation practices causing erosion,</li> </ul>

	increased water run-off speeds, soil compaction, soil disturbance and loss, soil degradation, dust, contamination of soil and water through the use of fertiliser and chemicals, spray drift, incorrect use and disposal of chemicals and residues, oils and containers, greases, and detergents used in cleaning and maintenance procedures.
Fertilizers and Soil amendments	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Fertilizers are any material (NPS, NPSB, UREA, NPSZn, KCl, Biofertilizer, compost, vermicompost, liquid fertilizers) of natural or synthetic origin applied to the soil to improve the supply of nutrients and directly affecting plant growth.</li> <li>• A soil amendment refers to any material added to the soil to improve its physical or chemical properties (e.g. soil structure, water infiltration), indirectly affecting plant growth.</li> <li>• Fertilizers and other amendments used will be dependent on nutrient levels, trace element, acidity, alkalinity, texture and other physical characteristics of the soil, and the growth stage of the crop.</li> <li>• During fertilizer application the following principles are considered. <ul style="list-style-type: none"> <li>✓ Right source</li> <li>✓ Right amount</li> <li>✓ Right place</li> <li>✓ Right time</li> </ul> </li> </ul>
Crop maturity indicators	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Colour</li> <li>• Moisture content</li> <li>• Compact ears</li> <li>• hard grains</li> <li>• Bolls fully opened</li> <li>• Cropping calendar</li> </ul>

### Evidence Guide

Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Select and utilise various features and controls of a range of equipment to seed and fertilise grains crop.</li> <li>• Knowhow and Use farm tools and equipment,</li> <li>• Assess soil and weather conditions</li> <li>• Identify seed source and quality seed</li> <li>• Identify crop performance and vigour</li> <li>• Determine appropriate planting/sowing methods</li> </ul>
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	<ul style="list-style-type: none"> <li>• Prepare seeds for planting</li> <li>• Ensuring optimum range of depth and density of sowing</li> <li>• Recognise and control hazards,</li> <li>• Evaluate planting/sowing operations and maintain records.</li> <li>• Demonstrate safe workplace and environmentally responsible practices</li> <li>• Apply fertilizers, soil amendments and other chemicals in a sound manner at the right time, place, rate, source and method in the growth cycle for the crop in order that undesirable results and run-off do not occur.</li> <li>• Detect differences and variations in crop health and growth</li> <li>• Observe and report on health and growth of the crop</li> <li>• Read and interpret manufacturer’s specifications, work and maintenance plans, and material safety data sheets.</li> <li>• Communicate ideas and information in dealing with the full range of field staff and industry participants.</li> </ul>
<p>Required Knowledge and Attitudes</p>	<p>Demonstrate knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>• Crop types, preparation of seeds, seeding/sowing methods and application methods</li> <li>• Fertilizer application principles for crop nutrient requirements</li> <li>• Types of herbicides, insecticides and other pesticides, and alternative pest control methods (non-chemical)</li> <li>• Effects of weather conditions (normal and adverse) on seeding and fertilizing applications</li> <li>• procedures for cleaning, securing and storing farm tools, equipment and materials</li> <li>• pre-operational and safety, servicing and maintenance procedures for planting/sowing tools and equipment</li> <li>• General farm tool maintenance procedures</li> <li>• the use and control of machinery/farm tools and equipment</li> <li>• OHS requirements in relation to relevant legislation, regulations and codes of practice</li> <li>• Determine potential hazards associated with the operation of basic tools and equipment</li> <li>• Understand positive and negative environmental impacts and mitigation measures associated with planting/sowing operations</li> <li>• environmental impacts associated with the operation of machinery and equipment</li> <li>• Relevant policies, legislation and regulations with regard to licensing requirements, manufacturer’s instructions and</li> </ul>

	organization procedures
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Crop types, preparation of seeds, Planting/sowing methods and application techniques</li> <li>• Apply fertilizer, herbicides, insecticides, other pesticides and hazardous substances safely</li> <li>• Identify types of pests harmful to crops</li> <li>• perform pre-operational and safety checks, servicing and maintenance on machinery/farm tools and equipment</li> <li>• Calibrate pesticide applications, operate and attach/detach equipment</li> <li>• Demonstrate emergency operating procedures in normal and adverse conditions</li> <li>• Recognize and report machinery/tool/equipment damage, faults or malfunctions and perform minor repairs</li> <li>• Read and interpret manufacturer’s specifications, work and maintenance plans, and material safety data sheets.</li> <li>• Clean, secure and store machinery and equipment</li> <li>• Interpret and apply task instructions</li> <li>• Use mathematical ideas and techniques in: <ul style="list-style-type: none"> <li>➤ fertilizer/pesticide requirements and application rates,</li> <li>➤ calibrating equipment and calculate volumes,</li> <li>➤ Consumption and servicing requirements.</li> <li>➤ Yields and crop quality to estimate the required amounts of farm chemicals and fertilizer.</li> <li>➤ Calculating area, quantity, volume</li> <li>➤ Calculate soil moisture percentage and interpret the result.</li> <li>➤ Calculate the land equivalent ratio and interpret the result.</li> </ul> </li> <li>• implementing seeding operations</li> <li>• Collect, analyse and organize the efficiency and effectiveness of the seeding program</li> <li>• Collect, analyse and organize the information with crop growth performance and maintenance.</li> <li>• Maintenance and repairs to machinery and equipment</li> <li>• Coordinate seeding schedules as required.</li> <li>• Observe and report on health and growth of the crop</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.

Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard: Crop Production Level III</b>	
<b>Unit Title</b>	<b>Horticultural Crops management and Propagation</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP3 02 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to prepare planting plan and implementing horticultural crop management practices. The unit also covers propagation media preparation, parent material selection, understand propagation techniques and undertake propagation.

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare planting plan	<p>1.1. The type of horticultural crop and method(s) of planting are determined from the organizations production manual/management plan and availability of planting material</p> <p>1.2. The resources required for the planting operations are assessed and calculated.</p> <p>1.3. The chemical applications that are required prior to and post planting is selected and organized to occur at an appropriate time</p> <p>1.4. The plan is prepared in line with the overall production plan of the organizations and ensuring any potential environmental impacts, including the proper disposal of containers, drums and other waste</p> <p>1.5. Occupational health &amp; safety hazards are identified, assessed</p> <p>1.6. Any approvals that are required for the planting operations are identified, sought and obtained</p> <p>1.7. Measurable indicators, specifications and targets are determined, based on the production/ management plan and the method, resources, and seed, seedling and cutting to be used.</p>



<p>2. Implement horticultural Crop management</p>	<p>2.1. Measurement and assessment of soil moisture is undertaken to calculate soil water percentage.</p> <p>2.2. Water requirements are calculated according to soil data analysis, standing crop, and forecast weather conditions.</p> <p>2.3. Soil amendments and nutrient requirements for crops are assessed and deficiencies identified.</p> <p>2.4. The planting pattern is marked out according to the production plan.</p> <p>2.5. Factors affecting horticultural crops production are identified.</p> <p>2.6. Sustainable land management is implemented according to horticultural crop specification environmental standards.</p> <p>2.7. Horticultural Crops monitored and planned to maintain water and nutritional requirements for optimal production.</p> <p>2.8. Pest levels are monitored and the control program modified as required.</p> <p>2.9. Benefits from fertilization methods are assessed and documented for analysis in future management programs.</p> <p>2.10. Cropping programs are monitored for efficiency and effectiveness, and documented for future best practice.</p> <p>2.11. Relevant data is documented for continual analysis and effective horticulture crop management.</p>
<p>3. Prepare propagating media</p>	<p>3.1. Media components are selected according to propagation method and plant needs.</p> <p>3.2. Propagation media is tested and treated to ensure the product complies with media specifications</p> <p>3.3. Media and components are handled according to OHS requirements.</p> <p>3.4. Storage requirements for the unused propagation media are selected.</p> <p>3.5. Conditioning and storage requirements are selected to ensure maximum viability of propagating material</p> <p>3.6. Growing site is prepared to suit species and propagation method.</p>
<p>4. Prepare parent material</p>	<p>4.1. Workplace information is interpreted and tasks organized to achieve daily work routine within time constraints.</p> <p>4.2. Tools, equipment and machinery are selected according to propagation method and work procedures.</p> <p>4.3. Parent plant is identified and selected according to health, vigour and desired characteristics.</p> <p>4.4. Parent plant is prepared and the method of taking propagation material suitable to the species is employed in accordance with organizational procedures.</p> <p>4.5. Propagation material is collected according to the species.</p>

	<p>4.6. Viability of materials is maintained by appropriate storage in accordance with the requirements of the species.</p> <p>4.7. Hygiene practices are implemented according to guidelines.</p> <p>4.8. OHS hazards are identified, risks assessed, controls implemented and reported to the supervisor</p>
5. Undertake propagation	<p>5.1. Propagation method is selected in accordance with crop type</p> <p>5.2. Propagation material is prepared according to the propagation method and the characteristics of species.</p> <p>5.3. Propagation techniques are performed according to the selected crop type</p> <p>5.4. Plants are handled to minimize damage.</p> <p>5.5. Records are completed accurately and at the required time in accordance with organizational guidelines.</p> <p>5.6. Out-of-specification process and equipment performance is identified, rectified and/or reported.</p>
6. Complete propagation activities	<p>6.1 Equipments are cleaned as required.</p> <p>6.2 Unused propagation material is disposed of/stored</p> <p>6.3 Waste generated by both the propagation and cleaning procedures is collected, treated, disposed of or recycled.</p> <p>6.4 Workplace information is recorded in the appropriate format.</p>

Variable	Range
Propagation method	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Seed,</li> <li>• Cuttings,</li> <li>• Layering,</li> <li>• Growing on tissue cultured plants,</li> <li>• Division or splitting,</li> <li>• Budding,</li> <li>• Grafting,</li> </ul> <p>Spores and cloning</p>
Propagation media	<p>May include but not limited to</p> <ul style="list-style-type: none"> <li>• sand, potting mix, agar, gravel, scoria, rock wool, gro-wool, sawdust, pine bark, perlite, vermiculite, and water (hydroponics), nursery</li> </ul>
Tools, equipment and machinery	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Shade cloth, plastic fencing, tape, support structures, labels, irrigation equipment, heaters, coolers, fans, vents, fogging/misting systems, screens</li> </ul>

	<ul style="list-style-type: none"> <li>• Secateurs, propagation knives, razor blades and other cutting instruments</li> <li>• Sharpening stone, strop, linear measure, grafting machine, plastic containers and trays, vermiculite boxes, wheelbarrow, trolley, mechanical trolley, shovel, water spray container, dibblers and rubbish bins.</li> </ul>
Parent plant	<p>May include, but not limited to:</p> <p>A plant grown for the purpose of taking cuttings, seeds or offsets in order to grow more quantity of the same plant.</p>
Propagation material	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Cuttings</li> <li>• Buds</li> <li>• Nursery rootstock</li> <li>• Scion</li> <li>• Runners</li> <li>• Rhizomes, tuber, corm, bulb, suckers, seed and mature plants.</li> <li>• spores, tissue cultures</li> <li>• hormones</li> <li>• fungicides</li> </ul>
Hygiene practices	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Hand washing, removing all media and organic matter from production surfaces, tools and equipment.</li> <li>• Disinfecting production surfaces, tools and equipment; disinfecting/sterilizing propagation media.</li> <li>• Disinfestations and removal of plant and media waste, footbaths.</li> <li>• Access restrictions and handling practices which minimize cross contamination, including organizations quarantine policies and legislation.</li> </ul>
OHS hazards	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Air- and soil-borne micro-organisms</li> <li>• Chemicals and hazardous substances</li> <li>• Sharp hand tools and equipment</li> <li>• Manual handling</li> <li>• Solar radiation, dust, noise</li> <li>• Machinery and machinery parts</li> <li>• Slippery and uneven surfaces.</li> </ul>

### Evidence Guide

Critical Aspects of

Demonstrate knowledge, attitude and skills to:

Competence	<ul style="list-style-type: none"> <li>• Select and use appropriate personal protection clothing and/or equipment</li> <li>• Type of horticultural crop and method(s) of planting</li> <li>• <i>Soil treatment/ amendments</i> according to soil test results</li> <li>• Marked planting pattern for horticultural, Stimulants and Spice crops establishment.</li> <li>• calculate nutrient and water requirements according to soil data analysis, standing crop, and forecast weather conditions.</li> <li>• Measurable indicators, specifications and targets</li> <li>• Monitor pest levels</li> <li>• Cropping programs are monitored for efficiency and effectiveness, and documented for future best practice.</li> <li>• Relevant data is documented for continual analysis and effective horticulture crop management.</li> <li>• Select appropriate material for propagation</li> <li>• Use quality specifications for parent plants and propagation materials Preparation</li> <li>• Prepare material for propagation</li> <li>• Select and prepare equipment as required</li> <li>• Identify propagation techniques required for a range of plants</li> <li>• Prepare preferred types of propagation media for different species.</li> <li>• Propagate plants according to instructions</li> <li>• Treat plants after propagation</li> <li>• Store unused propagation material</li> <li>• Take corrective action in response to out-of-specification results or non-compliance</li> </ul>
Required Knowledge and Attitude	<p>Demonstrate knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>• Principles and important considerations to prepare planting plan</li> <li>• Manage and establish horticultural crops</li> <li>• Basic plant physiology including the principles of transpiration, water intake, nutrient uptake, photosynthesis, respiration and translocation</li> <li>• Identify quality root stocks and scion</li> <li>• Importance of selection criteria for rootstock</li> <li>• Stages of the propagation procedure and their purpose</li> <li>• Phytosanitary and quarantine regulation of propagating</li> </ul>

	<p>materials</p> <ul style="list-style-type: none"> <li>• Common problems and corrective action required</li> <li>• Quality specifications for parent plants and propagation materials</li> <li>• Enterprise and industry hygiene standards required for propagation activities</li> <li>• Propagation techniques required for a range of plants</li> <li>• Aftercare requirements for a range of propagated plants</li> <li>• Testing methods applied to propagation media</li> <li>• Preferred types of propagation media for different species.</li> <li>• Operation, components and purpose of the different types of propagation techniques and equipment</li> <li>• Procedures and responsibilities for reporting problem</li> <li>• Environmental issues and controls</li> <li>• Cleaning requirements of work area and equipment</li> <li>• Recording requirements and procedures.</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Prepare planting plan</li> <li>• Calculate input requirements</li> <li>• Calculate water requirements</li> <li>• Establish horticultural crop</li> <li>• Calibrate equipments and tools</li> <li>• Select and use appropriate personal protection clothing and/or equipment</li> <li>• Identify propagation techniques for a range of plants</li> <li>• Select appropriate material for propagation</li> <li>• Prepare parental material</li> <li>• Perform propagation</li> </ul>

	<ul style="list-style-type: none"> <li>• Treat plants after propagation</li> <li>• Identifying and assessing hazards in the work area</li> <li>• Store/remove unused propagation material</li> <li>• Manage and monitor propagated plants</li> <li>• Clean equipment after use.</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

<b>Occupational Standard: Crop Production Level III</b>	
<b>Unit Title</b>	<b>Perform Irrigation Schedule and crop water requirement</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP3 03 0322</u></a>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitude required to monitor plant or crop environment, check water supply and availability, coordinate irrigation shifts, perform irrigation system process, and record irrigation information and activities perform in watering shifts, assist in monitoring factors that influence water requirements and adjust the irrigation schedule to accommodate changes in those factors.</p> <p>This unit also covers determining seasonal irrigation scheduling tasks and defines the standard required to estimate water availability for plants/crops; determine irrigation shifts and rates; monitor and record irrigation data; analyse moisture monitoring equipment data; evaluate effectiveness of irrigation.</p> <p>This unit also requires Implementing, monitoring and adjusting irrigation schedules which requires a knowledge of crop and plant health, weather patterns, irrigation monitoring procedures, soil water retention testing techniques, monitoring irrigation surface runoff and infiltration due to soil type and terrain, water quality monitoring methods and techniques, and water authority standards and procedures.</p>

<b>Element</b>	<b>Performance Criteria</b>
1. Monitor crop environment	<p>1.1. <b>Crop environment are monitored</b> and results interpreted according to organization policy and procedures.</p> <p>1.2. Crops are inspected for signs of stress.</p> <p>1.3. Changes to irrigation shifts are recommended according to environmental conditions and crop requirements.</p>
2. Check water supply and availability	<p>2.1. Type of crop identified and <b>crop water requirement</b> is manipulated</p> <p>2.2. <b>External factors affecting irrigation requirements</b> are recognized</p> <p>2.3. Irrigation schedule is prepared according to water management authority standards and procedures.</p> <p>2.4. Sufficient notice of water order/schedule is given, if necessary, to ensure water is available when required.</p>
3. coordinate irrigation	<p>3.1. Resources are co-ordinated and personnel briefed to deliver</p>

shifts and perform irrigation system	requirements. 3.2. Agreed irrigation schedule is implemented. 3.3. Frequency of irrigation is recorded. 3.4. Water usage is measured and recorded and does not exceed water allocation for a given period. 3.5. Differences between estimated water use and actual water used are calculated. 3.6. <b>Water quality</b> is measured according to Organization <b>occupational health standard (OHS)</b> policy and procedures. 3.7. Plant or crop growth and water use efficiency is assessed. 3.8. <b>Soil chemical characteristics</b> are measured and <b>soil moisture</b> is assessed. 3.9. Labor performance is measured. 3.10. Climate and weather conditions are recorded.
4. Record irrigation information and activities	4.1. Plant or crop environment <b>data</b> is recorded. 4.2 . Water orders/schedules and water usage is recorded. 4.3. Irrigation shifts are recorded. 4.1. System process data are recorded

Variable	Range
Crop environment monitored	May include, but not limited to: <ul style="list-style-type: none"> <li>▪ Drainage</li> <li>▪ Soil moisture</li> <li>▪ Water table levels</li> <li>▪ Soil salinity</li> <li>▪ Rainfall</li> <li>▪ Air temperature</li> <li>▪ Frost risk</li> <li>▪ Water quality</li> <li>▪ Plant/crop and soil nutrient deficiencies, and</li> <li>▪ Irrigation system maintenance requirements.</li> </ul>
Crop water requirement	May include, but not limited to: The depth of water needed to meet the water loss through evapo transpiration of a crop, being disease-free, growing in large fields under non restricting soil conditions, including soil water and fertility, and achieving full production potential under the given growing environment



External factors affecting irrigation requirements	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Pests and vermin (tortoises, ants, spiders, snails, rabbits, hares, foxes, wasps, rose weevil, earwigs, snakes, carp, pigs, wallabies, eels, rats, mice, dogs, cats, parrots)</li> <li>▪ Organic (leaves, slime, weeds, algae, sticks, crop residue)</li> <li>▪ Weather</li> <li>▪ Channel regulators (if applicable)</li> <li>▪ Fire,</li> <li>▪ Mechanical damage (if applicable)</li> <li>▪ Power spikes</li> <li>▪ Power failures</li> <li>▪ Storm, run-off, or system breakage.</li> </ul>
Water quality	<p>May include, but not limited to:</p> <p>Measurements to determine</p> <ul style="list-style-type: none"> <li>▪ Salinity (ground water and surface water)</li> <li>▪ PH level and nutrient concentration.</li> </ul>
Occupational health standard (OHS)	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Systems and procedures for outdoor work including: <ul style="list-style-type: none"> <li>✓ Protection from solar radiation</li> <li>✓ Dust and noise</li> <li>✓ The operation of machinery and equipment,</li> </ul> </li> <li>▪ Selection and use of relevant personal protective clothing and equipment.</li> <li>▪ Protection against chemical residues including that in/on foliage, water, soil and other items.</li> </ul>
Soil chemical characteristics	<p>May include, but not limited to:</p> <p>Chemical characteristics may include:</p> <ul style="list-style-type: none"> <li>✓ pH</li> <li>✓ salinity and</li> <li>✓ Carbonate content.</li> </ul>
Soil moisture	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Direct methods such as physical appearance/texture and rain gauge, or</li> <li>▪ Indirect methods such as tension meters, neutron probes, laboratory tests, weather reports and forecasts.</li> </ul>
Data	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>▪ On graphs and charts, on paper and/or electronically</li> </ul>

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Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>▪ understand watering shifts.</li> <li>▪ Monitor factors that influence water requirements.</li> <li>▪ Perform crop water requirements for different crops types</li> <li>▪ Adjust the irrigation schedule to accommodate changes in those factors.</li> <li>▪ Describe environmental impacts of irrigation using water from any ground or underground source</li> <li>▪ Recognized factors affecting irrigation requirements are</li> <li>▪ Perform soil water retention testing techniques</li> <li>▪ Explain how to monitor irrigation surface runoff and infiltration due to soil type and terrain</li> </ul>
Required Knowledge and Attitude	<p>Demonstrate knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>▪ Understand principles of crop water requirements and scheduling</li> <li>▪ Irrigation monitoring procedures</li> <li>▪ Environmental impacts of irrigation using water from any ground or underground source</li> <li>▪ understand adverse environmental impacts of irrigation</li> <li>▪ Soil water retention testing techniques</li> <li>▪ Water quality monitoring methods and techniques</li> <li>▪ Potable and recyclable water</li> <li>▪ Water allocation</li> <li>▪ Water authority standards and procedures</li> <li>▪ Purchasing procedures, budget restrictions and limits</li> <li>▪ Identify soil chemical characteristics</li> <li>▪ Organization policies and procedures.</li> <li>▪ Communicate ideas and information</li> <li>▪ Report irrigation activities, malfunctions, leaks, damage to water courses and blockages.</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>▪ Use irrigation monitoring equipment</li> <li>▪ Apply activities and appropriate remedial action</li> <li>▪ Access irrigation data</li> <li>▪ Plot and read graphic data</li> <li>▪ Measure and interpret environmental data</li> <li>▪ Estimate water availability for plants/crops</li> <li>▪ Prepare irrigation schedule</li> <li>▪ Read and apply map data to property features</li> <li>▪ Implement and follow relevant Organization and environmental policies and procedures.</li> <li>▪ Collect and organize information</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Check pressure and flow rates, and recording irrigation activities.</li> <li>▪ Plan and organize activities</li> <li>▪ Perform shut down sequence</li> <li>▪ monitor irrigation surface runoff and infiltration due to soil type and terrain</li> <li>▪ Use mathematical ideas and techniques in measuring and interpreting pressure and flow rates.</li> <li>▪ Maintain irrigation canals and equipments</li> <li>▪ Solve problems in identifying and correcting malfunctions, leaks and blockages.</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>▪ Interview/Written Test</li> <li>▪ Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crop Production Level III	
Unit Title	Perform Soil test and apply integrated soil fertility management
Unit Code	<a href="#">AGR CRP3 04 0322</a>
Unit Descriptor	This unit covers the process of performing soil test and applying integrated soil health and fertility management technologies and practices required for agricultural crop production. This unit specifies the competence required to implement to boost productivity of soils crops while maintaining soil health and fertility. The unit involves Soil sampling, conduct soil analysis and interpret results, preparing for Integrated soil fertility management, identify integrated soil fertility management practices and carry out Integrated soil fertility operations. Besides, it includes operation and quality control application issues.

Elements	Performance Criteria
1. Soil sampling and prepare for Integrated soil fertility management	<ol style="list-style-type: none"> <li>1.1. <b>Job sheet or work order</b> is prepared</li> <li>1.2. Field <b>Surveying activity</b> and <b>contractors</b> are identified according to site plans and <b>organization work procedures</b></li> <li>1.3. <b>Sampling operations and techniques</b> are identified and employed according to the procedures.</li> <li>1.4. Sample collection, <b>preparation</b> and <b>labelling</b> of <b>composite soil samples</b> are performed and dispatched according to testing agency requirements and organization work procedures</li> <li>1.5. <b>Precautions</b> during collection and storage of soil samples undertaken according to the guideline</li> <li>1.6. Specifications for <b>Integrated soil fertility technologies and practices</b> are confirmed according to <b>instructions</b> and Organization procedures.</li> <li>1.7. <b>Tools, accessories, Machinery and equipment</b> are selected and prepared.</li> <li>1.8. <b>Integrated soil fertility inputs</b> are selected and checked for serviceability.</li> <li>1.9. Existing and potential <b>Occupational Health and Safety (OHS)</b> hazards are identified.</li> <li>1.10. Suitable <b>personal protective equipment (PPE)</b> is selected, used and maintained.</li> <li>1.11. <b>Data</b> recorded in an established format for soil sample record sheet.</li> </ol>

2. Conduct soil analysis and interpret results	<p>2.1. The <i>physical, chemical and biological characteristics</i> of the soil are determined using <b>mobile soil test kits</b> or other technologies according to practice guidelines</p> <p>2.2. Sampling and testing tools and equipment are cleaned and returned to storage.</p> <p>2.3. Results are recorded in an established format according to organization work procedures</p> <p>2.4. The soil types of the sample area are classified according to standards for soil classification</p> <p>2.5. The acceptable <i>soil physical and chemical parameters</i> for a specified crop are determined</p>
3. Identify integrated soil fertility management practices	<p>3.1. Integrated soil fertility technologies and practices are clearly identified and confirmed.</p> <p>3.2. Required quantities of integrated soil fertility inputs are measured and transported to preparation area.</p> <p>3.3. Inputs required for integrated soil fertility are regularly monitored and checked against specifications and remedial action is taken according to Organization procedures and product specifications.</p> <p>3.4. Integrated soil fertility <b>input Preparation</b> methods and equipment to be used are confirmed.</p> <p>3.5. <i>Operation</i> of integrated soil fertility <b>input application</b> method is selected based on the guidelines and principles.</p>
4. Carry out Integrated soil fertility operations	<p>4.1. Integrated soil fertility inputs are handled and transported.</p> <p>4.2. Integrated soil fertility inputs are applied according to <b>agro ecology, soil type</b>, cropping system and crop type</p> <p>4.3. Input <b>application time</b> is carried out according to the planting plan.</p> <p>4.4. Tools and equipment are cleaned and sterilized.</p> <p>4.5. All containers, leftover fluids, waste and debris are disposed of safely and appropriately.</p> <p>4.6. All required workplace records are completed accurately and promptly in accordance with Organization requirements.</p> <p>4.7. Integrated soil fertility inputs are <b>inspected</b> and checked for their <i>quality, quantity</i> and compliance with job sheet and product requirements.</p> <p>4.8. Integrated soil fertility application methods and <b>results</b> are documented accurately and promptly according to organization procedures.</p>

Variable	Range statement
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Job sheet or work order	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Job number</li> <li>▪ Product batch order and packaging requirements</li> <li>▪ raw materials or product quantity and quality requirements</li> <li>▪ Raw materials preparation (pre-processing) requirements</li> </ul>
Surveying activity	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Collecting, preparing, packaging and labelling soil samples for off-site testing and/or on-site testing and analysis.</li> </ul>
Contractors	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Off-site testing agencies such as government, commercial or private consultants, and contractors engaged for the mechanical extraction of soil samples by the use of machinery such as an auger or backhoe.</li> </ul>
Organization work procedures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• supervisors oral or written instructions,</li> <li>• Organization standard operating procedures (SOP), specifications, routine maintenance schedules, work notes;</li> <li>• product labels and Material Safety Data Sheets (MSDS); manufacturers service specifications and operators' manuals;</li> <li>• waste disposal, recycling and re-use guidelines; and OHS procedures.</li> </ul>
Sampling operations	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Time of sampling</li> <li>• Sampling frequency</li> <li>• Sampling depth</li> </ul>
Preparation	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Measuring quantities</li> <li>▪ Identification of the right material</li> <li>▪ Identification of right place</li> <li>▪ Selection of the right material</li> <li>▪ Setting work order/procedure</li> <li>▪ Timing</li> </ul>
Labelling	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Information of product usage</li> <li>• Detail information of the product such as date of production type of product, expiry date, rate, kg</li> <li>• Compliance with law</li> </ul>
Composite sample	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• A technique that combines a number of discrete samples collected from the field into a single homogenised sample for the purpose of analysis</li> </ul>

Precautions	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Avoid contact of the samples with chemicals, fertilizers, manure, or other contaminants.</li> <li>• Use stainless-steel augers instead of rusted-iron spades for obtaining soil samples for micronutrient analysis.</li> <li>• Do not use containers (bags or boxes) previously used for storing fertilizer, salt, or other chemicals</li> <li>• Store soil samples in clean, preferably new, cloth or polythene bags.</li> <li>• Do not store wet samples for a long time in restricted/closed conditions. Keep soil samples in plastic bags to air-dry by opening and keeping them on a shelf.</li> <li>• Use a glass, porcelain, or polythene jar for long-duration storage.</li> </ul>
Integrated soil fertility technologies	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Acid soil reclamation</li> <li>• Saline and sodic soil reclamation</li> <li>• Conservation Agriculture(Cover crops, minimum tillage, crop rotation)</li> <li>• Vertisols management</li> <li>• Bio saline agriculture implementation for salt affected soils</li> <li>• Use of improved or quality seeds</li> <li>• Improved agronomic practices</li> <li>• Integrated use of organic and inorganic fertilizers <ul style="list-style-type: none"> <li>✓ Blended fertilizers (NPS, NPSB, NPSBZn and Urea</li> <li>✓ Conventional compost</li> <li>✓ Effective microorganism (EMO) for composting</li> <li>✓ vermicompost</li> <li>✓ Farmyard Manure (FYM)</li> <li>✓ Green manuring</li> <li>✓ Bio slurry</li> <li>✓ Animal manure</li> <li>✓ Crop residue management</li> <li>✓ Zero free grazing</li> <li>✓ Woodlot for fire wood and other purpose</li> <li>✓ Animal forage development</li> </ul> </li> </ul> <p>Bio fertilizers</p>
Integrated soil fertility practices	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Application of lime for acidic soils</li> <li>▪ Application of gypsum for salt affected soils</li> <li>▪ Right nutrient management for inorganic inputs and organic fertilizers)</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Application and use of Bio fertilizers, Bio slurry, Farm Yard Manure, Green manure, compost and vermicompost</li> <li>▪ Conservation agriculture practices</li> <li>▪ Use of BBM for vertesoil</li> <li>▪ Use of salt tolerant crop and forage varieties</li> </ul> <p>Use of acid tolerant crop varieties</p>
Instructions	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Standard Operating Procedures (SOPs), company policy and recommendation with regard to input application,</li> <li>▪ Specifications, work notes, Material Safety Data Sheets (MSDS), manufacturer’s instructions, product labels, or verbal directions from the manager, supervisor, or senior operator.</li> </ul> <p>Ccompany policy and procedures in regard input application, specifications, work notes</p>
Tools, accessories, equipment and machinery	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• A tube auger and spade</li> <li>• A screw-type auger</li> <li>• A post-hole auger</li> <li>• Core samplers</li> <li>• Bucket /tray</li> <li>• Soil sample recoding sheet</li> <li>• Pen/pencil</li> <li>• GPS</li> <li>• pH test kit or electronic pH testing device,</li> <li>• hand held salinity or EC meter,</li> <li>• tape measure,</li> <li>• sample bags,</li> <li>• plastic overlays,</li> <li>• aerial photographs,</li> </ul> <p>Charts and tables of soil characteristics and plant soil parameters.</p>
Integrated soil fertility management inputs	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Agricultural lime</li> <li>▪ Gypsum</li> <li>▪ Biofertilizers</li> <li>▪ FYM</li> <li>▪ Compost</li> <li>▪ Vermiworm to produce Vermicompost</li> <li>▪ Lupin for Green manure ing</li> <li>▪ Bio slurry</li> <li>▪ Salt and acid tolerant crop varieties</li> <li>▪ Improved or quality seed</li> </ul>



	<ul style="list-style-type: none"> <li>▪ Blended fertilizer</li> </ul> <p>Urea</p>
Occupational Health and Safety (OHS)	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Disturbance or interruption of services, dust, noise, soil-, air- and water-borne micro-organisms, chemicals and hazardous substances, sharp hand tools and equipment, manual handling, moving vehicles, machinery and machinery parts, flying objects and uneven surfaces.</li> </ul>
personal protective equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Appropriate footwear</li> <li>• Gloves</li> <li>• Hard hats</li> <li>• Equipment and procedures such as:</li> <li>• Procedure guides</li> </ul>
Data	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Sample collector Name, phone , email address</li> <li>• Organization, GPS reading, location</li> </ul> <p>Sample code, sampling depth, slope, production systems,</p>
Physical characteristics of soil	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Color, texture, structure, depth of root zone and depth of water table.</li> </ul>
Chemical characteristics of soil	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• PH, salinity, nutrient content such as N, K, P and carbonate content.</li> </ul>
Biological characteristics of soil	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Soil microbial and faunal activity and ecology in the soil</li> </ul>
mobile soil test kits	<p>May include but not limited to</p> <ul style="list-style-type: none"> <li>• Mobile Soil test equipment used to analyses soil pH, Soil texture, lime requirement, soil organic matter content, soil nutrient content.</li> </ul>
Soil physical parameters	<p>May include but not limited to:</p> <p>Soil texture, Bulk density, Particle density, Soil color, Water-holding capacity</p>
Soil chemical parameters	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Soil total N [%]</li> <li>▪ Soilavailable P [mg/kg soil]</li> <li>▪ pH (1:2.5)</li> <li>▪ EC (1:2.5) [dS/m]</li> <li>▪ Water-soluble K [cmol (c)/kg soil]</li> <li>▪ Exchangeable K [cmol (c)/kg soil]</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Soil organic carbon (SOC) [%]</li> </ul> <p>Cation exchange capacity (CEC) [cmol (c)/kg soil]</p>
Input and sample preparations	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Mix the samples thoroughly and remove foreign materials like roots, stones, pebbles and gravels.</li> <li>• Reduce the bulk to about half to one kilogram by quartering. Quartering - dividing the thoroughly mixed sample into four equal parts</li> </ul>
input application	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Liming for acidic soils</li> <li>▪ Gypsum application for saline soils</li> <li>▪ Green manuring</li> <li>▪ Compost application</li> <li>▪ Vermicompost application</li> <li>▪ Biofertilizer application</li> <li>▪ FYM and bio slurry application</li> <li>▪ Right type, rate, time, and placement of inorganic fertilizers</li> </ul>
agro ecology	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Combining elements of traditional farmers' knowledge with elements of modern ecological, social and agronomic science</li> <li>▪ Reduced use of external inputs <ul style="list-style-type: none"> <li>✓ Integrated use of synthetic fertilizers and variety of organic practices such as crop rotation, composting, green manuring, etc.</li> </ul> </li> <li>▪ Management of pests and diseases through <ul style="list-style-type: none"> <li>✓ Use of Integrated Pest Management,</li> <li>✓ variety of biological substances and prevention measures</li> </ul> </li> <li>▪ Reduced use of Water <ul style="list-style-type: none"> <li>✓ drip irrigation,</li> <li>✓ spot irrigation,</li> <li>✓ controlling freely moving flood, etc</li> </ul> </li> <li>▪ Local and diversified use of seed <ul style="list-style-type: none"> <li>✓ efficient storage and use of seed/planting materials:</li> <li>✓ optimal seed spacing such as transplanting, row planting of seedlings</li> </ul> </li> <li>▪ Reduced waste: <ul style="list-style-type: none"> <li>✓ Reduction of losses at harvesting, processing, storage or post-harvest.</li> </ul> </li> <li>• Improved plant variety: <ul style="list-style-type: none"> <li>✓ Improved plant variety that reduces the use of and/or</li> </ul> </li> </ul>

	dependency on external inputs (water, pesticide, fertilizer, and seed).
Soil type	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Acid soils</li> <li>▪ Saline soils</li> <li>▪ Vertisols</li> </ul>
Application time	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Time of lime and gypsum application</li> <li>▪ Time of fertilizer application</li> <li>▪ Time of organic input application (biofertilizer, compost, vermicompost, bio slurry etc...)</li> </ul>
Inspected	may include but not limited to: <ul style="list-style-type: none"> <li>▪ Quality of product</li> <li>▪ Quantity of product</li> <li>▪ Packaging material</li> <li>▪ Expiry date</li> </ul>
Quality and quantity	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Compost quality parameters</li> <li>▪ Quantity of compost</li> <li>▪ Lime quality parameters</li> <li>▪ Quantity of lime</li> <li>▪ Vermicompost quality parameters</li> <li>▪ Quantity of vermicompost</li> <li>▪ bio slurry quality parameters</li> <li>▪ Quantity of bio slurry</li> </ul> Application rate of inputs and their integration
Results	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Soil health and fertility improvement <ul style="list-style-type: none"> <li>✓ Soil structure improvement</li> <li>✓ Change in soil pH (acidic to neutral)</li> <li>✓ Soil Organic matter increment</li> <li>✓ Yield increment</li> </ul> </li> <li>▪ Nutrient use efficiency</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	Must demonstrate knowledge, skills and attitudes competence to: <ul style="list-style-type: none"> <li>▪ Soil surveying activity and contractors guidelines</li> <li>▪ Principles and techniques of soil sampling operations.</li> <li>▪ Soil sample preparation and labelling according to testing agency requirements and organization work procedures</li> <li>▪ Recognize soil properties and their impact on crop production and</li> </ul>

	<p>productivity</p> <ul style="list-style-type: none"> <li>▪ Recognize, quantify and handle integrated soil fertility inputs</li> <li>▪ Recognize integrated soil fertility technologies and practices and their application</li> <li>▪ Conduct work in a safe and efficient manner</li> <li>▪ Maintain appropriate documentation.</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge of:</p> <ul style="list-style-type: none"> <li>▪ Procedures and principles of soil surveying</li> <li>▪ Procedures and principles of soil sampling</li> <li>▪ Appreciate soil analysis and interpretation of the result</li> <li>▪ Understand soil physical, chemical and biological characteristics.</li> <li>▪ Concepts and operating principles of Integrated Soil Fertility Management(ISFM)</li> <li>▪ Understand crop-based Farming system with respect to agroecology</li> <li>▪ Recognize specifications and standards of Integrated soil fertility practices</li> <li>▪ Recognize technologies used for Integrated soil fertility practices</li> <li>▪ Understand Common practices of Integrated soil fertility technologies</li> <li>▪ Recognize quality parameters of Integrated soil fertility inputs (Lime, Gypsum, bio fertilizers, vermicompost, fertilizers)</li> <li>▪ Hazards in handling materials and additives and appropriate risk control measures</li> <li>▪ Identification of equipment and machineries</li> <li>▪ legislation, regulations and codes of practice with regard to workplace OHS and use and control of hazardous substances</li> <li>▪ Procedures for cleaning, securing and storing machinery, equipment and materials</li> <li>▪ Potential risks and hazards associated with application of integrated soil fertility practices</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>▪ undertake soil survey</li> <li>▪ collect soil sample</li> <li>▪ Interpret agronomic and soil analysis result</li> <li>▪ determine soil physical, chemical and biological properties.</li> <li>▪ communicating with work team and supervisor</li> <li>▪ Demonstrate Integrated soil fertility practices</li> <li>▪ Apply procedures and application of bio fertilizers</li> <li>▪ Measuring and calculating inputs required</li> <li>▪ Determine products quality</li> <li>▪ Demonstrate application methods and time of application</li> </ul>

Resources Implication	The following resources MUST be provided. <ul style="list-style-type: none"> <li>▪ Access is required to real or appropriately simulated situations, including work areas, inputs and equipment,</li> <li>▪ Documentation and information on workplace practice and OHS practices.</li> <li>▪ Specifications and work instructions</li> </ul>
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>▪ Interview / Written Test / Oral Questioning</li> <li>▪ Observation / Demonstration</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

<b>Occupational Standard: Crop Production Level III</b>	
<b>Unit title</b>	<b>Apply Plant Nutrition Program and Fertigation</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP3 05 0322</u></a>
<b>Unit Descriptor</b>	<p>This unit covers the process of implementing a plant nutrition program on agricultural crop production. The work is usually done within a program, routines, methods and the process of operating fertigation equipment to deliver fertilizers via the irrigation system.</p> <p>It requires the ability to include preparing implementation of plant nutrition program materials, connecting, and monitoring soil pH, determining nutritional problems, preparing materials and equipment to apply fertilizers, operate fertigation processes and apply fertilizer application principles. Fertigation equipment Shut down, cleaning of equipment and disposal of waste are also included.</p>

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare for implementation of plant nutrition program	<p>1.1. Goals and target site for implementation of the plant nutrition program including <i>soil fertility status</i>, plant species and varieties are identified according to <i>Organization work procedures</i>.</p> <p>1.2 Materials for soil and plant treatments available to the Organizations are identified and the storage site or supplier details located.</p> <p>1.3 <i>Services</i> are located using site plans and in consultation with the supervisor.</p> <p>1.4 <i>OHS hazards</i> are identified, risks assessed, controls implemented and reported to the supervisor.</p>

	1.5 Suitable <b>personal protective equipment (PPE)</b> is selected, used and maintained.
2 Monitor soil pH	2.1 <b>Soil pH</b> in the implementation site is monitored in relation to plant nutrition and according to organization work procedures. 2.2 Products useful in changing soil pH are identified, compared, selected and sourced according to Organization work procedures. 2.3 Product <b>application methods</b> are assessed according to product type, soils, organization work procedures, and in due consideration of the <b>environmental implications</b> .
3. Determine nutritional problems in plants	3.1 Common <b>plant nutrient deficiency and toxicity</b> problems in plants are identified using visual inspection. 3.2 The supervisor and/or nutritional specialist are consulted, as required, to determine causes of nutritional or toxicity problems. 3.3 <b>Soil ameliorants</b> to improve soil fertility are identified, compared, selected and sourced according to Organization work procedures.
4 Prepare materials and equipment to apply fertilizers	4.1. The right sources of specific products are identified, right rate, time and placement of fertilizer implemented according to the product type and analysis, manufacturers specifications, organization work procedures, and in due consideration of the environmental implications. 4.2. The <b>fertilizer</b> to be used is selected according to fertilizer type, soils, organization work procedures, and in due consideration of the environmental implications. 4.3. Fertilizer application methods are assessed according to fertilizer type, soils, organization work procedures, and in due consideration of the environmental implications. 4.4. <b>Tools, equipment and machinery</b> are selected according to organization work procedures. 4.5. Pre-operational and safety checks are carried out on tools, equipment and machinery according to manufacturer's specifications and organization work procedures. 4.6. Tools, equipment and machinery are calibrated and adjusted according to manufacturers' guidelines and organization work procedures 4.7. Fertilizers are handled and stored safely in a manner that minimizes detrimental environmental impact, and according to organization work procedures.
5. Operate the fertigation process	5.1. Materials are prepared to meet fertigation requirements. 5.2. Injection or fertigation equipment is connected, as directed, and calibrated according to manufacturers' specifications. 5.3. Startup sequence is implemented according to operations

	<p>manual and Organization procedures.</p> <p>5.4. Fertilizer concentration is calculated and the solution thoroughly mixed according to enterprise, OHS and environmental requirements.</p> <p>5.5. Fertigation process is operated and monitored to ensure delivery is maintained according to organization specifications and procedures.</p> <p>5.6. Fertigation are applied according to the plant growing cycle and the organizations fertilizer calendar.</p> <p>5.7. Fertigation equipment is monitored to ensure no adverse environmental impact is caused by faulty operation.</p> <p>5.8. Corrections to the process and equipment adjustments are implemented as necessary.</p>
6. Complete fertigation	<p>6.1. Injection equipment is flushed out according to Organization standards prior to shut down.</p> <p>6.2. Equipment is cleaned according to Organization procedures.</p> <p>6.3. Waste generated by both the fertigation process and cleaning procedures is managed according to environmental protection requirements and Organization OHS procedures.</p> <p>6.4. Fertigation activities are reported and recorded according to regulatory requirements and Organization procedures.</p>

Variable	Range
soil fertility status	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Soil acidity, salinity, soil organic matter</li> </ul>
Organization work procedures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ supervisors oral or written instructions, plant nutrition program, Organization standard operating procedures (SOP), specifications, routine maintenance schedules, work notes; product labels and Material Safety Data Sheets (MSDS); manufacturers service specifications and operators manuals; waste disposal, recycling and re-use guidelines; and OHS procedures</li> </ul>
Services	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Water supply, gas, power (electricity), telecommunications, irrigation, storm water and drainage.</li> </ul>
Occupational Health Standard hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Disturbance or interruption of services, solar radiation, dust, noise, soil-, air- and water-borne micro-organisms, chemicals</li> </ul>

	and hazardous substances, sharp hand tools and equipment, manual handling, moving vehicles, machinery and machinery parts, flying objects and uneven surfaces.
Personal protective equipments	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Hat, boots, overalls, gloves, goggles, respirator or face mask, face guard, spray clothing, hearing protection, sunscreen lotion and hard hat.</li> </ul>
Soil pH	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Soil reaction (acidity, alkalinity and neutral)</li> </ul>
application methods	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Banding, broadcasting, spot application, deep placement foliar application, side dressing ripping, spraying and fertigation.</li> </ul>
Environmental implications	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Over-spraying or run-off into the external environment may result in nutrient overload or excess water to native plants, natural waterways, water tables and ecosystems, water erosion, water logging and salinisation.</li> <li>▪ Responsible fertilization and watering practices may, however, help to reverse previous environmental degradation by allowing natural recovery and regeneration of native ecosystems</li> </ul>
Plant nutrient deficiency and toxicity	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Complete crop failure at the seedling stage.</li> <li>▪ Severe stunting of plants.</li> <li>▪ Specific leaf symptoms appearing at varying times during the season.</li> <li>▪ Internal abnormalities such as clogged conductive tissues.</li> <li>▪ Delayed or abnormal maturity.</li> <li>▪ Obvious yield differences, with or without leaf symptoms.</li> <li>▪ Poor quality of crops, including differences in protein, oil, or starch content, and storage quality.</li> </ul>
Soil ameliorants	May include but not limited to: <ul style="list-style-type: none"> <li>▪ cover crops, animal manures, gypsum and lime, compost</li> </ul>
Fertilizers	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Solids, liquids, which are artificial, organic, applied directly to the soil or to the plant via foliar sprays.</li> </ul>
Tools, equipment and machinery	May include but not limited to: <ul style="list-style-type: none"> <li>▪ Monitoring equipment may include a pH test kit, electronic pH testing device, hand held salinity or EC meter, tape measure, sample bags, plastic overlays, aerial photographs, charts and tables of soil characteristics and plant soil parameters, as well as charts and illustrations of the symptoms of plant nutrient</li> </ul>



	<p>deficiencies and toxicities.</p> <ul style="list-style-type: none"> <li>▪ Application equipment and machinery may include backpack spray equipment, tractors and trailed spreaders, seeders, rippers and spray equipment, pumps and pump fittings, and irrigation systems set up for fertigation.</li> </ul>
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<b>Evidence Guide</b>	
<p>Critical Aspects of Competence</p>	<p>Must demonstrate knowledge, attitude and skills competence to:</p> <ul style="list-style-type: none"> <li>▪ understand plant nutrient deficiencies</li> <li>▪ Familiar with fertilizer application principles</li> <li>▪ assess the nutritional health of plants grown</li> <li>▪ Access and apply appropriate products to plants and soils to meet the goals and objectives of the plant nutrition program.</li> <li>▪ Describe the relationship between soil characteristics and the availability of nutrients, including macro and micro elements, to plants</li> <li>▪ Explain the environmental implications for the external environment of soil ameliorant and fertilizer use, which may include over-spraying, run-off, nutrient overload, erosion, toxicity, noise and dust.</li> <li>▪ communicate with work team members, supervisors, and suppliers,</li> <li>▪ interpret manufacturers and plant nutrition program specifications, utilize proforma reporting, analysis and work procedure documents, and understand labels and symbols</li> <li>▪ estimate treatment and product requirements, material sizes and quantities, interpret specifications, and calculate areas, ratios, proportions and application rates</li> </ul>
<p>Required Knowledge and Attitudes</p>	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>▪ Knowledge of identifying plant nutrient deficiencies</li> <li>▪ Fertilizer application principles</li> <li>▪ Knowledge of integrated use of organic and inorganic fertilizers and</li> <li>▪ Knowledge of soil acidity and salinity</li> <li>▪ The relationship between soil characteristics and the availability of nutrients, including macro and micro elements, to plants</li> <li>▪ Nutrient cycling and its practical relevance to the specific plants and soils used in crop production.</li> <li>▪ Nutrient uptake by plants</li> <li>▪ Nutrients required by plants grown within the organization and the effects of nutrient deficiency and toxicity on individual</li> </ul>

	<p>plant species and varieties, including visual symptoms</p> <ul style="list-style-type: none"> <li>▪ Soil ameliorants commonly required to treat the soil problems experienced by the enterprise</li> <li>▪ The main simple and compound fertilizer products available to the Organization including analysis, solubility, salt index, application rates and costs</li> <li>▪ The environmental implications for the external environment of soil ameliorant and fertilizer use, which may include over-spraying, run-off, nutrient overload, erosion, toxicity, noise and dust.</li> <li>▪ Recognize fertigation injection equipment</li> <li>▪ Understand cleaning procedures for fertigation equipment</li> <li>▪ material safety data sheets (MSDS)</li> <li>▪ OHS issues</li> <li>▪ Organization policies and procedures.</li> </ul>
<p>Required Skills</p>	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>▪ Identify plant nutrient deficiencies</li> <li>▪ Apply Fertilizer application techniques</li> <li>▪ Nutrient budget calculation skills</li> <li>▪ Application of integrated use of organic and inorganic fertilizers</li> <li>▪ Identify soil acidity and salinity problems</li> <li>▪ communicate with work team members, supervisors, and suppliers</li> <li>▪ interpret manufacturers and plant nutrition program specifications, analysis and work procedure documents, and understand labels and symbols</li> <li>▪ calculate areas, ratios, proportions and application rates</li> <li>▪ Plan and organize work activities for the work group</li> <li>▪ Facilitate and leading members of a team to complete the program on time and budget for plant nutrition program in a timely and cost-effective manner</li> <li>▪ Use of mathematical ideas and techniques to calculate and apply the spatial and logistical requirements of the plant nutrition program.</li> <li>▪ Apply problem-solving skills on nutritional deficiencies and toxicities, the selection and sourcing of treatment products.</li> <li>▪ Use of technology to access and apply program specifications, undertake plant nutrition activities, communicate, report and keep records.</li> </ul>

Resources Implication	<p>The following resources MUST be provided.</p> <ul style="list-style-type: none"> <li>▪ Access is required to real or appropriately simulated situations, including work areas, materials and equipment,</li> <li>▪ Documentation and information on workplace practice and OHS practices, and specifications and work instructions</li> </ul>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>▪ Interview / Written Test / Oral Questioning</li> <li>▪ Observation / Demonstration</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting</p>

<b>Occupational Standard: Crop Production</b>	
<b>Unit Title</b>	<b>Apply crop pest management and Disorders</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP3 06 0322</u></a>
<b>Unit Descriptor</b>	This unit of competency covers the knowledge, skills and attitude to assess/survey pest infestation, plan for the implementation of pest control measures, implement control measures and Monitor effectiveness of control measures.

<b>Element</b>	<b>Performance Criteria</b>
1. Survey pest infestation	1.1. Prepare survey equipment(quadrant and GPS) 1.2. Assess scope and size of the infestation and level of damage 1.3. Identify plants <i>pests</i> , disorders, <i>beneficial organisms</i> and <i>natural enemies</i> are reported/recorded in field notes 1.4. Levels of pest infestations tolerated by the market or environment are identified from the <i>Integrated Pest Management (IPM)</i> strategy Economic threshold level of the pests are determined 1.5. Infestation levels, about which plant health or growth objectives are identified and professional advice is obtained according to guidelines
2. Plan for the implementation of pest control measures	2.1. <i>Control measures</i> suitable for the pest infestation and level of damage are selected from Integrated Pest Management (IPM) strategy 2.2. <i>Tools, equipment and machinery</i> are selected from Integrated Pest Management (IPM) strategy 2.3. <i>Occupational Health and Safety hazards</i> are identified, risks assessed, controls implemented and reported 2.4. Suitable <i>Personal Protective Equipment (PPE)</i> are selected, used, maintained and stored 2.5. Control measures selected need to be in full consideration of social and <i>environmental implications</i>
3. Implement control measures	3.1. Control measures are implemented according to the integrated Pest Management(IPM)standards and requirements. 3.2. Implement Integrated Pest Management(IPM) activities according to <i>Occupational Health and Safety (OHS) requirements</i> 3.3. Depending on the size of infestation, control methods are decided

	3.4. A <b><i>clean and safe work area</i></b> is maintained throughout and on completion of each work activity
4. Monitor effectiveness of control measures	<p>4.1 Control operations are monitored to check the control efficiency</p> <p>4.2 Control methods are monitored to identify side effects to other plants, animals or external environment</p> <p>4.3 Assess effectiveness of control methods in reference to specified standards</p> <p>4.4 Implement adjustments to Integrated Pest Management measures, where necessary.</p> <p>4.5 <b><i>Records</i></b> are maintained as required.</p>

<b>Variable</b>	<b>Range</b>
Pests	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Organisms that decrease the quality and quantity of agricultural production and products, such as: <ul style="list-style-type: none"> <li>✓ weeds,</li> <li>✓ insects,</li> <li>✓ diseases,</li> <li>✓ nematodes,</li> <li>✓ rodents and birds);</li> <li>✓ Vertebrate pests</li> <li>✓ Migratory insect pests</li> </ul> </li> </ul>
Beneficial organisms	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Bees</li> <li>▪ Pollinators</li> <li>▪ Beneficial soil organisms</li> <li>▪ Natural enemies</li> <li>▪ parasites</li> <li>▪ parasitoids</li> </ul>
Natural enemies	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Volunteer or cultivated plants that out-compete the weed</li> <li>▪ Insects and other non-vertebrates, and micro-organisms</li> <li>▪ Volunteer or cultivated plants, insects, spiders and microorganisms that out-compete/parasitize the pest</li> <li>▪ Parasitize or predate on the pests and disease relevant to the Integrated Pest Management program</li> <li>▪ Mass rearing</li> </ul>
Integrated Pest Management (IPM)	<p>May include but not limited to:</p> <p>An effective and environmentally sensitive approach to pest management that relies on a combination of biological, cultural, chemical, and physical practices.</p>

Control measures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Targeted chemical application</li> <li>▪ The application of non-chemical controls include: <ul style="list-style-type: none"> <li>✓ organic/ natural ingredient-based sprays(Botanicals)</li> <li>✓ controlled release of predatory organisms</li> <li>✓ Cultural control methods including removal and disposal of pests</li> <li>✓ physical control</li> <li>✓ Biological control</li> <li>✓ Quarantine</li> <li>✓ IPM</li> <li>✓ Control the cause of disorders</li> </ul> </li> </ul>
Tools, equipment and machinery	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ manually operated sprayers (ULV, Knapsack)</li> <li>▪ Boom sprayer tractor mounted/trailed</li> <li>▪ insect traps</li> <li>▪ Pitfall trap</li> <li>▪ plant tissue test kits</li> <li>▪ sampling equipment</li> <li>▪ Drone</li> <li>▪ Phermone trap</li> <li>▪ Light trap</li> </ul>
Occupational Health and Safety hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Chemicals and hazardous substances</li> <li>▪ Noise</li> <li>▪ Dust</li> <li>▪ Solar radiation</li> <li>▪ Falls objects and tripping</li> <li>▪ Overhead power lines</li> </ul>
Personal Protective Equipment /PPE	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Hat</li> <li>▪ Rubber boots</li> <li>▪ Overalls</li> <li>▪ Rubber gloves</li> <li>▪ Goggles</li> <li>▪ Respirator/ face mask/face shield</li> <li>▪ Hearing protection</li> <li>▪ Sunscreen lotion</li> </ul>
Environmental implications	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Beneficial environmental impacts</li> <li>▪ Where reduced and informed targeting of pesticides,</li> <li>▪ Fertilizers and water to the site and recycling within the</li> </ul>

	<p>System, result in minimal escape of contaminants to</p> <ul style="list-style-type: none"> <li>▪ The external environment</li> <li>▪ Beneficial impacts may also result from <ul style="list-style-type: none"> <li>✓ Improved production,</li> <li>Healthier ecosystems,</li> <li>✓ More efficient water and nutrient utilization</li> <li>✓ Reduced pest numbers</li> </ul> </li> <li>▪ Detrimental environmental impacts may arise where Integrated Pest Management activities produce <ul style="list-style-type: none"> <li>✓ Excess noise,</li> <li>✓ Dust or water,</li> <li>✓ The systems do not function effectively because of inadequate implementation techniques</li> </ul> </li> </ul>
Occupational Health and Safety requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Identifying hazards, assessing risks and implementing controls</li> <li>▪ Cleaning, maintaining and storing tools, equipment and machinery</li> <li>▪ Appropriate use, maintenance and storage of PPE including <ul style="list-style-type: none"> <li>✓ Sun protection</li> <li>✓ Safe operation of tools</li> <li>✓ Equipment and machinery</li> <li>✓ Safe handling</li> </ul> </li> <li>▪ Use and store <ul style="list-style-type: none"> <li>✓ pesticides</li> <li>✓ Organically based materials and hazardous substances</li> </ul> </li> <li>▪ Correct manual handling</li> <li>▪ Basic first aid</li> <li>▪ Safety procedures for protection of others and the environment.</li> <li>▪ Personal hygiene</li> <li>▪ Reporting problems</li> <li>▪ posting hazard warning signs</li> </ul>
Clean and safe work areas	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Removing unused tools, equipment and machinery and storing neatly out of the way of Integrated Pest Management activities</li> <li>▪ Correct storage of PPE</li> <li>▪ Safely storing materials on site, and swiftly and efficiently</li> <li>▪ Removing debris and waste from the work area</li> <li>▪ Calculate correct application rates</li> <li>▪ Monitor success of treatments</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Apply economic threshold level for selected crop/pest</li> </ul>
Records	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Types of pests and beneficial organisms present</li> <li>▪ Numbers of pests and beneficial organisms present</li> <li>▪ Treatments applied</li> <li>▪ Date of application</li> <li>▪ Application rates</li> <li>▪ Success of treatments</li> <li>▪ Economic thresholds</li> <li>▪ Accident and dangerous occurrence records</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Pest survey/assessment principles and equipment</li> <li>• Scope, size and level of pest infestation</li> <li>• Identify plants <i>pests</i>, disorders, <i>beneficial organisms</i> and <i>natural enemies</i> <ul style="list-style-type: none"> <li>▪ Principles and guidelines of pest control measures</li> <li>▪ Recognize integrated pest management principles</li> <li>▪ Understand chemical, biological and cultural control methods and available treatments</li> <li>▪ Range and use of tools, equipment and machinery</li> <li>▪ Describe monitoring and analysis techniques that may be used to implement and integrated pest management program</li> <li>▪ Apply occupational health and safety issues and legislative requirements</li> <li>▪ Apply a correct fitting, cleaning and storage of PPE</li> <li>▪ Apply test results and calculate the quantities and application rates of control materials</li> <li>▪ Coordinate work group, contractors and own activities to sequentially and effectively complete integrated pest</li> <li>▪ Manage activities in a timely and cost-effective manner</li> </ul> </li> </ul>
Required Knowledge and Attitude	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>▪ Pest recognition</li> <li>▪ Economic, aesthetic or environmental thresholds for a range of pest</li> <li>▪ Identification of pesticide, biological and cultural control methods and treatments available to the organization within the parameters of an integrated pest management program</li> <li>▪ Principles and guidelines of pest control measures</li> <li>▪ Range and use of tools, equipment and machinery available</li> </ul>



	<p>to the organization for implementing the control measures</p> <ul style="list-style-type: none"> <li>▪ Range of site monitoring and analysis techniques that may be used to implement and integrated pest management program</li> <li>▪ Limitations, environmental implications, end market and horticultural objectives for the site</li> <li>▪ Occupational health and safety issues and legislative requirements associated with hazardous substances, regulations and codes of practice</li> <li>▪ OHS responsibilities of employers and employees</li> <li>▪ Association of integrated pest management methods with site limitations, environmental implications, end market and production or environmental objectives for the site</li> <li>▪ Integrated pest management symbols and information understanding</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>▪ Recognize a range of pests, natural enemies and beneficial organisms</li> <li>▪ Communicate with work team members, supervisors, contractors and consultants</li> <li>▪ Interpret and apply integrated pest management program</li> <li>▪ Cost benefit analysis of pest control managements</li> <li>▪ Select appropriate pest control measures</li> <li>▪ Correct fitting, cleaning and storage of PPE</li> <li>▪ Interpret and apply test results and calculate the quantities and application rates of control materials</li> <li>▪ Coordinate work group, contractors and own activities to sequentially and effectively</li> <li>▪ Manage activities in a timely and cost-effective manner</li> <li>▪ Collect, analyze and organize information on organization work procedures and integrated pest management</li> <li>▪ Interpret, consult and apply management program to coordinate pests</li> <li>▪ Correct wearing/fit of PPE</li> </ul>
Resources Implication	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>▪ Interview/Written Test</li> <li>▪ Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

Occupational Standard: Crops Production Level III	
<b>Unit Title</b>	<b>Perform post-Harvest management for Field Crops</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP3 07 0322</u></a>
<b>Unit Descriptor</b>	This competence standard covers the process of implementing a post-harvest management for field crop. It covers prepare for implementation of post-harvest operations, plan harvest strategy, monitor moisture content, implement harvest schedule, co-ordinate and implement post-harvest treatments, implement hazardous waste disposal guidelines, implement packing and storage requirements of produce.

<b>Element</b>	<b>Performance Criteria</b>
1. Prepare for implementation of post-harvest operations	<p>1.1 <i>post-harvest operations</i> to be performed are identified according to <i>post harvest work procedures</i>, the marketing plan.</p> <p>1.2 <i>Materials, tools, equipment and machinery</i> are selected according to work procedures.</p> <p>1.3 pre-operational and safety checks are carried out on tools, equipment and machinery according to manufacturers Specifications.</p> <p>1.4 <i>OHS hazards</i> are identified, risks assessed, controls Implemented and reported.</p> <p>1.5 Suitable safety and <i>personal protective equipment (PPE)</i> are selected, used and maintained.</p>
2. Plan harvest strategy	<p>2.1 The commencement date and the time span for harvest are estimated, so that the crop will be maintained in optimum condition.</p> <p>2.2 The equipment and labour resources required for harvest are calculated from the size of the land, amount of labour, equipment availability and the time limitations on the harvest.</p> <p>2.3 pre-harvest pest control treatments are to be applied, according to the recommendations of the manufacturer and the legislative requirements.</p> <p>2.4. <i>Order of harvesting</i> is determined, planned, and described in the plan.</p>

3 Monitor moisture content	<p>3.1 Crops are monitored for moisture content against classification standards.</p> <p>3.2 Weather patterns and forecasts are monitored to determine impact on moisture content.</p> <p>3.3 Harvesting operations are adjusted, as required to control moisture in stored crop.</p> <p>3.4 When the ambient conditions cannot bring moisture to market standard, the crop is dried according to the prepared plans for drying and storage.</p>
4. Implement harvest schedule	<p>4.1 The schedules for harvest are reviewed in light of the weather and other conditions immediately before and during the harvest.</p> <p>4.2 Operating hours are managed to suit the resources available throughout the harvest.</p> <p>4.3 Equipment operation is co-ordinated for maximum efficiency, including allowances for downtime, maintenance and servicing requirements.</p> <p>4.4 Operator diaries are collected regularly throughout the harvest to identify any actual or potential maintenance or operator issues.</p> <p>4.5 Any changes that are made to the initial plan are noted and a report made for input to subsequent harvest review and planning.</p>
5. Co-ordinate post-harvest work	<p>5.1 post-harvest works identified and tasks are co-ordinated in a sequential, timely and effective manner.</p> <p>5.2 post-harvest operations are undertaken according to <b>OHS requirements</b> and with due consideration of the <b>environmental implications</b>.</p> <p>5.3 A clean, safe and hygienic work area is maintained throughout and on completion of work.</p>
6. Implement post-harvest treatments	<p>6.1 harvested crop produce is threshed, dried, and transported and stored.</p> <p>6.2 Harvested produce is graded and labelled according to the marketing plan.</p> <p>6.3 Produce that does not meet specifications and produce standards is identified and disposed of according to <b>sector environmental procedures</b>.</p> <p>6.4. <b>Post-harvest treatments</b> are selected according to harvested produce requirements, the integrated pest management strategy and the marketing plan.</p> <p>6.5. Timing, rate, application method, environmental requirements and handling techniques conform to the requirements of the harvested produce.</p> <p>6.6. Post-harvest practices are implemented based on economical, methodological, perspectives to meet established work schedules and</p>

	<p>minimise damage to produce.</p> <p>6.7 Tools, equipment and machinery are cleaned and maintained.</p>
7. Implement packing and storage requirements of produce	<p>7.1 <b><i>Packing and storage requirements</i></b> specified in the marketing plan and production procedures are reviewed and operational tasks determined.</p> <p>7.2 Packing and storage of produce conform to the requirements of the harvested produce, the marketing plan and production best practice.</p> <p>7.3 Packing and storage processes are monitored and remedial action taken where necessary.</p> <p>7.4. Packing and storage processes are recorded according to the production work procedures.</p>
8. Implement hazardous waste disposal guidelines	<p>8.1. Waste disposal requirements of the crop production and principles are reviewed and operational tasks determined.</p> <p>8.2. Collection of waste and disposal are monitored with variation from sector environmental procedures addressed promptly.</p> <p>8.3. Conditions likely to impact on business viability are reported.</p>

Variable	Range
post-harvest operations	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• All crops harvested may be assessed for the estimation of yield. The field crops such as cereals, pulses, oil crops and cotton.</li> <li>• transporting harvested produce from the field to post-harvest processing or storage facilities,</li> <li>• Grading, applying treatments, and packing, labelling and storing harvested produce.</li> </ul>
Post-harvest work procedures	<p>May include but not limited to::</p> <ul style="list-style-type: none"> <li>• Crop harvest instructions and principles,</li> <li>• Post-harvest program or production schedule,</li> <li>• Marketing plan, crop production standard operating procedures (sops),</li> <li>• Specifications,</li> <li>• Routine maintenance schedules,</li> <li>• Work notes;</li> <li>• Crop production best practice guidelines on quality,</li> <li>• Food safety and hygiene;</li> <li>• Product labels and material safety data sheets (MSDS), manufacturers service specifications and operators manuals, waste disposal,</li> <li>• recycling and re-use guidelines, and</li> </ul>

	OHS procedures.
Materials, tools, equipment and machinery	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Materials may include harvesting equipment's, threshing machines, storage technologies, chemicals, gases, cleaning agents, packaging materials and containers, labels, adhesives and performs.</li> <li>• Tools, equipment and machinery may include moisture tester, sickle, combine harvester, tractors, trailers, silos, hermetic bags, threshing machines, trucks, forklifts, snips, knives, gloves, containers, grading machinery, washers, brushes, dryers, chemical applicators, gassing chambers, labelling devices, packing tools, scales, pallets, hand trolleys and lifting aids, cool-rooms and dedicated storage facilities.</li> </ul>
OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• a wet working environment including electricity, solar radiation, dust, pollen, soil-borne micro-organisms, noise, chemicals and hazardous substances, confined spaces, sharp hand tools and equipment, manual handling, slippery or uneven surfaces, and moving equipment, machinery and vehicles.</li> </ul>
PPE	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• hat, boots, overalls, gloves, apron, waterproof clothing, spray clothing, goggles, respirator or face mask, face guard, self-contained breathing apparatus, hearing protection, sunscreen lotion and hard hat.</li> </ul>
Order of harvesting	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Time of maturity, which may be influenced by soil type and crop variety and value, might affect order of harvest.</li> </ul>
OHS requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Throughout the planning and operations for harvesting,</li> <li>• precautions should be taken for control, dust protection,</li> <li>• working in hot weather,</li> <li>• working in confined and enclosed spaces, and working in the vicinity of pesticide residues</li> <li>• identifying hazards,</li> <li>• assessing and reporting risks,</li> <li>• cleaning, maintaining and storing tools, equipment and machinery;</li> <li>• appropriate use of PPE, s</li> <li>• the operation of tools, equipment and machinery,</li> <li>• Ensuring operational safety exits from cool rooms and gassing chambers,</li> <li>• Confined spaces policy and procedures,</li> </ul>

	<ul style="list-style-type: none"> <li>• Safe handling, use and storage of chemicals and hazardous substances,</li> <li>• Correct manual handling,</li> <li>• Basic first aid,</li> <li>• Personal hygiene and reporting problems.</li> </ul>
Environmental implications	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Detrimental environmental impacts may arise where post-harvest activities produce excess noise, dust or water run-off, disposal of unwanted or waste plant material that produces odour and attracts pests, and risks infecting healthy</li> <li>• Crops, or on- and off-site ground water or soils that are contaminated from solids, debris, nutrients, chemicals and water run-off.</li> </ul>
Sector environmental procedures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Procedures for the disposal of out-of-standard produce, waste material such as chemicals and hazardous substances used in post-harvest treatments, their containers, plant debris, litter, processing and cleaning water run-off, and broken components and packaging.</li> <li>• Waste may be removed to designated areas for recycling, reuse, and return to the manufacturer or disposal.</li> </ul>
Post-harvest treatments	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Removal of dirt and foreign material,</li> <li>• Stripping excess leaves and/or trimming, brushing, washing/hydration, drying, applying preservatives,</li> <li>• Applying fungicides and insecticides by spraying or dipping,</li> <li>• Observing quarantine requirements and storing in a controlled environment.</li> </ul>
Packing and Storage requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Packing and storage requirements for specific produce and clients may include specifications for packaging materials and containers, filling techniques and arrangement of produce within the container, and for labelling.</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, attitude and skills competence to:</p> <ul style="list-style-type: none"> <li>• Prepare and implement the harvesting plan and schedule based on harvest maturity</li> <li>• Conduct analysis initially in crop estimation, resource planning and contract negotiating.</li> <li>• Communicate with all the relevant parties in the form of a</li> </ul>

	<p>discussion, to maintain the optimum quality of the crop,</p> <ul style="list-style-type: none"> <li>• Anticipate and prevent or control the possibility of emergencies.</li> <li>• Co-ordinate post-harvest operations;</li> <li>• Implement harvesting, threshing, transportation, drying, post-harvest treatments, hazardous waste disposal guidelines, and packing and storage requirements according sector specifications.</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>• Harvesting operations depending on the moisture levels of the crop, the crop type, and the equipment available.</li> <li>• Capability and use of harvesting equipment</li> <li>• Crop measurement techniques and parameters</li> <li>• Location and relative skills and abilities of available contractors</li> <li>• Management of the moisture content of crops, including drying and aeration</li> <li>• Storage options and local storage availability</li> <li>• Bushfire prevention and control strategies and equipment</li> <li>• Weather conditions which may affect the harvest</li> <li>• Contractor engagement, chemical use and application</li> <li>• Vehicle and plant use</li> <li>• The attributes of produce in relation to the desired quality of produce to be presented to the client</li> <li>• Integrated Pest Management principles and Organization policy</li> <li>• The importance of maintaining the quality of produce including handling and cooling requirements</li> <li>• The relationship between the quality attributes of produce and packing techniques and packaging</li> <li>• Understand standards for packaging</li> <li>• The correct storage temperatures for a range of produce</li> <li>• Humidity levels and their effect on the quality of produce</li> <li>• Hygiene issues in the handling and storage of plant produce</li> <li>• Environmental effects of post-harvest treatments and hazardous waste disposal methodologies, application and purpose</li> <li>• Confined spaces policy and safety procedures.</li> </ul>
Required Skills	<p>Demonstrate Skills to:</p> <ul style="list-style-type: none"> <li>• Plan and implement harvesting and post-harvest operations</li> <li>• organize and schedule the maintenance of machinery and equipment</li> <li>• Establish processes/strategies, procedures and quality controls for crop harvesting</li> <li>• Assess potential yields</li> </ul>

	<ul style="list-style-type: none"> <li>• Interpret and confirm chemical labels, MSDS, work instructions.</li> <li>• Record information about work activities on preform participate in teams and contribute to team objectives</li> <li>• Count and calculate quantities, treatment application rates and storage requirements</li> <li>• Correctly dispose of chemical substances, their containers and other waste materials</li> <li>• Implement post-harvest OHS policy and procedures.</li> <li>• Communicate ideas and information relating to post-harvest activities and problems</li> <li>• Collect, and organize information-post harvest work procedures and client specifications in the marketing plan</li> <li>• Solve problems in produce quality issues, the selection and sourcing of treatments and products,</li> <li>• Use technology to access and apply program specifications, undertake post-harvest activities, communicate, report and keep records.</li> </ul>
Resources Implication	<p>The following resources MUST be provided.</p> <ul style="list-style-type: none"> <li>• Access is required to real or appropriately simulated situations, including work areas, materials and equipment,</li> <li>• Documentation and information on workplace practice and OHS practices, and specifications and work instructions</li> </ul>
Method of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test / Oral Questioning</li> <li>• Observation / Demonstration</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting</p>



Occupational Standard: Crop Production	
Unit Title	Perform post-Harvest management for Horticultural Crops
Unit Code	<a href="#">AGR HCP3 08 0322</a>
Unit Descriptor	This competency standard covers the knowledge, skills and attitude to prepare for implementation of horticultural crop harvest, post-harvest operations, co-ordinate post-harvest activities, implement post-harvest treatments, implement hazardous waste disposal guidelines, implement packing and appearance requirements of produce and Implement storage requirements of produce.

Element	Performance Criteria
1. Plan and implement horticultural crop harvest	<p>1.1 The commencement date and the time span for harvest are estimated, so that the crop will be maintained in optimum condition.</p> <p>1.2 The equipment and labour resources required for harvest are calculated from the size of the land, amount of labour, equipment availability and the time limitations on the harvest.</p> <p>1.3 Harvest is planned based on the <i>maturity indexes</i> for horticultural crops.</p> <p>1.4 The <i>method and order of harvesting</i> is determined, planned, and described in the plan.</p>
2. Prepare for implementation of post-harvest operations.	<p>2.1 <b>post-harvest operations</b> to be performed are identified according to <b>work procedures</b>, the <b>marketing plan</b> and guidelines</p> <p>2.2 <b>Materials, tools, equipment and machinery</b> are Selected according to work procedures.</p> <p>2.3 pre-operational and safety checks are carried out on tools, equipment and machinery according to manufacturers Specifications.</p> <p>2.4 <b>OHS hazards</b> are identified, risks assessed, controls Implemented and reported.</p> <p>2.5. Suitable <b>safety and personal protective equipment (PPE)</b> are selected, used and maintained.</p>
3. Co-ordinate post-harvest activities	<p>3.1 Work team is identified and tasks are co-ordinated in a sequential, timely and effective manner.</p> <p>3.2 post-harvest operations are undertaken according to <i>OHS requirements</i> and with due consideration of the <i>environmental implications</i>.</p> <p>3.3 A <i>clean, safe and hygienic work area</i> is maintained throughout and on completion of work.</p>
4. Implement post-harvest treatments	<p>4.1 Harvested produce is graded and labelled according to the marketing plan and work procedures.</p> <p>4.2 Produce that does not meet specifications and standards is identified and disposed of according to <i>environmental procedures</i>.</p> <p>4.3 <i>Post-harvest treatments</i> are selected according to harvested produce</p>

	<p>requirements, integrated pest management strategy and the marketing plan.</p> <p>4.4 Timing, rate, application method, environmental requirements and handling techniques conform to the requirements of the harvested produce and work procedures.</p> <p>4.5 <b>Post-harvest practices</b> are economical, methodical, meet established work schedules and <i>minimise damage to produce</i>.</p> <p>4.6 Tools, equipment and machinery are cleaned and maintained according to work procedures.</p>
5. Implement hazardous waste disposal guidelines	<p>5.1 Waste disposal requirements are reviewed and operational tasks determined.</p> <p>5.2 Collection of waste and disposal are monitored with variation from environmental procedures.</p> <p>5.3 Conditions likely to impact on business viability are reported.</p>
6. Implement packing and appearance requirements of produce	<p>6.1 <b>Packing and presentation requirements</b> specified in the marketing plan and work procedures are reviewed and operational tasks determined.</p> <p>6.2 Packing and presentation of produce conform to the requirements of the harvested produce, the marketing plan and best practices.</p> <p>6.3 Packing and presentation processes are monitored and remedial action taken where necessary.</p> <p>6.4 Packing and presentation processes are recorded according to work procedures.</p>
7. Implement storage requirements of produce	<p>7.1 <b>Storage requirements</b> specified in the marketing plan and work procedures are reviewed and operational tasks determined.</p> <p>7.2 Storage and handling of produce conform to the requirements of the harvested produce, the marketing plan and best practice.</p> <p>7.3 Storage processes and facilities are monitored and remedial action taken where necessary.</p> <p>7.4 Storage processes and conditions are recorded according to work procedures.</p>

Variable	Range statement
Maturity indexes	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The sign or indication the readiness of the commodity for harvest. It is the basis for determining harvest date. Types of maturity. A. Physiological maturity: It refers to the stage in the development of the fruits and vegetables when maximum growth and maturation has occurred. Maturity indexes include: <ul style="list-style-type: none"> <li>• Shape</li> <li>• Color</li> <li>• Texture/Firmness</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Brix ratio</li> <li>• size</li> </ul>
Order of harvesting	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Time of maturity, which may be influenced by soil type and crop variety and value, might affect order of harvest.</li> </ul>
Method of harvesting	<p>May include but not limited to:</p> <p>Harvesting is the method of collecting a ripe crop from the fields. It is carried out as soon as the plant attains average maturity concerning the useful requirement. Methods includes</p> <ul style="list-style-type: none"> <li>• Hand without the use of any tools</li> <li>• Hand Tools</li> <li>• Machinery</li> </ul>
post-harvest operations	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>➤ Transporting harvested produce from the field to post-harvest processing or storage facilities,</li> <li>➤ grading,</li> <li>➤ applying treatments, and packing,</li> <li>➤ Labelling and storing harvested produce.</li> </ul>
work procedures	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Sound horticultural principles and practices</li> <li>▪ Post-harvest program or production schedule,</li> <li>▪ Marketing plan,</li> <li>▪ Standard operating procedures(SoPs),</li> <li>▪ Specifications,</li> <li>▪ Routine maintenance schedules,</li> <li>▪ Work notes;</li> <li>▪ Best practice guidelines on quality,</li> <li>▪ Food safety and hygiene;</li> <li>▪ Product labels and material safety data sheets (MSDS),</li> <li>▪ Manufacturers service specifications and operators manuals,</li> <li>▪ Waste disposal,</li> </ul> <p>Recycling and re-use guidelines and OHS procedures.</p>
Marketing plan	<p>May include but not limited to:</p> <p>The marketing plan will address client specifications that may include quality of plant produce (and various grades) such as:</p> <ul style="list-style-type: none"> <li>▪ Variety,</li> <li>▪ Shape,</li> <li>▪ Size,</li> <li>▪ Weight,</li> <li>▪ Length,</li> <li>▪ Colour,</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Maturity,</li> <li>▪ Moisture content,</li> <li>▪ Ripeness,</li> <li>▪ Texture,</li> <li>▪ Skin condition,</li> <li>▪ Blemishes,</li> <li>▪ Bud count and health which are subject to seasonal and market forces.</li> </ul> <p>Client preferences may also specify</p> <ul style="list-style-type: none"> <li>▪ Packaging materials,</li> <li>▪ containers,</li> <li>▪ filling techniques,</li> <li>▪ labelling and storage requirements from field to client such as:</li> <li>▪ The cool chain concepts.</li> </ul>
Materials, tools, equipment and machinery	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Preservatives,</li> <li>▪ Chemicals,</li> <li>▪ Gases,</li> <li>▪ Cleaning agents,</li> <li>▪ Packaging materials and containers,</li> <li>▪ Labels,</li> <li>▪ Adhesives</li> <li>▪ Tools, equipment and machinery may include but not limited to: <ul style="list-style-type: none"> <li>▪ Tractors,</li> <li>▪ Trailers,</li> <li>▪ Light trucks,</li> <li>▪ Forklifts,</li> <li>▪ Snips,</li> <li>▪ Knives,</li> <li>▪ Gloves,</li> <li>▪ Containers,</li> <li>▪ Grading machinery,</li> <li>▪ Washers,</li> <li>▪ Brushes,</li> <li>▪ Dryers,</li> <li>▪ Chemical applicators,</li> <li>▪ Gassing chambers,</li> <li>▪ Labelling devices,</li> <li>▪ Packing tools,</li> <li>▪ Scales,</li> <li>▪ Pallets,</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>▪ Hand trolleys and lifting aids,</li> <li>▪ Cold-rooms and dedicated storage facilities.</li> </ul>
OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ A wet working environment including electricity,</li> <li>▪ Solar radiation,</li> <li>▪ Dust,</li> <li>▪ Pollen,</li> <li>▪ Soil-borne micro-organisms,</li> <li>▪ Noise, chemicals and hazardous substances,</li> <li>▪ Confined spaces,</li> <li>▪ Sharp hand tools and equipment,</li> <li>▪ Manual handling,</li> <li>▪ Slippery or uneven surfaces,</li> <li>➤ Moving equipment, <ul style="list-style-type: none"> <li>▪ Machinery and vehicles.</li> </ul> </li> </ul>
Safety equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Warning sign and barriers,</li> <li>▪ Operational safety exits from cool-rooms and gassing chambers.</li> </ul>
PPE	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Hat,</li> <li>▪ Boots,</li> <li>▪ Overalls,</li> <li>▪ Gloves,</li> <li>▪ Apron,</li> <li>▪ Waterproof clothing, goggles,</li> <li>▪ Respirator/face mask,</li> <li>▪ Face guard,</li> <li>▪ Self-contained breathing apparatus,</li> <li>▪ Hearing protection,</li> <li>▪ Sunscreen lotion and hard hat.</li> </ul>
OHS requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Identifying hazards,</li> <li>▪ Assessing and reporting risks,</li> <li>▪ Cleaning,</li> <li>▪ Maintaining and storing tools, equipment and machinery;</li> <li>▪ Appropriate use of PPE,</li> <li>▪ Safe operation of tools,</li> <li>▪ Equipment and machinery,</li> <li>▪ Ensuring operational safety exits from cool-rooms and gassing chambers,</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Confined spaces policy and procedures,</li> <li>▪ Safe handling, use and storage of chemicals and hazardous substances,</li> <li>▪ Correct manual handling,</li> <li>▪ Basic first aid,</li> <li>▪ Personal hygiene.</li> </ul>
Environmental implications	<p>May include but not limited to: Detrimental environmental impacts may arise where post-harvest activities produce :</p> <ul style="list-style-type: none"> <li>▪ Excess noise,</li> <li>▪ Dust or water run-off,</li> <li>▪ Disposal of unwanted or waste plant material that produces dour and attracts pests, and risks infecting healthy crops, or on- and off-site ground water or soils that are contaminated from solids,</li> <li>▪ Debris,</li> <li>▪ Nutrients,</li> <li>▪ Chemicals and water run-off.</li> </ul>
Clean, safe and hygienic work area	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Disabling unused tools,</li> <li>▪ Equipment and</li> <li>▪ Machinery and storing neatly out of the way of post-harvest</li> <li>▪ Activities,</li> <li>▪ Safely storing materials including chemicals on-site, using sign and safety barriers during post-harvest activities</li> <li>▪ Cleaning, fumigating or sterilizing post-harvest equipment and storage facilities, and swiftly and efficiently removing and processing debris and waste from the work area.</li> </ul>
environmental procedures	<p>May include but not limited to: Procedures for the disposal of out-of-standard produce, waste material such as:</p> <ul style="list-style-type: none"> <li>▪ Chemicals and hazardous substances used in post-harvest treatments,</li> <li>▪ Their containers,</li> <li>▪ Plant debris,</li> <li>▪ Litter,</li> <li>▪ Processing and cleaning water run-off,</li> <li>▪ Broken components and packaging.</li> <li>▪ Waste may be removed to designated areas for recycling, reuse, and return to the manufacturer for disposal.</li> </ul>
Post-harvest treatments	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Removal of dirt and foreign material,</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Stripping excess leaves and/or trimming,</li> <li>▪ Brushing,</li> <li>▪ Washing/hydration,</li> <li>▪ Drying,</li> <li>▪ Applying preservatives,</li> <li>▪ Applying fungicides and insecticides by spraying or dipping,</li> <li>▪ Waxing and polishing,</li> <li>▪ Ripening or de-greening with ethylene gas,</li> <li>▪ Observing quarantine requirements and storing in a controlled environment.</li> </ul>
Post -harvest practices	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Employed to minimize damage to the produce</li> <li>▪ Field handling practices may include observing the fill level of containers</li> <li>▪ Lifting rather than dragging containers to avoid contact with dirt</li> <li>▪ Correctly stacking containers on transport to reduce the risk of bruising, squashing or damaging the produce,</li> <li>▪ Smoothly transporting the harvested produce to the post-harvest processing or storage facility.</li> <li>▪ Harvested crops may need to be stored in the shade, in water-filled or covered containers in the field. In the shed storage may occur in a temperature-controlled environment such as a cool-room. These may include forced air cool-rooms for table grapes, hydro cool-rooms for stone fruit and vacuum cool-rooms for mushrooms.</li> <li>▪ Produce damage may be minimized by wearing gloves,</li> <li>▪ Maintaining sharp tools,</li> <li>▪ Placing rather than dropping produce into containers,</li> <li>▪ Cutting fingernails,</li> <li>▪ Observing fill heights,</li> <li>▪ Arrangement of produce and packing instructions for containers, and correctly stacking containers on transport.</li> </ul>
Packing and presentation requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Packing and presentation requirements for specific produce and clients may include specifications for packaging materials and containers,</li> <li>▪ Filling techniques and arrangement of produce within the container, and for labelling.</li> </ul>
Storage requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>▪ Storage requirements for specific produce and clients may include specifications for storage facilities,</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Environmental conditions such as <ul style="list-style-type: none"> <li>✓ Temperature,</li> <li>✓ humidity and light,</li> </ul> </li> <li>▪ Length of storage,</li> <li>▪ Position in the storage facility and cleaning processes</li> <li>▪ To ensure a level of hygiene that protects the quality and health status of the stored produce.</li> </ul>
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<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>A candidate must be able to demonstrate the knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>▪ Identify the maturity indexes of horticultural crops</li> <li>▪ Understand order of harvest</li> <li>▪ Understand climacteric and non-climacteric fruits characteristics</li> <li>▪ Co-ordinate post-harvest operations;</li> <li>▪ Implement post-harvest treatments,</li> <li>▪ Hazardous waste disposal guidelines</li> <li>▪ Packing, presentation and storage requirements according to industry best practice and market specifications.</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>▪ The attributes of produce in relation to the desired quality of produce to be presented to the client</li> <li>▪ Integrated Pest Management principles and organization policy</li> <li>▪ The importance of maintaining the quality of produce including handling and cooling requirements</li> <li>▪ The relationship between the quality attributes of produce and packing techniques and packaging</li> <li>▪ Industry standards for packaging</li> <li>▪ Cool chain principles and practices</li> <li>▪ characteristics and procedures for the use of cool-rooms</li> <li>▪ Storage methods for a range of produce</li> <li>▪ The correct storage temperatures for a range of produce</li> <li>▪ Humidity levels and their effect on the quality of produce</li> <li>▪ hygiene issues in the handling and storage of plant produce</li> <li>▪ environmental effects of post-harvest treatments and hazardous waste disposal methodologies, application and purpose</li> <li>▪ Organization confined spaces policy and safety procedures.</li> </ul>
Required Skills	<p>Demonstrate skill to:</p> <ul style="list-style-type: none"> <li>▪ Identify the maturity indexes</li> <li>▪ Determine order of harvest</li> <li>▪ Identify climacteric and non-climacteric fruits characteristics</li> </ul>



	<ul style="list-style-type: none"> <li>▪ Determine packaging, labelling, transportation and storage</li> <li>▪ Communicate orally and in writing with team members and supervisors</li> <li>▪ Interpret and confirm chemical labels, MSDS, work instructions and Organization work procedures</li> <li>▪ Record information about work activities on performs</li> <li>▪ Count and calculate quantities, treatment application rates and storage requirements</li> <li>▪ manage disposal of chemical substances, their containers and other waste materials to minimize environmental impact</li> <li>▪ Implement Organization OHS policy and procedures.</li> <li>▪ Collect, analyze and organize information-Organization work procedures and client specifications in the marketing plan</li> <li>▪ Plan and organize activities for the work group and self</li> <li>▪ Using mathematical ideas and techniques to calculate and apply the spatial and logistical requirements of the post-harvest program.</li> <li>▪ Solve problems in produce quality issues, the selection and sourcing of treatments and products,</li> <li>▪ Use technology to access and apply program specifications, undertake post-harvest activities, communicate, report and keep records.</li> </ul>
Resources Implication	<p>The following resources must be provided.</p> <ul style="list-style-type: none"> <li>▪ Access is required to real or appropriately simulated situations, including work areas, materials and equipment,</li> <li>▪ Documentation and information on workplace practices and OHS practices.</li> <li>▪ specifications and work instructions</li> <li>▪ Approved assessment tools</li> <li>▪ Certified assessor /Assessor’s panel</li> </ul>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>▪ Practical assessment by direct observation of tasks through simulation/Role-plays</li> <li>▪ Written exam/test on underpinning knowledge</li> </ul> <p>Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge</p>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting. This competency standard could be assessed on its own or in combination with other competencies relevant to the job function</p>

<b>Occupational Standard: Crop Production</b>	
<b>Unit Title</b>	<b>Apply Chemicals and Biological Agents for the Control of pests</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP3 09 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude to apply chemicals and biological agents for the control of weeds, pests and diseases using workplace specific application equipment. The work functions in this standard will be carried out under supervision.

<b>Element</b>	<b>Performance Criteria</b>
1. Apply instructions and maintenance	<p>1.1. <b><i>Pre and post operational checks</i></b> and maintenance on <b><i>application equipment</i></b> are carried out according to manufacturer's specifications and <b><i>procedures</i></b></p> <p>1.2. <b><i>Chemical label</i></b> is interpreted</p> <p>1.3. Measurement and decanting of substances comply with directions</p> <p>1.4. <b><i>Safe working practices</i></b> relevant to the situation are followed</p> <p>1.5. Procedures in the event of a chemical spill are identified and followed</p> <p>1.6. Application and <b><i>Personnel Protective Equipment (PPE)</i></b> are prepared and adjusted for use appropriate to the situation and in accordance with <b><i>Occupational Health and Safety (OHS)</i></b> requirements</p> <p>1.7. Instructions are followed to identify and maintain damaged, non-functioning or worn equipment</p> <p>1.8. OHS hazards are identified and reported to the supervisor</p>
2. Use chemical application equipment	<p>2.1. Potential and existing hazards are identified and minimized safely in a manner consistent with accepted industry practices and/or reported to supervisor or an appropriate authority.</p> <p>2.2. The workplace is maintained to an accepted industry standard and appropriate step to ensure public safety are selected and used.</p> <p>2.3. Safe working practices determined by industry or organization are employed and <b><i>regulations and legislation</i></b> relevant to the situation are observed.</p> <p>2.4. Application Equipment are used to accurately and effectively apply the required dose to the target.</p> <p>2.5. Application details are recorded in accordance with Organization policy, legislative requirements and industry practice.</p> <p>2.6. <b><i>Weather conditions</i></b> are assessed as suitable for the application of</p>

	selected chemical.
3. Apply chemicals & bio-agents	<p>3.1. Chemical labels are interpreted</p> <p>3.2. <b>Hazards</b> are identified and associated risks recognized</p> <p>3.3. Requirements for application equipment to accurately and effectively apply the required dose of the chemical to the target are followed according to correct <b>calibration</b> result.</p> <p>3.4. Suitable Weather conditions are assessed for the application of selected chemical.</p> <p>3.5. Safe working practices relevant to the situation are followed</p> <p>3.6. <b>Classification of pesticides</b> is realized</p> <p>3.7. Equipment and cleanup methods and Instructions are followed using appropriate tools</p>
4. Complete application and record keeping	<p>4.1. Instructions for disposal of containers and unused chemicals or biological agents are identified</p> <p>4.2. Chemical inventory is recorded as instructed and as required by regulations</p> <p>4.3. Chemical <b>application details</b> are reported as instructed and as required by regulations</p>
5. Transport, handle, store chemicals & bio-agents	<p>5.1 Transport, handling and storage requirements for chemicals &amp; bio-agents are recognized and followed</p> <p>5.2 Requirements for storage of chemicals &amp; bio-agents at the workplace are recognized and followed</p>

Variable	Range
Pre and post operational checks	<p>May include weather conditions (e.g.,</p> <ul style="list-style-type: none"> <li>• Wind</li> <li>• Nozzles,</li> <li>• Hoses,</li> <li>• Regulators/gauges,</li> <li>• Respirator cartridges,</li> <li>• Drench, and</li> <li>• Protective clothing and equipment.</li> </ul>
Application equipment	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Knapsacks or hand-held pneumatic sprayers, drench</li> <li>• Guns, spot on applicators, syringes, vehicle mounted sprayers, ULV sprayer or other equipment relevant to the workplace.</li> </ul>
procedures	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Procedures according to the label</li> <li>• MSDSs or legislation.</li> </ul>
Chemical label	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Labeling of chemicals involves determining the hazard</li> </ul>

	category to which the chemical belongs and assigning a codified regulatory phrase describing the type of hazard (hazard statement according to the CLP regulation, risk phrase in the pre-existing regulations)
Safe working practices	May include, but not limited to: <ul style="list-style-type: none"> <li>• Procedures for handling</li> <li>• Transporting and storing chemicals</li> <li>• Selecting and using personal protective clothing and equipment</li> <li>• Safe operation of machinery and equipment</li> <li>• Safe procedures for applying chemicals and following manufacturer's instructions.</li> </ul>
Personal Protective Equipments	May include, but not limited to: <ul style="list-style-type: none"> <li>• Boots, overalls, chemical resistant gloves, aprons, face shields, Respirators or hats.</li> </ul>
OHS Hazards	May include, but not limited to: <ul style="list-style-type: none"> <li>• Hazards will be listed on labels and the MSDSs for the chemical concerned and may include flammability</li> <li>• Toxicity, health hazards, damage to non-target organisms</li> <li>• Environmental damage or residues in food or feedstuffs.</li> </ul>
Regulations and legislation	May include, but not limited to: <ul style="list-style-type: none"> <li>• Pesticides Acts</li> <li>• Occupational Health and Safety Acts and associated Hazardous Substances Regulations/ Codes of Practice</li> <li>• Dangerous Goods Acts</li> <li>• Poisons Schedule or Protection of the Environment Acts.</li> </ul>
Weather conditions	May include but not limited to: <ul style="list-style-type: none"> <li>• wind speed and direction</li> <li>• Environmental temperature</li> <li>• Humidity</li> <li>• Cloudiness.</li> </ul>
Calibration	May include but not limited to: Calibration is an operation that relates an output quantity to an input quantity for a measuring system under given conditions.
Classification of pesticides	May include but not limited to: <ul style="list-style-type: none"> <li>• Based on: <ul style="list-style-type: none"> <li>❖ <b>Type of pest they control</b> <ul style="list-style-type: none"> <li>➤ Herbicides</li> <li>➤ Insecticides</li> <li>➤ Fungicides</li> <li>➤ Avicides</li> </ul> </li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>➤ Bactericides</li> <li>➤ Rodenticides</li> <li>❖ <b>Time of application</b> <ul style="list-style-type: none"> <li>➤ Pre-emergence</li> <li>➤ Post-emergence</li> </ul> </li> <li>❖ <b>Physical state</b> <ul style="list-style-type: none"> <li>➤ Powder</li> <li>➤ Liquid</li> <li>➤ Granuel</li> <li>➤ Gas</li> </ul> </li> <li>❖ <b>Mode of action</b> <ul style="list-style-type: none"> <li>➤ Selective</li> <li>➤ Non selective</li> <li>➤ Contact</li> <li>➤ Systemic</li> <li>➤ Stomach poison</li> </ul> </li> </ul> <ul style="list-style-type: none"> <li>• This unit excludes classification of pesticides based on their basic chemical element content and their persistence to the environment</li> </ul>
Application details	May include details such as time, date, quantity and type of chemical, weather, application equipment, host and pest, accidents or dangerous occurrences may be recorded or must be recorded where required by legislation.

<b>Evidence Guide</b>	
Critical Aspects of Competence	Demonstrate knowledge, attitude and skills to: <ul style="list-style-type: none"> <li>• Use the correct equipment,</li> <li>• Apply the chemical correctly,</li> <li>• Record application,</li> <li>• Identify safety hazards and how to avoid them,</li> <li>• Interpret and follow directions.</li> <li>• Work using a variety of chemical and bioagent application tools and pieces of equipment</li> <li>• Respond to emergencies and apply first aid in the event of pesticide poisoning</li> <li>• Communicate ideas and information about chemicals and how they will be applied and recorded</li> <li>• Principles and guidelines of transport, handling and storage requirements for chemicals &amp; bio-agents</li> </ul>
Required Knowledge	Demonstrate knowledge and attitude of:

and Attitude	<ul style="list-style-type: none"> <li>• Environmental effects of selected chemicals and how to minimize damaging effects of chemicals.</li> <li>• Different broad chemical types, e.g., insecticides, herbicides and fungicides and their mode of action symbols on the label.</li> <li>• Paths of entry of poisons into the body and methods of limiting exposure.</li> <li>• Methods of minimizing risk during application.</li> <li>• PPE and how, when and why it should be used and stored.</li> <li>• Relevant legislation, regulations and Codes of Practices with regard to hazardous substances or the use of chemicals.</li> <li>• Principles and guidelines of transport, handling and storage requirements for chemicals &amp; bio-agents</li> <li>• Occupational Health and Safety concerning personal safety and safety of others in the workplace.</li> <li>• Use of chemicals as one tool of pest management.</li> <li>• Possible effects on health of bystanders/public in addition to applicators.</li> <li>• Weather conditions and means of assessing them in line with risks, and recognizing when they become unsuitable for application to continue.</li> </ul>
Required Skills	<p>Demonstrate Skills to:</p> <ul style="list-style-type: none"> <li>• Accurately interpret labels, operator manuals, or from Codes of Practice and record relevant information</li> <li>• Measure application amounts.</li> <li>• Identify type of chemicals</li> <li>• Chemical calibration</li> <li>• Work using chemical application tools and equipment</li> <li>• Safe and environmentally responsible work practices.</li> <li>• Respond to emergencies and apply first aid in the event of pesticide poisoning</li> <li>• Communicate ideas and information about chemicals and how they will be applied and recorded</li> <li>• Correct wearing of PPE.</li> <li>• Maintenance of tools and equipment.</li> <li>• Plan and organize activities</li> <li>• Cleaning up of chemicals</li> <li>• Use mathematical ideas and techniques to apply, recording information and working out time periods before work can continue in the area.</li> <li>• Transport, handling and storage chemicals &amp; bio-agents</li> </ul>

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crop production Level III	
Unit Title	Apply Digital Technology in Agriculture.
Unit Code	<a href="#">AGR CRP3 10 0322</a>
Unit Descriptor	This unit covers the knowledge, skills and attitude required to Understand the Concept of digital technology, apply Digital technologies among rural population and recording and documentation system.

Element	Performance Criteria
1. Understand the Concept of digital technology	<p>1.1. <i>Digital technologies</i> are understood to apply digital technology.</p> <p>1.2. <i>Importance of digital technologies</i> are understood in agricultural sector</p> <p>1.3. <i>Role of digital technologies</i> in agriculture is identified to enhance agricultural development.</p> <p>1.4. <i>Principles of Agricultural technology</i> are identified to apply in the agricultural sector</p> <p>1.5 Mobile/Smart phones and template functions are understood to collect data and use in the reporting system</p>
2. Apply Digital technologies among rural population and farmers	<p>2.1. Require <i>tools and equipment</i> are identified and coordinated to apply digital technologies</p> <p>2.2. Digital technology <i>infrastructures</i> are identified to implement in agricultural development</p> <p>2.3. Digital technology skills are developed among the rural population</p> <p>2.4. Digital <i>Agri-preneurial</i> skill is developed for agricultural transformation.</p> <p>2.5. <i>Digital technology communication tools are</i> used to collect data and reporting system</p> <p>2.6. Digital technologies, tools and <i>techniques</i> are used to deliver digital education</p>

	2.7. Implementation of digital technologies is promoted to enhance productivity
3. Recording and documentation	<p>3.1. <i>Data collecting formats</i> are developed based on the needs</p> <p>3.2. <i>Data collection methodologies</i> are identified and selected based on the intended objectives</p> <p>3.3. Collected data are organized, analyzed and interpreted based on the intended objectives</p> <p>3.4. Organized, analyzed and interpreted data are documented and reported</p> <p>3.5. Feedbacks are collected from the relevant stakeholders</p>

Variable	Range
Digital technologies	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Internet</li> <li>• Computer</li> <li>• Smart phone</li> <li>• Tablet</li> <li>• GPS</li> <li>• Web browser</li> </ul>
Importance of digital technologies	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Sharing and searching information</li> <li>• Collect data</li> <li>• Enable storage of massive information</li> <li>• Time saving</li> <li>• Cost minimizing</li> <li>• Data accuracy and reliability</li> <li>• Data centralizing and administration</li> <li>• Improve collaboration</li> <li>• Enhance creativity</li> <li>• Enhances work accuracy</li> </ul>
Role of digital technologies	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Create connectivity between operations</li> <li>• Facilitate communication in agricultural sectors</li> <li>• Globalize communication</li> <li>• Strengthen market linkage</li> </ul>
Principles of Agricultural technology	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Design with user</li> <li>• Understand the existing ecosystem</li> <li>• Design for scale</li> <li>• Build for sustainability</li> <li>• Data driving</li> </ul>



	<ul style="list-style-type: none"> <li>• Reuse and improve</li> <li>• Address privacy and security</li> <li>• Collaborative</li> </ul>
tools and equipment	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Chargers</li> <li>• Computer</li> <li>• Smart phone</li> <li>• Tablet</li> <li>• I pad</li> <li>• GIS</li> <li>• Website</li> <li>• Online resources</li> <li>• Digital programs</li> </ul>
infrastructures	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Telecommunications utilities</li> <li>• Electricity power</li> <li>• Server</li> <li>• Information and communication Technologies</li> <li>• Mobiles Phones</li> <li>• Computers systems</li> </ul>
Agri-preneurial	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Online marketing</li> <li>• Online Learning</li> </ul>
Digital technology communication tools	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Smart phone</li> <li>• Cell phone</li> <li>• Email</li> <li>• Telegram</li> <li>• SMS</li> <li>• What's APP</li> </ul>
technique	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Video chat</li> <li>• Virtual meeting</li> <li>• E-learning</li> <li>• Email</li> <li>• Video conference</li> </ul>
Data collecting formats	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Google sheet</li> <li>• Templates</li> <li>• Ex-cell</li> <li>• Google drive storage</li> </ul>

Data collection methodologies	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Interview</li> <li>• Questionnaire</li> <li>• Surveying</li> <li>• Focus group discussion (FGD)</li> <li>• Case study</li> </ul>
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<b>Evidence guide</b>	
Critical aspects of competence	<p>Demonstrate knowledge and skills on:</p> <ul style="list-style-type: none"> <li>• Understand the basic digital technologies.</li> <li>• Use mobile/Smart phones and template to collect data and reporting the data</li> <li>• Understand the basic digital technology communication tools.</li> <li>• Identify the require tools and equipment to apply digital technologies</li> <li>• Apply digital technology</li> <li>• Understand the basic virtual meeting.</li> </ul>
Required knowledge and attitude	<p>Demonstrate knowledge on:</p> <ul style="list-style-type: none"> <li>• Understand the basic digital technology communication tools.</li> <li>• Understand the basic digital technologies.</li> <li>• New or upgraded technology performance</li> <li>• Environmental considerations</li> <li>• Appropriate performance evaluation.</li> </ul>
Required skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Use Digital technology communication to collect data and report system</li> <li>• Use digital technologies applications</li> <li>• Use software applications (word processing, spread sheets, data base management</li> <li>• Apply skills for accessing and using spreadsheets and databases</li> <li>• Literacy skills for data analysis and interpretation</li> <li>• Determine and confirm digital technology communication tools.</li> </ul>
Resources implication	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/written test</li> <li>• Observation/demonstration with oral questioning</li> </ul>
Context of assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

# ***NTQF L- IV***

Occupational Standard: Crop Production Level IV	
Unit Title	Manage Integrated Soil Fertility Management Technologies and Practices
Unit Code	<a href="#">AGR CRP4 01 0322</a>
Unit Descriptor	<p>This unit specifies the knowledge, skills and attitude required to manage Integrated soil Fertility management principles and practices in crop sub sector.</p> <p>This unit includes selection of appropriate integrated soil fertility management strategy, determination of relevant soil health and fertility management technologies, requirements for soil health and fertility improvement, implementation of agro ecology elements in production systems, and documentation of soil health and plant nutrition programs. Besides, monitoring and evaluation of soil health, fertility and crop production program included in this unit of competency.</p>

Element	Performance Criteria
1. Select appropriate integrated Soil Fertility Management (ISFM) strategy	<p>1.1. Site specific and profitable ISFM practices are determined</p> <p>1.2. Key <i>socio-economic and biophysical contexts</i> affecting ISFM approaches are identified</p> <p>1.3. Main <i>socio-economic and biophysical challenges</i> are recognized</p> <p>1.4. <i>Local adaptation</i> is required to effectively adapt ISFM practices</p>
2. Determine relevant soil health and fertility management technologies for crop production	<p>2.1. Goals and target site for assessment and development of program are defined following a review of organization production plan and in consultation with owner.</p> <p>2.2. Relevant soil, agronomic, climate, environmental contexts and site data are accessed and reviewed.</p> <p>2.3. Appropriate <i>soil, plant and water tests</i> are determined based on laboratory results according to plant species, climatic conditions, prevailing growth media, industry best practice and enterprise guidelines.</p> <p>2.4. Testing tasks are implemented and monitored, liaison procedures with outside testing agencies are supervised, and remedial action is undertaken where necessary.</p> <p>2.5. Characteristics, condition and nutritional status of soils and <i>plant species under production</i> are determined by analysing collected data and comparing to accepted standards.</p> <p>2.6. Appropriate Integrated soil fertility technologies are identified and determined based on agro ecological principles</p>

<p>3. Determine the requirements for soil health and fertility improvement for crop production</p>	<p>3.1. <b>Integrated soil fertility management principles</b> are identified and included in the production system</p> <p>3.2. <b>Improved Agronomic</b> practices employed to achieve the maximum return to investments</p> <p>3.3. Program is developed to achieve appropriate soil conditions and nutrient availability for plant production based on crop production plan.</p> <p>3.4. <b>Soil amendment</b> management practices are determined and implemented.</p> <p>3.5. <b>Agronomic efficiency (AE)</b> calculated to measure the amount of additional yield obtained per kilogram of nutrient applied</p> <p>3.6. Cost-effective approach to soil management, soil amendment, and provision of plant nutrients is determined.</p> <p>3.7. <b>Environmental implications</b> of program are identified and documented in plant nutrition program.</p> <p>3.8. <b>OHS hazards</b> associated with program are identified, risks are assessed, and <b>controls</b> are developed and documented.</p> <p>3.9. <b>Resources, tools, equipment and machinery</b> required for program are identified and costed, and availability is confirmed with suppliers and appropriate personnel.</p>
<p>4. Implement agro ecology principles and elements in production systems</p>	<p>4.1. Agro ecological <b>diversity</b> for sustainability is identified</p> <p>4.2. Knowledge of agro ecological practices that are tailored to fit the environmental, social, economic, cultural and political context are identified</p> <p>4.3. Diversified systems that selectively combine all <b>components</b> to enhance <b>synergies</b> in the context of an increasingly changing climate.</p> <p>4.4. Biological, socio-economic and institutional diversity are aligned in time and space to support greater <b>efficiency</b>.</p> <p>4.5. Resource-use efficiency is implemented to reduce costs and the negative environmental impacts</p> <p>4.6. <b>Recycling</b> of nutrients, biomass and water within production systems, is implemented to increase resource use efficiency and minimize waste and pollution.</p> <p>4.7. Identify and implement agro ecology principles and elements</p>
<p>5. Document the soil health and plant nutrition program and specifications</p>	<p>5.1. Detailed plan, objectives, specifications and associated costs are established based on program requirements.</p> <p>5.2. Detailed on-site procedures and schedules required for program are developed and documented.</p> <p>5.3. <b>Agronomic and soil data</b> are recorded for future planning and</p>

	intervention
6. Monitor and evaluate soil health, fertility and crop production program	<p>6.1. Program implementation and results are monitored by soil health and fertility improvement, crop production and productivity increment.</p> <p>6.2. Program is reviewed and refined to ensure its responsiveness to changing conditions.</p> <p>6.3. Non-compliance with documented objectives and specifications is identified</p> <p>6.4. Remedial action to improve soil health, fertility and plant nutrition is taken, documented and reported to appropriate personnel according to enterprise plan.</p> <p>6.5. Feed backs and Changes are incorporated into a detailed plan.</p>

Variable	Range
Socio-economic and biophysical contexts	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• High returns – high potential</li> <li>• High returns – low potential</li> <li>• Poor returns – high potential</li> <li>• Poor returns – low potential</li> </ul>
socio-economic challenges	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The price of inorganic fertilizer</li> <li>• Limitations of organic soil fertility options</li> <li>• The control of free grazing</li> <li>• Shortage of credit facilities</li> </ul>
biophysical challenges	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Soil variability and variations of responsiveness of soil</li> <li>• scarcity of organic residues and competition for residues with livestock</li> <li>• Limited availability of biomass</li> <li>• Distinct variations in input responsiveness across different land types</li> </ul> <p>Climate change</p>
Local adaptation	<p>May include, but not limited to:</p> <p>Variability/ Differences in responsiveness of soils for agricultural inputs</p>
Soil, plant and water Tests	<p>Conducted as part of a plant nutrition program May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Acidity or alkalinity (Ph)</li> <li>• Cation exchange capacity</li> <li>• Nutrient and carbonate content</li> <li>• Salinity</li> <li>• On-site testing and off-site analysis of growth media to determine physical characteristics such as:</li> </ul>

	<ul style="list-style-type: none"> <li>➤ colour</li> <li>➤ depth of root zone</li> <li>➤ depth of water table</li> <li>➤ plant available water</li> <li>➤ soil organic matter</li> <li>➤ structure</li> <li>➤ texture</li> <li>• Testing nutrient status of plants through: <ul style="list-style-type: none"> <li>➤ establishing likely effects on soil chemical and physical characteristics</li> <li>➤ plant tissue testing</li> </ul> </li> </ul> <p>Testing water for suitability for plant growth.</p>
Plant species under production	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Cereals</li> <li>• Pulse</li> <li>• Bulbs</li> <li>• Containerized, field planted and stock specimens</li> <li>• Flowers and foliage</li> <li>• Fruit and vegetables</li> <li>• Herbs</li> <li>• Indigenous and exotic species and varieties</li> <li>• Nuts</li> <li>• Oil crops</li> <li>• Tubers</li> <li>• Root crops</li> <li>• Vines and canes</li> </ul>
Integrated soil fertility management principles	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• A set of soil fertility management principles necessarily include the use of <ul style="list-style-type: none"> <li>✓ fertilizer</li> <li>✓ organic inputs and</li> <li>✓ improved germplasm combined with the knowledge on how to adapt these practices to local conditions,</li> <li>✓ aiming at optimizing agronomic use efficiency of the applied nutrients and</li> <li>✓ improving crop productivity</li> </ul> </li> </ul>
Improved Agronomic practices	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• use of appropriate varieties,</li> <li>• appropriate land preparation,</li> <li>• use of organic inputs and inorganic fertilizers</li> <li>• spacing, planting dates and practices,</li> <li>• weeding, pest and disease management practices</li> <li>• appropriate cropping system arrangements.</li> </ul>
Soil amendments	<p>May include, but not limited to:</p>

	<ul style="list-style-type: none"> <li>• Animal manures</li> <li>• Composts</li> <li>• Cover crops</li> <li>• Gypsum</li> <li>• Lime</li> <li>• Materials to modify soil Ph</li> <li>• Mulches</li> </ul> <p>Soil amendments to improve chemical, physical and/or biological properties of soil to meet requirements of plant production.</p>
Agronomic efficiency	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Measuring the amount of additional yield obtained per kilogram of nutrient applied.</li> </ul>
Environmental implications	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Beneficial impacts, including minimization of nutrient</li> <li>• Run-off and toxic side effects in soil and surrounding environment achieved by: <ul style="list-style-type: none"> <li>➤ improved application techniques and rates</li> <li>➤ improved assessment and targeting of nutrient requirements</li> </ul> </li> <li>• Reduction of toxic side effects of applied nutrients in crop plants</li> <li>• Negative impacts, including over-spraying or run-off into external environment resulting in nutrient overload or excess water affecting things such as: <ul style="list-style-type: none"> <li>➤ loading atmosphere with greenhouse gas</li> <li>➤ mining native soil fertility</li> <li>➤ native plants</li> <li>➤ natural waterways</li> <li>➤ salinization</li> <li>➤ water erosion</li> <li>➤ water logging</li> <li>➤ water tables and ecosystems</li> </ul> </li> <li>• Methods which may aid in reversal of environmental degradation include: <ul style="list-style-type: none"> <li>➤ allowing natural recovery and regeneration of native ecosystems</li> </ul> </li> </ul> <p>Responsible fertilization and watering practices.</p>
OHS hazards	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Polluted air</li> <li>• Chemicals and hazardous substances</li> <li>• Disturbance or interruption of services</li> <li>• Dust</li> <li>• Incorrect manual handling</li> <li>• Machinery and machinery parts</li> <li>• Moving vehicles</li> <li>• Noise</li> <li>• Sharp hand tools and equipment</li> <li>• Slippery and uneven surfaces</li> </ul>



	<ul style="list-style-type: none"> <li>• Soil and water-borne micro-organisms</li> <li>• Solar radiation.</li> </ul>
Resources, tools, equipment and machinery	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Aerial photographs, charts and tables of soil</li> <li>• Characteristics and plant soil parameters</li> <li>• Application equipment and machinery such as: <ul style="list-style-type: none"> <li>➤ air blowers</li> <li>➤ backpack spray equipment</li> <li>➤ irrigation systems set up for fertigation</li> <li>➤ pumps and pump fittings</li> <li>➤ rippers and spray equipment</li> <li>➤ seeders</li> <li>➤ tractors and trailed or three-point linkage spreaders</li> <li>➤ backhoe</li> </ul> </li> <li>• Charts and illustrations of symptoms of plant nutrient</li> <li>• Deficiencies and toxicities</li> <li>• Hand-held salinity or electrical conductivity meter</li> <li>• Hand or powered auger</li> <li>• Nutrient application methods, including placement methods such as: <ul style="list-style-type: none"> <li>➤ banding</li> <li>➤ broadcasting</li> <li>➤ ripping</li> <li>➤ spraying and fertigation on or below soil surface</li> </ul> </li> <li>• Ph test kit or electronic Ph testing device</li> <li>• Plastic overlays</li> <li>• Sample bags</li> <li>• Tape measure.</li> </ul>
Diversity	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• optimize the diversity of species and genetic resources in different ways such as agro forestry systems organize crops, shrubs, and trees of different heights and shapes at different levels or strata, increasing vertical diversity</li> </ul>
Components	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• annual and perennial crops,</li> <li>• livestock and aquatic animals,</li> <li>• trees,</li> <li>• soils,</li> <li>• water and other components on farms and agricultural landscapes</li> </ul>
Synergies	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Combining <ul style="list-style-type: none"> <li>➤ annual and perennial crops,</li> <li>➤ livestock and aquatic animals,</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>➤ trees, soils, water and crops</li> <li>• other components on farms and agricultural landscapes</li> </ul>
Efficiency	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• recycling biomass, nutrients and water in the agricultural systems</li> </ul>
Recycling	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>➤ Crop–livestock systems promote recycling of organic materials by using manure for composting or directly as fertilizer, and crop residues and by-products as livestock feed</li> </ul>
Agronomic and soil data	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Agronomic practices data</li> <li>• Amount of Input used (seed, fertilizer, pesticides)</li> <li>• Soil PH, soil amendment practices (liming, composting)</li> <li>• Yield data</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Understand basic concepts, principles and strategies of integrated soil fertility management, agroecology and crop production system</li> <li>• Recognize agronomic and soil data management</li> <li>• Understand biophysical and socio-economic contexts and challenges</li> <li>• Identify and manage resources, tools and equipment required for implementation</li> <li>• Understand environmental implication for crop production and soil health</li> <li>• Prepare implementation plans, specifications and associated documents</li> <li>• Able to monitor and evaluate soil health, fertility management and crop production program</li> <li>• Familiar with documentation and data sharing of results obtained</li> <li>• Access and analyse information on site factors</li> <li>• Select suitable management practices, soil amendments and fertilizers</li> <li>• Determine analytical and appropriate application techniques for soil health &amp; plant nutrition program</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Align agro ecological concepts, principles and elements in to the existing cropping system</li> <li>• Characteristics of soil and crop requirement to enhance productivity</li> <li>• Methods of nutrient uptake by plants and favourable</li> </ul>

	<p>conditions for effective uptake to occur</p> <ul style="list-style-type: none"> <li>• Understand nutrients and water required by plants grown by the enterprise</li> <li>• Identify effects of nutrient deficiency and toxicity on individual plant species and varieties, including visual symptoms <ul style="list-style-type: none"> <li>○ OHS hazards associated with implementing a plant nutrition program and controls necessary to remove or minimise associated risks</li> </ul> </li> <li>• Understand organic matter, pest and disease, and nutrient interactions in soil and nutrient cycling</li> <li>• Agro ecological approaches associated with application of integrated soil fertility management technologies and practices</li> <li>• Understand processes and techniques for preparing, costing and documenting a soil health, fertility &amp; plant nutrition program</li> <li>• Understand soil fertility and productivity concepts</li> <li>• Recognize site evaluation techniques for growth media, cropping system, methods of soil sampling and analysis <ul style="list-style-type: none"> <li>○ Soil amendments commonly required to treat soil problems experienced by organization.</li> </ul> </li> </ul>
Required Skills	<p>Demonstrate skills in:</p> <ul style="list-style-type: none"> <li>• Integrated use of organic and inorganic fertilizer application and soil amendment activities</li> <li>• Implementing improved agronomic practices in to the existing cropping system</li> <li>• Measuring agronomic use efficiency</li> <li>• calculate nutrients and water required for crop</li> <li>• Implementing a plant nutrition program</li> <li>• Calculate nutrient budgeting</li> <li>• Documenting plans, specifications and work procedures</li> <li>• Calculating cost, spatial and logistical requirements</li> <li>• Communicating and negotiating orally and in writing with staff, managers, consultants and customers</li> <li>• Complying with legislative requirements and codes of practice</li> <li>• Writing reports and feedbacks for staff, managers, and customers.</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

<b>Occupational Standard: Crop Production Level IV</b>	
<b>Unit Title</b>	<b>Develop Production Plans for Field Crops</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP4 02 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to Select field crop type and variety, determine yield potential, Prepare individual field and a whole farm crop production plan and Review production plan. In addition, this unit covers monitoring, evaluation and learning of field crop production plan.

<b>Element</b>	<b>Performance Criteria</b>
1. Select crop type and variety	<p>1.1 Crop types and varieties are <i>assessed</i> and selected for their market potential and gross margin returns for the farm environment.</p> <p>1.2 Most profitable cultural practices and rotations are selected consistent with pest management strategies, available machinery resources, and management for sustainability of resources.</p> <p>1.3 Production risks are identified for each crop and strategies to address these are determined.</p> <p>1.4 Environmental risks are identified and strategies developed as appropriate.</p> <p>1.5. Crop types and varieties are selected based on their potential for import substitution, raw material for agro industry and <i>small-scale processors</i></p>
2. Determine crop yield potential	<p>2.1 Relevant benchmark for yield are sourced, where available, to assist setting target yields.</p> <p>2.2 Past production records are analysed to determine the key determinants of yield.</p> <p>2.3 Available models for calculating water, nutrients and agronomic use efficiency or other key determinants of yield are used, as appropriate; to assist in setting targeted yields.</p> <p>2.4 Quality specifications and target yields are established for the selected field crop.</p>
3. Prepare production plan for individual crop and the whole farm	<p>3.1. Crop fields are assessed for their nutrient, pest status, water reserves, tillage requirements, and other factors before selecting <i>crop type</i> and variety.</p> <p><b>3.2. Records of chemical use</b> are used as appropriate to assist planning to reduce chemical residue</p> <p>3.3. Crop variety is selected and Crop field preparation, planting, fertilizing and other treatments are planned.</p> <p>3.4. Optimum timing of planting, applications of input is determined and operational calendar is prepared.</p> <p>3.5. Labour, Machinery and equipment requirements are identified and planned</p> <p>3.6. Resources and budget for the cropping program is determined.</p>
4. Implementing	<b>4.1. Logistical arrangement</b> related to production, harvesting,

Production Plan	<p>transportation, marketing and other key operations are prepared based on the production plan.</p> <p>4.2. Seed, fertilizer, pest treatments and other input requirements are prepared.</p> <p>4.3 Crops establishment and management is implemented based on the <i>cropping calendar</i></p> <p><b>4.4. Physical and financial record keeping system</b> is established to provide data for the analysis of crop performance, and to meet other statutory requirements including records of chemical use.</p> <p>4.5. Production plan is reviewed and amended where required.</p>
5. Monitor, evaluate and learning of crop production plan	<p>5.1. Monitoring and evaluation standards are determined</p> <p>5.2. Appropriate monitoring, evaluation and learning techniques are selected</p> <p>5.3. Monitoring and evaluation is implemented at every production stage as indicated in the production plan</p> <p>5.4. Feedbacks and reporting are prepared and submitted for appropriate personal.</p> <p>5.5. Modify or amend production plan, when necessary, based on the monitoring and evaluation feedbacks and reports.</p> <p>5.5. Record keeping and documentation is implemented for future use</p>

Variable	Range
Assessed	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Current and previous observations/tests,</li> <li>• Range of other historical records.</li> <li>•</li> </ul>
Small-scale processors	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Small scale processors refer to the production of a commodity with a small plant size firm or homemade processing. It requires less amount of capital and is labour intensive in nature.</li> <li>• Includes <ul style="list-style-type: none"> <li>✓ “Shiro”</li> <li>✓ “Beso”</li> <li>✓ “Kolo”</li> <li>✓ Spices</li> <li>✓ Packed flours</li> </ul> </li> </ul>
Crop type	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Cereal crops</li> <li>• Pulses</li> </ul>

	<ul style="list-style-type: none"> <li>• Oil crops</li> <li>• Fibre crops</li> </ul>
Records of chemical use	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Minimum legal requirements,</li> <li>• Time/frequency of application</li> <li>• Quality parameters set by the production plan.</li> <li>• Instruction on the chemical label</li> </ul>
Logistical arrangements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Planning the most cost-effective mix of arrangements related to on-farm storage capacity,</li> <li>• Off-farm collection point alternatives,</li> <li>• Transport alternatives and opportunities for backfilling when transporting product, etc.</li> </ul>
Cropping calendar	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• <b>schedule of cultural operation needed in crop production with respect to time</b></li> </ul>
Physical and financial record keeping system	<p>May include but limited to:</p> <ul style="list-style-type: none"> <li>• Crop field records,</li> <li>• Input records,</li> <li>• Computer or non-computer based</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Develop production plans for field crops</li> <li>• Appropriately implement and monitor production plans</li> <li>• Prepare budgets and gross margins of profit</li> <li>• Plan and organize activities</li> <li>• Prepare production plan for individual crop and the whole farm</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>• Determinant of crop yield</li> <li>• Cultural practices related to cropping</li> <li>• Market prices and cash flow budgets</li> <li>• Pest management for relevant crops</li> <li>• Identify Machinery and equipment requirements for cropping</li> <li>• Record keeping systems (computer or non-computer)</li> <li>• Market oriented crop production</li> <li>• Understand/set Criteria to select crop type and variety for agro-processing industries, international market and small-scale</li> </ul>

	processing
Required Skills	<p>Demonstrate skills of:</p> <ul style="list-style-type: none"> <li>• Prepare budgets</li> <li>• Manage and monitor crop diaries and associated records</li> <li>• Select crop types and variety based on market demand, raw material for agro industry, small scale processing and export market</li> <li>• Determine yield potential for selected field crop</li> <li>• Prepare individual crop field plans</li> <li>• Review production plan</li> <li>• Communicate ideas and information through record keeping of previous yields and other relevant data.</li> <li>• Collect, analyse and organize information through evaluation and review of production plans, and comparison with collated data.</li> <li>• Plan and organize activities according to standard planning processes for crops production.</li> <li>• Apply team work through consultation with others involved in crop management.</li> <li>• Use mathematical ideas and techniques to determine yield potential, nutrient/fertilizer, seed, and pesticide requirements</li> <li>• Apply problem-solving skills through planning for unforeseen circumstances related to crop production and dealing with variables as they arise</li> <li>• Use information communication technologies for reporting and documentation</li> </ul>
Resources Implication	<p>The following resources MUST be provided.</p> <ul style="list-style-type: none"> <li>• Access is required to real or appropriately simulated situations, including work areas, materials and equipment,</li> <li>• Documentation and information on workplace practice and OHS practices.</li> <li>• specifications and work instructions</li> </ul>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Practical assessment by direct observation of tasks through simulation/Role-plays</li> <li>• Written exam/test on underpinning knowledge</li> </ul> <p>Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge</p>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting. This competence standard could be assessed on its own</p>

	or in combination with other competencies relevant to the job function.
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<b>Occupational Standard: Crop Production Level IV</b>	
<b>Unit Title</b>	<b>Develop Production Plans for Horticultural Crops</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP4 03 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude required to select horticultural crop type and variety, determine yield potential, prepare individual crop and a whole farm production plan. In addition, the unit covers major points on greenhouse establishment and maintenance; and reviewing whole farm production plan.

<b>Element</b>	<b>Performance Criteria</b>
1. Select horticultural crop type and variety	<p>1.1 Horticultural crop types and varieties are <i>assessed</i> and selected for their market potential and gross margin returns for the farm environment.</p> <p>1.2 Most profitable cultural practices and rotations are selected consistent with pest management strategies, available machinery resources, and management for sustainability of resources.</p> <p>1.3 Production risks are identified for each crop and strategies to address these are determined.</p> <p>1.4 Environmental risks are identified and strategies developed as appropriate.</p> <p>1.5. Horticultural crop types and varieties are selected based on their potential for Import substitution, export potential, raw material for agro industry and <i>small-scale processors</i></p>
2. Determine yield potential for horticultural crop	<p>2.1 Relevant benchmark for yield are sourced, where available, to assist setting target yields.</p> <p>2.2 Past production records are analysed to determine the key determinants of yield.</p> <p>2.3 Available models for calculating water, nutrients and agronomic use efficiency or other key determinants of yield are used, as appropriate; to assist in setting targeted yields.</p> <p>2.4 Quality specifications and target yields are established for the selected horticultural crop.</p>
3. Greenhouse management	<p>3.1. Specific criteria and materials for <i>greenhouse</i> establishment are identified.</p> <p>3.2. Site selection and green house establishment is performed based on the identified criteria</p> <p>3.3. Green house management plan is prepared</p> <p>3.3 Proper planting methods are determined based on the crop type.</p> <p>3.4 Basic <i>equipment and tools</i> are selected and confirmed against the <i>work plan</i> and prepared to manufacturer's specifications.</p>



	<p>3.5 <b>Fertilizer and amendments</b> are selected based on greenhouse standard for growth stages.</p> <p>3.6 Identified and prepared <b>growing media</b> in accordance with production requirements.</p> <p>3.7 Apply agronomic <b>management practices</b> according to the requirements and greenhouse management procedures</p> <p>3.8 <b>Pest management</b> practices are identified and applied in line with crop type and level of infestation</p> <p>3.9 Existing and potential <b>OHS hazards</b> in the workplace are identified, risks assessed and controlled in line with organization requirements</p> <p>3.10 Greenhouse activities are reported and documented</p>
4. Prepare production plan for individual horticultural crop and whole farm	<p>4.1. Fields are assessed for their nutrient, pest status, water reserves, tillage requirements, and other factors before selecting crop type and variety.</p> <p>4.2. Records of chemical use are used as appropriate to assist planning to reduce chemical residue</p> <p>4.3. Horticultural crop variety is selected and field preparation, planting; fertilizing and other treatments are planned.</p> <p>4.4. Optimum timing of planting, applications of input is determined and operational calendar is prepared.</p> <p>4.5. Labour, Machinery and equipment requirements are identified and planned</p> <p>4.6. <b>Production plan</b> is prepared</p>
5. Implementing production plan	<p>5.1. <b>Logistical arrangement</b> related to production, harvesting, transportation, marketing and other key operations are prepared based on the production plan.</p> <p>5.2. Seed, fertilizer, pest treatments and other input requirements are prepared.</p> <p>5.3. Machinery, equipment and tools requirements are planned and checked for the horticultural crop production cycle.</p> <p>5.4. Crops establishment and management is implemented based on the <b>cropping calendar</b></p> <p>5.5. <b>Physical and financial record keeping system</b> is established to provide data for the analysis of crop performance, and to meet other statutory requirements including records of chemical use.</p> <p>5.6. Production plan is reviewed and amended where required.</p>
6. Monitor, evaluate and learning of crop production plan	<p>6.1. Monitoring and evaluation standards are determined</p> <p>6.2. Appropriate monitoring, evaluation and learning techniques are selected</p> <p>6.3. Monitoring and evaluation is implemented at every production</p>

	<p>stage as indicated in the production plan</p> <p>6.4. Feedbacks and reporting are prepared and submitted for appropriate personal.</p> <p>6.5. Modify or amend production plan, when necessary, based on the monitoring and evaluation feedbacks and reports.</p> <p>6.6. Record keeping and documentation is implemented for future use</p>
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Variable	Range
Assessed	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Current and previous observations/tests,</li> <li>• Range of other historical records.</li> </ul>
Small-scale processors	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Small scale processors refer to the production of a commodity with a small plant size firm or homemade processing. It requires less amount of capital and is labour intensive in nature.</li> <li>• Includes <ul style="list-style-type: none"> <li>✓ Fruit Jam</li> <li>✓ Juice</li> <li>✓ Chips</li> <li>✓ Spice (mitmita)</li> </ul> </li> </ul>
Green house	<p>May include but not limited to:</p> <p>The science of providing favourable environment conditions to the plants. It also protects the plants from the adverse climatic conditions such as: -</p> <ul style="list-style-type: none"> <li>• Wind</li> <li>• Cold</li> <li>• Precipitation</li> <li>• Excessive radiation</li> <li>• Extreme temperature</li> <li>• Insects and diseases.</li> </ul> <p>Type of greenhouses are classified as</p> <ul style="list-style-type: none"> <li>✚ Based on Construction <ul style="list-style-type: none"> <li>○ Wooden framed structure.</li> <li>○ Pipe framed structure</li> <li>○ Truss framed structure.</li> </ul> </li> <li>✚ Based on Covering Material <ul style="list-style-type: none"> <li>• Glass greenhouses</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Plastic film greenhouses</li> <li>• Rigid panel greenhouses</li> <li>✚ Based on Cost of Construction <ul style="list-style-type: none"> <li>• High-cost Green House</li> <li>• Medium cost Green House</li> <li>• Low-cost Green House</li> </ul> </li> </ul>
Growing media	<p>May include but not limited to:</p> <p>Maximize the productivity of plants and utilizing from all inputs in an efficient way for commercial and individual production such as: -</p> <ul style="list-style-type: none"> <li>○ vermiculite</li> <li>○ perlite</li> <li>○ Rockwool cubes</li> <li>○ peat moss</li> <li>○ Compost</li> <li>○ Coco pit</li> <li>○ Coffee Husk</li> </ul>
OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Exposure to loud noise and fumes,</li> <li>• Solar radiation,</li> <li>• Dust,</li> <li>• Ergonomic hazards associated with posture and vibration,</li> <li>• Hazardous substances,</li> <li>• The presence of by standards,</li> <li>• Slippery or uneven terrain, potholes, stumps, ditches, gullies,</li> <li>• Embankments, obstacles (rocks, logs, fences, debris),</li> <li>• Adverse weather conditions,</li> <li>• Mechanical malfunctions and exposed moving parts,</li> </ul>
Methods of planting	<p>May Include but not limited to:</p> <ul style="list-style-type: none"> <li>• Direct seeding</li> <li>• Transplanting</li> <li>• Pot</li> <li>• Container</li> </ul>
Fertilizer and amendments	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Fertilizers and other amendments used will be dependent on nutrient levels, trace Element, acidity, alkalinity, texture and other physical characteristics of the soil, and the growth stage of the plant.</li> <li>• During fertilizer application the following principles are considered.</li> </ul>

	<ul style="list-style-type: none"> <li>✓ Right source</li> <li>✓ Right amount</li> <li>✓ Right place</li> <li>✓ Right time</li> </ul>
Management activities	<p>May Include but not limited to:</p> <ul style="list-style-type: none"> <li>• Soil nutrient management</li> <li>• Water requirement and irrigation management</li> <li>• Apply pest control measures</li> </ul>
Pest management	<p>May include but not limited to: Pest management is therefore a means to reduce pest numbers to an acceptable threshold. Methods of control can be categorized as: _</p> <ul style="list-style-type: none"> <li>• Integrated pest management /IPM/</li> <li>• Chemical</li> <li>• Biological</li> <li>• Cultural</li> <li>• Physical/mechanical,</li> <li>• Cultivar</li> </ul>
Equipment and tools	<p>May include but not limited to:-</p> <ul style="list-style-type: none"> <li>• Wood</li> <li>• Galvanized steel</li> <li>• Iron and aluminium</li> <li>• Concrete.</li> <li>• Plastic Films</li> <li>• Rigid plastics</li> <li>• Seed drills</li> <li>• Plough</li> <li>• Harrows</li> <li>• Augers and bins</li> <li>• Row planters</li> <li>• Row maker</li> <li>• Ditcher, ridge maker</li> <li>• Sprayer equipment</li> <li>• Fertilizer applicator or spreader</li> </ul>
Work plan	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Location</li> <li>• Crop type (vegetables, fruits, floricultures and root and tubers) and seeding method)</li> <li>• Soil condition (structure, moisture and nutrient)</li> <li>• Seeding practices (sowing time, sowing rate, optimal depth of sowing)</li> </ul>

	<ul style="list-style-type: none"> <li>• Fertilizer type and application</li> <li>• Pest and weed control type and application</li> <li>• Machinery</li> <li>• Equipment</li> </ul>
Production plan	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Land preparation,</li> <li>• seed sowing,</li> <li>• transplanting</li> <li>• planting,</li> <li>• fertilizing, and other treatments</li> </ul>
Logistical arrangements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Planning the most cost-effective mix of arrangements related to on-farm and off -farm cold storage capacity,</li> <li>• Transport alternatives and opportunities for backfilling when transporting product, etc.</li> </ul>
Cropping calendar	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• <b>schedule of cultural operation needed in crop production with respect to time</b></li> </ul>
Physical and financial record keeping system	<p>May include but limited to:</p> <ul style="list-style-type: none"> <li>• Horticultural crop field records,</li> <li>• Input records,</li> <li>• Computer or non-computer based</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate attitude, knowledge and skills to:</p> <ul style="list-style-type: none"> <li>• Develop production plans for individual horticultural crops</li> <li>• Appropriately implement and monitor production plans</li> <li>• Prepare budgets and gross margins of profit</li> <li>• Plan and organize activities</li> <li>• Prepare whole farm production plan</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>• Determinant of horticultural crop yield</li> <li>• Cultural practices related to cropping</li> <li>• Market prices and cash flow budgets</li> <li>• Pest management for relevant crops</li> <li>• Identify Machinery and equipment requirements for cropping</li> <li>• Record keeping systems (computer or non-computer)</li> </ul>
Required Skills	<p>Demonstrate skillsof:</p> <ul style="list-style-type: none"> <li>• Prepare budgets</li> <li>• Manage and monitor crop diaries and associated records</li> <li>• Select crop species and variety</li> <li>• Determine yield potential for horticultural crop</li> </ul>

	<ul style="list-style-type: none"> <li>• Prepare individual crop field plans</li> <li>• Prepare cropping calendar</li> <li>• Review production plan</li> <li>• Communicate ideas and information through record keeping of previous yields and other relevant data.</li> <li>• Collect, analyse and organize information through evaluation and review of production plans, and comparison with collated data.</li> <li>• Plan and organize activities according to standard planning processes for crops production.</li> <li>• Apply team work through consultation with others involved in horticulturalcrop management.</li> <li>• Apply problem-solving skills through planning for unforeseen circumstances related to crop production and dealing with variables as they arise</li> <li>• Use information communication technologies for reporting and documentation</li> </ul>
Resources Implication	<p>The following resources MUST be provided.</p> <ul style="list-style-type: none"> <li>• Access is required to real or appropriately simulated situations, including work areas, materials and equipment,</li> <li>• Documentation and information on workplace practice and OHS practices.</li> <li>• specifications and work instructions</li> </ul>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Practical assessment by direct observation of tasks through simulation/Role-plays</li> <li>• Written exam/test on underpinning knowledge</li> </ul> <p>Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge</p>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting. This competence standard could be assessed on its own or in combination with other competencies relevant to the job function.</p>

<b>Occupational Standard: Crop Production Level IV</b>	
<b>Unit Title</b>	<b>Plan and implement organic farm production</b>
<b>Unit Code</b>	<b><u>AGR CRP4 04 0322</u></b>
<b>Unit Descriptor</b>	<p>This unit specifies the knowledge, skills and attitude required to plan and implement organic farming production.</p> <p>The unit involves monitor soil health and fertility indicators, assess soil related factors for organic farming, select and implement allowable techniques and inputs for organic farming.</p> <p>It also covers implement, monitor and evaluate organic farming activities, maintain quality standard of the products of organic farming and documenting organic farming program.</p>

<b>Element</b>	<b>Performance Criteria</b>
1. Assess soil-related factors for organic farming	<p>1.1 Nutritional requirements for selected crop types are identified.</p> <p>1.2 Soil analysis and suitable testing facilities are selected.</p> <p>1.3 Soil and plant tissue sample collection is conducted according to organisation procedures and requirements of testing facility.</p> <p>1.4 Results of soil and tissue testing are analysed in relation to requirements of the farming system.</p> <p>1.5 Soil condition is assessed for drainage, compaction, aeration, water infiltration and moisture conservation techniques in relation to requirements for desired crop growth for selected crop type.</p> <p>1.6 Soil biological activity is assessed by identifying and evaluating presence of organisms.</p>
2. Assess soil health and fertility indicators	<p>2.1 Work is undertaken in an environmentally appropriate manner and according to workplace information, <i>principles of organic agriculture</i>, occupational health and safety requirements.</p> <p>2.2 Soil health is assessed by identifying and evaluating plant species present.</p> <p>2.3 Soil acidity or alkalinity (pH), <i>mineral balances</i>, organic matter levels, and plant performances are assessed and recorded.</p> <p>2.4 Soil texture, structure, colour, salinity and sodicity are assessed and recorded.</p> <p>2.5 Results are analysed to identify trends and areas for improvement.</p>
3. Select and implement allowable techniques and inputs for organic farming	<p>3.1 Range of <i>allowable inputs</i> are identified according to requirements of the <i>National Standard for Organic and Biodynamic Produce</i>.</p> <p>3.2 <i>Suitable nutrient cycling techniques</i> are identified, evaluated and implemented.</p> <p>3.3 Appropriate inputs are calculated based on soil/plant analyses, crop removal and plant/animal observations.</p>

	<p>3.4 Cover crop and pasture systems are selected and managed.</p> <p>3.5 <b>Organic Soil fertility improvement practices</b> and <b>cultural practices</b> are developed, applied and monitored.</p> <p>3.6 <b>Cropping systems</b> are designed and implemented to improve soil fertility.</p>
4. Implement, monitor and evaluate organic farming activities	<p>4.1 <b>Principles of organic farming</b> required for the program are developed and implemented</p> <p>4.2 <b>Essential characteristics</b> of organic farming identified and implemented</p> <p>4.3 Program implementation and results are monitored in terms of <b>soil biodiversity</b> according to industry practice.</p> <p>4.4 Organic farming program is reviewed and refined to ensure it is responsive to changing conditions</p> <p>4.5 Remedial action to improve organic farming production is taken, documented and reported to appropriate personnel according to organization plan.</p>
5. Maintain quality standard of the products of organic farming	<p>5.1 Confirm organic farming principles are implemented according to the organization guideline</p> <p>5.2 Ensure soil biodiversity is maintained throughout the production processes</p> <p>5.3 Ensure that products are properly labelled and have the correct design specifications</p> <p>5.4 Ensure that adequate documentation of operation, and accredited certification are archived.</p>
6. Document organic farming program	<p>6.1 Detailed plan, objectives, specifications and associated costs are established based on program requirements and presented to appropriate body/personnel.</p> <p>6.2 Detailed on-site procedures and schedules required for program are developed and documented.</p> <p>6.3 <b>Production and soil data</b> are recorded for future planning and intervention</p>

Variable	Range
Principles of organic agriculture	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Integrity in organics</li> <li>• Integrating the farm</li> <li>• Learning from nature and human culture</li> <li>• Managing soil to increase health of whole system</li> <li>• Reading the landscape</li> </ul>



	<ul style="list-style-type: none"> <li>• Farm ecology.</li> </ul>
Mineral balances	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Should be applied according to ratios identified by the Albrecht testing method.</li> </ul>
Allowable inputs	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Farm diary or logbook records</li> <li>• Plant and animal pest and disease control</li> <li>• Soil conditioning</li> <li>• Soil fertilising.</li> </ul>
National Standard for Organic and Biodynamic Produce	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• National Standard is the minimum requirement set to evaluate organic product</li> <li>• Biodynamic Produce means an agricultural system that introduces specific additional requirements to an organic system.</li> </ul>
Suitable nutrient cycling techniques	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Biodynamic preparations</li> <li>• Compost teas</li> <li>• Composting</li> <li>• Inoculants</li> <li>• Livestock grazing</li> <li>• Mulching</li> <li>• Slashing.</li> <li>• Green manuring</li> </ul>
Organic Soil fertility improvement practices	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Composting</li> <li>• Mulching</li> <li>• Farm yard manure</li> <li>• Bio fertilizer</li> <li>• Bio slurry</li> <li>• Green manuring</li> <li>• Vermicompost</li> </ul>
Cropping systems	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Relay cropping</li> <li>• Alley cropping</li> <li>• Crop rotation</li> <li>• Intercropping</li> <li>• Mixed cropping</li> <li>• multiple cropping</li> </ul>
Cultural practices	<p>May include, but not limited to physical practices such as:</p> <ul style="list-style-type: none"> <li>• Cultivation and harrowing</li> <li>• Deep ripping</li> <li>• Grazing</li> <li>• Hand pulling</li> </ul>

	<ul style="list-style-type: none"> <li>• Pruning</li> <li>• Slashing</li> <li>• Other non-chemical techniques.</li> </ul>
Principles of organic farming	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Improvement and maintenance of agro-ecosystem</li> <li>• Conservation of soil, water and biodiversity</li> <li>• Preventing exploitation and pollution of natural resources</li> <li>• Reduction in consumption of non-renewable energy</li> <li>• Production of nutritious and high-quality product</li> <li>• Conservation of indigenous knowledge and eco-friendly farming systems</li> </ul>
Essential characteristics	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Sustainable use of local resources</li> <li>• Ensuring basic biological functions of soil-water-nutrient-humus-continuum</li> <li>• Maintenance of diversity of plants</li> <li>• Maintenance of nutrient cycle within the farm</li> <li>• Stability due to diversification</li> <li>• Optimum input output ratio</li> </ul>
Soil biodiversity	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Abundant arthropods and earthworms</li> <li>• High occurrence of symbionts</li> <li>• High occurrence of micro-organisms</li> <li>• Microbial carbon</li> <li>• Wild flora</li> </ul>
Production and soil data	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Agronomic practices</li> <li>• Input used (compost, FYM, crop residues)</li> <li>• Soil pH, soil amendment practices (liming, composting)</li> <li>• Yield data</li> </ul>

## Evidence Guide

Critical Aspects of Competence	<p>Demonstrate knowledge, attitudes and skills to:</p> <ul style="list-style-type: none"> <li>• Apply principles and practices of organic agriculture</li> <li>• Understand soil biology, chemical and physical conditions</li> <li>• Analyse soil test results for a range of indicators of soil fertility</li> <li>• Apply soil amendments and organic soil improvements, such as lime, compost, crop rotation, mulching, green manuring</li> <li>• Assessing biodiversity and plant health through observation of plant community</li> <li>• Observe soil health and relating it to plant and soil nutrient status</li> <li>• Identify and operate equipment safely</li> <li>• Record and interpret results of soil tests</li> <li>• Understand quality standards of produce</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Principles and practices of organic agriculture</li> <li>• Assessing biodiversity and plant health through observation of plant community</li> <li>• Recognise soil biology, chemical and physical conditions</li> <li>• Principles of organic produce standards and certification</li> <li>• Interactions among soil fertility, animals, plants, pests and diseases</li> <li>• Understand soil health and soil fertility</li> <li>• Understand the production site ecosystem</li> </ul>
Required Skills	<p>Demonstrate skills of:</p> <ul style="list-style-type: none"> <li>• Implement principles and practices of organic farming</li> <li>• Implement organic farming standards</li> <li>• Implement soil health and fertility improvement practices</li> <li>• Identifying and preparations of organic resources for organic farming</li> <li>• Operating equipment safely</li> <li>• Sampling soil and plant tissues.</li> <li>• Analyse soil test results for a range of indicators of soil fertility</li> <li>• Recording, interpreting and document results of soil tests</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

<b>Occupational Standard: Crop Production Level IV</b>	
<b>Unit Title</b>	<b>Plan Horticultural Crops Propagation Program</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP4 05 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitude of carry out preliminary planning activities for a plant propagation program, develop the propagation plan, prepare parent material and monitor success of horticultural crop propagation activities.

<b>Element</b>	<b>Performance Criteria</b>
1. Carry out preliminary planning activities for Horticultural crop propagation program	<p>1.1. Management activities and marketing <i>requirements</i> are confirmed and understood.</p> <p>1.2. <i>Weather and climate information</i> and forecast are regularly monitored to determine likely conditions.</p> <p>1.3. Area requirements for propagation program are evaluated.</p> <p>1.4. <i>Propagation techniques</i> are determined according to horticultural crop type and sound practice.</p> <p>1.5. <i>OHS hazards</i> associated with the propagation program are identified and risks assessed.</p>
2. Develop the propagation plan	<p>2.1. Labour, <i>materials, equipment and machinery</i> needs are identified.</p> <p>2.2. <i>Propagation media requirements</i> are determined according to the propagation method and needs of the horticultural crops</p> <p>2.3. <i>Strategies</i> to modify environmental conditions are determined according to the type of horticultural crops and propagation method used.</p> <p>2.4. <i>Selection criteria for propagation material</i> are determined according to the type of horticultural crops and propagation method.</p> <p>2.5. Budget for the propagation programs is determined</p> <p>2.6. <i>Hygiene requirements</i> for propagation activities are determined.</p> <p>2.7. Propagation plan and schedule of activities are prepared and communicated clearly to staff.</p>
3. Implement propagation plan and monitor success of propagation	<p>3.1. Propagation is implemented based on propagation plan and following standard procedures and principles.</p> <p>3.2. Variances from plan and scheduled activities are identified and recorded.</p> <p>3.3. Propagated plants are assessed for health, quality and viability according quality standards and principles</p> <p>3.4. <i>Remedial procedures</i> are planned to meet marketing objectives and business imperatives.</p>

Variable	Range
Requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Budget limitations, propagation technique, controlling the growing environment; plant species, growth habits and cultural requirements</li> <li>• The purpose or intended use of the propagated plants, maintenance services for propagation after-care, quality specifications and timelines for the program.</li> </ul>
Weather and climate information	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Temperature</li> <li>• Wind</li> <li>• Light</li> <li>• Humidity</li> <li>• Frost</li> </ul>
Propagation Techniques	<p>May include, but not limited to: is an art and science of establishing plant life and increasing the number of plants that are used in daily life Seed</p> <ul style="list-style-type: none"> <li>• Cuttings</li> <li>• Layering</li> <li>• Tissue culture,</li> <li>• Division</li> <li>• Budding</li> <li>• Grafting</li> <li>• Top working</li> </ul>
OHS Hazards	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Air- and soil-borne micro-organisms</li> <li>• Chemicals and hazardous substances</li> <li>• Sharp hand tools and equipment</li> <li>• Manual handling</li> <li>• Solar radiation, dust, noise</li> <li>• Machinery and machinery parts</li> </ul> <p>Slippery and uneven surfaces.</p>
Materials, equipment and machinery	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Shade cloth, plastic fencing, tape, support structures, labels, , heaters, coolers, fans, vents, fogging/ misting systems, screens</li> <li>• Secateurs, propagation knives, razor blades and other cutting instruments</li> <li>• Sharpening stone, strop, linear measure, grafting machine, plastic containers and trays, vermiculite boxes, wheelbarrow, trolley, mechanical trolley, shovel, water spray container, dibblers and rubbish bins. <ul style="list-style-type: none"> <li>• Quality propagation knife.</li> <li>• Sharpening stone.</li> <li>• Hand pruners.</li> <li>• Dibble. ...</li> <li>• Grafting chisel and small mallet.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Grafting wrap or tape.</li> <li>• Grafting wax.</li> </ul>
Propagation media requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Will be specific to the species and method of propagation</li> <li>• Be determined using recognized testing procedures for pH, drainage, aeration, salinity, nitrate levels and water repellence to ensure that it meets the needs of the propagation plan <ul style="list-style-type: none"> <li>• peat moss, bark, coir, perlite and vermiculite</li> <li>• organic or inorganic</li> </ul> </li> </ul>
Strategies	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Cooling by manual or automatic processes such as the use of vents, exhaust fans, evaporative coolers, wetting walls; heating by manual or automatic processes such as the use of wall heaters, ducts, heating lines or under-bed heating systems.</li> <li>• Controlling air circulation to maintain uniform temperatures and relative humidity, such as ventilation or wind breaks;</li> <li>• Use of artificial light; carbon dioxide enrichment, and irrigation.</li> </ul>
Selection criteria for propagation material	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Company specifications and quality standards</li> <li>• The use of certified parent stock</li> <li>• Ensuring parent stock is well nourished and healthy, free from disease, pest, frost or mechanical damage</li> <li>• Results from recognized testing procedures, such as leaf tissue analysis; and the season.</li> </ul>
Hygiene requirements	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Hand washing, removing all media and organic matter from production surfaces, tools and equipment.</li> <li>• Disinfecting production surfaces, tools and equipment; disinfecting/sterilizing propagation media.</li> <li>• Disinfestations and removal of plant and media waste, footbaths.</li> <li>• Access restrictions and handling practices which minimize cross contamination, including enterprise quarantine policies and legislation.</li> </ul>
Remedial procedures	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Response to damage or loss, pest and disease problems, and marketing requirements</li> <li>• Quarantine/isolation procedures,</li> <li>• Schedule amended,</li> <li>• Integrated pest management,</li> <li>• Cultural intervention such as fertilising, misting, tip/root pruning, spraying growth hormones, light manipulation, temperature changes, increased/decreased humidity, tying, staking, taping;</li> <li>• Removing and disposing of damaged plant material, and irrigation.</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of	Must demonstrate knowledge, attitude and skills of:

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Competence	<ul style="list-style-type: none"> <li>• Management activities and marketing requirements</li> <li>• Understand weather and environmental conditions for propagation techniques</li> <li>• Regulations and workplace procedures relevant to planning a propagation program</li> <li>• Identification of propagation materials</li> <li>• Identify propagation methods and techniques</li> <li>• Understanding the accurate time of propagations</li> <li>• Scheduling propagation activities</li> <li>• Implementing a propagation plan</li> <li>• Promoting propagation plan</li> <li>• Performance and success of propagation</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Quality standards for propagation and marketing propagated seedlings</li> <li>• workplace health, safety, environmental and biosecurity legislation</li> <li>• principles and practices of propagation program planning</li> <li>• Processes and techniques for preparing, costing and documenting plans and scheduling propagation activities</li> <li>• OHS hazards associated with undertaking propagation activities, and the controls necessary to remove or minimise risks associated with them</li> <li>• organisation hygiene practice, standards required for propagation activities, including relevant quarantine regulations</li> <li>• organisation quality specifications for parent plants and propagation materials</li> <li>• Common problems that may occur while performing propagation activities in a controlled environment, and preventative/corrective action that may apply</li> <li>• Aftercare requirements for a range of propagated plant varieties and cultivars</li> <li>• Preferred types of propagation materials for different species</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Develop propagation plan</li> <li>• Apply quality standards set by responsive authority for propagation and marketing propagated seedlings</li> <li>• Identify parent materials (Scion and rootstock)</li> <li>• Identify and check propagation materials</li> <li>• Sterilize propagation equipments and tools</li> <li>• Implement propagation techniques (grafting, layering, cutting, budding, ...)</li> <li>• Identify propagation stages</li> <li>• Check the performance and success of propagation</li> <li>• Determine acclimatization/hardening of propagated seedlings</li> <li>• Determine propagation success rate</li> <li>• Write reports for the understanding of staff, supervisors and clients</li> </ul>

Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crop Production Level IV	
Unit Title	Plan and Implement Crop Pest Management Practices
Unit Code	<a href="#">AGR CRP4 06 0322</a>
Unit Descriptor	This unit competency knowledge, skills and attitude required to Plan and perform field surveillance for a specific Pest, implement pest management action plan, identify resources for pest management, Plan and apply cultural methods of crop pest management, Plan and implement chemical use program, ensure the correct selection and application of the chemical, Coordinate activities, Prepare Reports and document the data.

Element	Performance Criteria
1. Plan to perform field surveillance for a specific Pest	<p>1.1. Recognize signs or symptoms for <i>crop pests</i>.</p> <p>1.2. Diagnostic samples are collected, handled, packaged and dispatched according to relevant standards and protocols.</p> <p>1.3. Appropriate measures are identified to manage pest outbreak</p> <p>1.4. Information relevant to management of plant pest outbreak is collected and reported to surveillance coordinator.</p>
2. Identify pest management options and prepare action plan	<p>2.1. Identify <i>resources</i>, personals, machineries, materials and tools to carry out crop pest management's activities.</p> <p>2.2. Crop pest management options are identified.</p> <p>2.3. <i>Relevant stakeholders</i> are consulted regarding the scheduling of activities.</p> <p>2.4. Schedule and planning pest management activities in consideration with pest management strategy, community attitudes, and in accordance with relevant <i>legislations and regulations</i></p> <p>2.5. Materials and Personal protective equipment are checked for compliance with OHS standards</p> <p>2.6. Monitoring and measurement activities are selected and scheduled to comply with the crop pests</p>
3. Apply cultural and	3.1. Identify the type of pest occurred



biological crop pest management methods	<p>3.2. Identify the suitable <b>cultural</b>, and biological pest control methods</p> <p>3.3. Available resources are mobilized for crop pest management</p> <p>3.4. Biological crop pest control methods are implemented and evaluated</p>
4. Implement chemical use program	<p>4.1 Chemical requirements are identified for pest managements</p> <p>4.2. Safety <b>hazards</b> in the transport, storage and application of the chemicals are identified.</p> <p><b>4.3. Risk control measures</b> are identified to minimize risk involved in chemical use.</p> <p>4.4. Chemical is applied to the infested field by considering appropriate time, safety pre-questions and environmental conditions.</p> <p>4.5. Implement a maintenance program for application and personal protective equipment</p> <p>4.6. Implement recording systems for chemical storage and use</p> <p>4.7. Take appropriate precautions during <b>handling</b> and disposal of pesticides.</p>
5. Ensure the correct selection and application of chemicals	<p>5.1. Suitable chemicals are identified, and procedures for preparation, application and risk controls are read and interpreted.</p> <p><b>5.2. Application equipments</b> are selected in accordance with procedures.</p> <p>5.3. Ensure calibration of equipment is implemented according to directions and standards.</p> <p>5.4. Pre-operative checks and maintenance procedures are implemented.</p> <p><b>5.5. Meteorological conditions</b> are assessed as appropriate to application prior to and during chemical application.</p> <p>5.6. Chemical application is conducted safely in accordance with hazards associated with the chemicals concerned.</p> <p>5.7. Chemical spills or accidents are dealt with according to procedures.</p>
6. Coordinate contingency plan and document reports	<p>6.1. potential risks are Identified</p> <p>6.2. Prefer contingency plans are coordinated</p> <p>6.3. Contingency plan problem and status are reported</p> <p>6.6. Relevant information is <b>documented</b> for continual analysis and effective planning management.</p>

Variable	Range
Crop pests	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Insect pests</li> <li>• Disease causing pathogens</li> </ul>

	<ul style="list-style-type: none"> <li>• Non-parasitic and parasitic weeds</li> <li>• vertebrate pests (birds and rodents),</li> <li>• Established introduced invasive alien species,</li> </ul>
Resources	<p>May include but not limited to</p> <ul style="list-style-type: none"> <li>• Land</li> <li>• Finance</li> <li>• Input materials</li> <li>• Human labour</li> </ul> <p>Equipments and machinery</p>
Relevant stakeholders	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Land management bodies</li> <li>• Local regulatory authorities</li> <li>• Environmentalist</li> <li>• Farm owners</li> </ul>
legislation and regulations	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• May approved Pesticide Acts, OHS Acts regarding hazardous substances and application equipment, Dangerous Goods Act, Poisons Act or Protection of the Environment Acts for chemical use.</li> </ul>
cultural pest control	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Planning Crop Location</li> <li>• Timing to Avoid Insect Pests,</li> <li>• Farm Location,</li> <li>• Crop Rotation and Isolation</li> <li>• Planting Date</li> <li>• Method of Planting</li> </ul>
hazards	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Flammability,</li> <li>• Toxicity,</li> <li>• Health hazards,</li> <li>• Damage to non-target organisms,</li> <li>• Environmental damage,</li> <li>• Off target spray drift or</li> <li>• Residues in foods.</li> </ul>
Risk control measures	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Relating spillage,</li> <li>• Fire,</li> <li>• Contact of chemical with skin or eyes,</li> <li>• Accidental ingestion,</li> <li>• Incorrect concentrations in mixtures</li> <li>• Faulty or inappropriate storage containers,</li> <li>• Current insurance policies,</li> <li>• Livelihood of run-off post application</li> </ul>

	<ul style="list-style-type: none"> <li>• Incorrectly calibrated equipment,</li> <li>• Spray drift,</li> <li>• Incorrect disposal of waste chemicals or</li> <li>• Faulty equipment.</li> </ul>
Handling	<p>May include but not limited to</p> <ul style="list-style-type: none"> <li>• Transportation,</li> <li>• Storing,</li> <li>• mixing,</li> <li>• loading</li> </ul> <p>applying pesticides</p>
Application equipment	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Hand held knapsacks or pneumatics,</li> <li>• Drench guns,</li> <li>• Spot on or power operated equipment</li> <li>• Boom sprays,</li> <li>• pressure wand</li> <li>• Or air blast sprayer,</li> <li>• Jetting race,</li> <li>• Hand jetting</li> <li>• Shower/plunge dips.</li> </ul>
Meteorological conditions	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Rain</li> <li>• Wind</li> <li>• Temperature</li> <li>• Relative humidity</li> <li>• Inversion</li> <li>• Stable air conditions.</li> </ul>
documented	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Chemical trade name,</li> <li>• Registration number under the Federal Act</li> <li>• Active ingredient, amount in kilograms</li> <li>• Total area treated</li> <li>• Time of application</li> <li>• Description of treatment locations and accompanying maps</li> <li>• Methods used to apply pesticides</li> <li>• Methods of non-pesticide pest controls (manual treatment applications) and estimated total area treated.</li> </ul> <p>The effectiveness of chemicals or cultural methods to control pests</p>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Schedule, cost, communicate a pest management action plan</li> <li>• Plan and manage resources and time.</li> <li>• Plan and organize the work</li> <li>• Record and report actions and work progress.</li> <li>• Monitor the implementation of the systems and procedures developed for chemical concerned.</li> </ul>

	<ul style="list-style-type: none"> <li>• Plan to perform field surveillance for a specific emergency plant disease</li> <li>• Recognize crop management options</li> <li>• Determined threshold level for chemical applications</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Relevant legislative and regulatory requirements</li> <li>• Pest control methods and techniques</li> <li>• Integrated pest management</li> <li>• Social and environmental issues</li> <li>• Contingency management principles.</li> <li>• Ecological systems.</li> <li>• Sustainable production systems.</li> <li>• Appropriate standards and protocols for the emergency disease or plant pest, such as Plant Pest Response Plan (PLANTPLAN)</li> <li>• Emergency plant pest control procedures</li> <li>• Personal and general decontamination procedures.</li> <li>• Hazards involved in the use of the specific chemical concerned and related risk control measures.</li> <li>• Signs of pest damage and signs of beneficial organisms.</li> <li>• Recognise pest management thresholds</li> <li>• Life cycle of pests and target stages.</li> <li>• Pest resistance to chemicals.</li> <li>• Types of chemical and modes of action.</li> <li>• Recognise weather conditions for chemical application</li> <li>• Maximum residue limits.</li> <li>• OHS legislative requirements and codes of practice relevant to chemical use and hazardous substances.</li> <li>• Use, maintenance and storage of personal protective equipment.</li> <li>• First aid and emergency procedures.</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Plan and manage resources and time.</li> <li>• Communicate, negotiate and liaise with other statutory authorities, agencies and stakeholders.</li> <li>• Organize the work.</li> <li>• Record and report actions and work progress.</li> <li>• Identify pests for planning activities and control measures</li> <li>• Access, accurately read and interpret conditions and labels information for chemicals.</li> <li>• Identifying hazardous situations.</li> <li>• Correct wearing/fit of personal protective equipment.</li> <li>• Communicate procedures, policies and safety information to others in the workplace.</li> <li>• Plan and organize activities to be planned in conjunction with chemical use.</li> <li>• Use mathematical ideas and techniques in calibration and calculation of equipment and chemicals.</li> </ul>

	<ul style="list-style-type: none"> <li>• Calibrate and calculate of equipment and chemicals</li> <li>• Calculate threshold levels</li> <li>• Identify hazards and potential problems that may arise during chemical use and developing suitable solutions and risk control measures.</li> <li>• Apply relevant standards, protocols and procedures</li> <li>• Apply disposal of packaging materials, left over chemicals and washing of equipments</li> <li>• Collect, analyse and organize information on labels, MSDS and legislation need to be interpreted and analysed.</li> </ul>
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crop Production Level IV	
Unit Title	<b>Manage and implement quality standards in storage</b>
Unit Code	<a href="#"><u>AGR CRP4 07 0322</u></a>
Unit Descriptor	<p>This unit covers the knowledge, skills and attitude of assessing and maintaining hygiene in the storage areas, monitor produce from arrival to dispatch, monitor and maintain produce conditions in storage as well as control pests in storage area.</p> <p>Monitoring the storage regularly to protect from deterioration or pests damage and contaminants. It includes implementing pre-determined integrated pest management strategies, and investigating and recommending options for technology, systems or practices that will improve crop produce and seed quality. Maintaining the quality in storage is likely to be undertaken without supervision, with only general guidance on progress sought from others. It requires skills in sampling of produce and working safely in a potentially hazardous environment, as well as in calculating volumes, mass and quantities.</p>

Element	Performance Criteria
1. Maintain hygiene in storage areas	<p>1.1.Storage facilities selected based on availability, cost and crop type</p> <p>1.2.<i>Problems of storage facility</i> condition are identified.</p> <p>1.3.<i>Storage</i> conditions are assessed to maintain the <i>standards of hygiene</i> in the stored <i>crop produce</i>.</p> <p>1.4.<b>Storage systems</b> and purpose of storages are identified and implemented.</p> <p>1.5.The need for repairs and maintenance is identified, and either carried out or a report of the need is made.</p> <p>1.6.<i>Treatments</i> are applied to storage facilities to maintain hygiene standards and in line with the storage program.</p> <p>1.7.Storage plan is prepared according to the organization objective and guidelines.</p> <p>1.8.The application of all treatments used is recorded in line with the <i>storage program</i>.</p>
2. Monitor crop produce arrival and dispatch	<p>2.1. Before crop produce is stored <i>samples</i> are taken for testing to ensure a complete record of the quality standards.</p> <p>2.2. At dispatch, the produce is checked for quality and against the records taken at the point of storage.</p> <p>2.3. Test samples are taken, prepared and forwarded for analysis according to prescribed guidelines.</p> <p>2.4. Transportation facilities are selected based on the type of produce</p>

	2.5. All activities around the storage facilities are undertaken according to the OHS guidelines detailed in the crop storage program.
3. Monitor and maintain crop produce conditions in storage	<p>3.1. <b>Options for maintaining or improving produce quality</b> are identified.</p> <p>3.2. Regular checks of storage are conducted to maintain continued freedom from <b>contaminants</b> and <b>deterioration</b>.</p> <p>3.3. Periodical checks of long-term storage are conducted for quality factors and viability according to organization requirements.</p> <p>3.4. Where test samples are required, they are taken, prepared and forwarded for analysis according to industry quality assurance and laboratory requirements.</p> <p>3.5. Clear and accurate records of tests and inspections are created, maintained and kept as described in the storage program.</p> <p>3.6. The <b>condition of storage facilities</b> is monitored using the schedule and methods outlined in the storage program.</p> <p>3.7. Where it is required, appropriate <b>corrective action</b> is taken to maintain the quality of stored produce.</p> <p>3.8. Crop produce waste disposal is undertaken</p> <p>3.9. All activities around the storage facilities are undertaken according to the OHS guidelines detailed in the storage program.</p>
4. Control storage pests	<p>4.1. Storage pest are identified that affect crop produce quality.</p> <p>4.2. Crop produce is monitored according to the checklist, targets and methods outlined in the storage program.</p> <p>4.3. Samples of the stored produce are taken to test for pest infestation.</p> <p>4.4. storage pests are controlled according to the guidelines in the storage program.</p> <p>4.5. Enclosed storage area is <b>fumigated</b>, and the surrounding environment is kept clean according to the integrated <b>pest management</b> strategy in the storage program.</p> <p>4.6. The sources of any infestations are identified and steps are taken to control them in line with the integrated pest management strategy in the storage program.</p> <p>4.7. <b>Pest control activities</b> are undertaken in line with the <b>OHS hazard</b> guidelines detailed in the storage program.</p> <p>4.8. Clear and accurate records and reporting of treatments to the stored produce and storage facilities are created, maintained and kept as described in the storage program.</p>

Variable	Range
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Problems of storage facility	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The presence of water or water damage</li> <li>• Presence and activity of pests (including insects, moulds, birds and rodents),</li> <li>• Dead vertebrate pests in storage</li> <li>• Breakdown of storage security and integrity (e.g. Holes, cracks, poor sealing, etc.)</li> <li>• Grain moisture content</li> <li>• Excessive dust levels</li> <li>• High pesticide and fumigant residues</li> <li>• Legal withholding periods</li> </ul>
Storage facilities	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The storage facility covers all types of temporary and permanent storage, complete with installed aeration, and controlled environment (atmosphere) or cold store.</li> </ul>
Storage	<p>May include, but not limited to:</p> <p>Receive, storage, sampling and analysis operations are coordinated processes and detailed in the storage program.</p> <ul style="list-style-type: none"> <li>• The act of storing; state or fact of being stored;</li> <li>• Capacity or space for storing;</li> <li>• A place, a room or building used for storage purpose.</li> </ul>
Hygiene standards	<p>May include, but not limited to:</p> <p>The storage area, grain storages, machinery, buildings, vehicles, handling equipment, produce and vegetation, might all be subject to inspection and treatment, including for insect and other pest refuges.</p>
Crop produce	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• A crop produce is a small, hard, dry seed, fruits – with or without an attached hull or fruit layer – harvested for human or animal consumption.</li> <li>• crop produce being stored include <ul style="list-style-type: none"> <li>✓ cereals</li> <li>✓ legumes</li> <li>✓ pulses</li> <li>✓ oilseeds</li> <li>✓ pasture seeds</li> <li>✓ vegetables</li> <li>✓ Fruits</li> <li>✓ root and tubers</li> <li>✓ stimulants and spice</li> </ul> </li> </ul>
Storage system	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>➤ Hermetics bag</li> <li>➤ metal silos</li> <li>➤ bulk storage system <ul style="list-style-type: none"> <li>• Jute bags</li> <li>• Farm level bulk storage</li> </ul> </li> </ul>



	<ul style="list-style-type: none"> <li>• Commercial bulk storage</li> <li>• Wire houses</li> <li>• Cold rooms</li> </ul>
Treatments	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Treatment of something involves putting a particular substance onto or into it, in order to clean it, to protect it, or to give it special properties</li> <li>• Recording the application of treatments might require the use of either digital or paper-based systems, or a range of data capture technologies.</li> </ul>
Storage program	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• The program will provide details of the product to be stored, the timeframes involved, the resources to be used, the locations for storage, the recording and documentation requirements, the scheduling of the operation, the responsibility of the various operators to be involved, the method of pest control, and the method of sampling and where samples should be sent.</li> <li>• Details of the requirements to minimize or eliminate OHS risks, the legislative requirements in relation to all activities undertaken during quality maintenance activities, and chemical handling procedures and guidelines would also be covered in the program.</li> <li>• The storage program would also ensure that equipment and personnel arranged for operations are appropriate to the requirements of various legislation and may include equipment for detection of fumigant in the atmosphere, confined spaces equipment, pressure testing equipment, fumigant/inert atmosphere pressure bottles, fumigant generation equipment, and personal protection.</li> </ul>
Samples	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>✓ A small part or quantity intended to show what the whole is like.</li> <li>✓ Inspection/sampling techniques may include turning, visual inspection, hand sampling, grain sieves, probes and spears, or trapping</li> </ul>
Records	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Records provide details required by legislation and are kept for the required period of time.</li> <li>• They might contain information relating to the produce itself (crop types, varieties, quality segregation), expenditure in relation to storage and handling, OHS considerations (those relating to chemical handling and application), and operational functions (dates, times, quantities, personnel).</li> <li>• The format of any reporting might be electronic or paper based.</li> </ul>
Options for maintaining or improving produce quality	<p>May include but not limited to:</p> <p>They may involve new technology, new systems, or altered practices such as drying, aeration, sealing, controlled atmospheres, or the use of</p>

	desiccant dusts.
Contaminants	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Substances (i.e., chemical elements and compounds) or groups of substances that are toxic, persistent and liable to bio accumulate and other substance or group of substance which, gives rise to an equivalent level of concern.</li> <li>• It includes: <ul style="list-style-type: none"> <li>• moulds,</li> <li>• moisture,</li> <li>• mites,</li> <li>• insects, or</li> <li>• fungal diseases.</li> </ul> </li> </ul>
Deterioration	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• The action or process of becoming impaired or inferior in quality, functioning, or condition and loss in the properties of a material by chemical interaction with the environment.</li> </ul>
Condition of storage facilities	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Systems should be in place to ensure the safe operation and maintenance of machinery and equipment.</li> <li>• Precautions should also be in place to minimize exposure to noise, and organic and other dusts.</li> <li>• Systems and procedures for handling and storing grain, as well as working with and around electricity should also be in place.</li> <li>• Fixtures should be in place in all silos and storage sheds, including appropriate access ladders, hand rails and ladder cages.</li> <li>• PPE should be selected, used and maintained.</li> <li>• Environmental conditions should be controlled. For example, keeping moisture levels within prescribed industry standards will reduce the likelihood of fire and silo collapse.</li> <li>• Procedures should be in place and used for working on top of stored produce, working with grain mass movement and stability, working within confined working spaces, moving vehicles, and working at heights.</li> <li>• Record keeping should ensure that requirements in relation to properly observing and using product labels and MSDS sheets, instruction manuals, and written organizational procedures.</li> </ul>
Corrective action	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Maintenance activities such as inspection for structural problems repair of physical damage, sealing of inlets and outlets to maintain gas tightness, pressure testing of sealed storages to recommended levels, location and repair of leaks in sealed storages, maintenance of pressure relief valves, and painting and upkeep of heat reflecting coating.</li> <li>• Corrective action might also include the operation of installed</li> </ul>

	<p>equipment where it exists. For example, refrigeration may be used on storage facilities holding malt quality barley or sorghum, or where high moisture content is jeopardizing grain quality.</p> <ul style="list-style-type: none"> <li>• Matching the cooling load with equipment selection may involve site-specific data and calculations, combined with the use of manufacturer’s data.</li> <li>• Additionally, aeration might assist to reduce grain temperature and grain moisture levels to client and organizations requirements.</li> </ul>
Fumigation	<p>May include but not limited to: the process of using smoke or fumes to disinfect a place or thing or to rid it of fleas, roaches, agricultural pests, weeds, for the purposes of treating identified pests, or for meeting grain quality requirements.</p>
Pest management	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Activities such as application of insecticides, herbicides and growth regulators, baiting (using registered controlled and generally available substances), desiccant dusts, or fumigation and/or inert atmosphere operations could be employed either separately or in partnership.</li> <li>• Sampling and testing is a part of the integrated pest management activities and may provide evidence of the development of resistance to pesticides in pests.</li> </ul>
Pest control activities	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Be in silos, grain storages, surrounding area, grain handling equipment, machinery, buildings, and hay and other produce that can harbor insect pests.</li> <li>• cultural, chemical and biological</li> <li>• exclusion, repulsion, physical removal</li> </ul>
OHS hazards	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Amongst the risks are operating and maintaining machinery and equipment, including hydraulics and guarding of exposed moving parts, noise, organic and other dusts, working with</li> <li>• Transporting and storing hazardous substances (such as pesticides), using fumigants, working at heights, and working on the crop produce mass.</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, attitudes and skills competence to:</p> <ul style="list-style-type: none"> <li>• Monitor and maintain hygiene,</li> <li>• Apply legislative requirements, and procedures relating to the purchase, transport, storage, use and disposal of pesticides and fumigants</li> <li>• The range of applicable pesticides, application methods and handling requirements</li> <li>• Identify commodity types, varieties and grades</li> <li>• Describe the range of applicable pesticides, their uses, application methods and handling requirements</li> <li>• Developments and options available for maintaining or</li> </ul>

	<p>improving the quality of produce during storage</p> <ul style="list-style-type: none"> <li>• Integrated Pest Management principles and the procedures used within the organization.</li> <li>• Common crop produce pests and their general control methods</li> <li>• Appropriate action to be taken in contingency situations</li> <li>• Marketing requirements and options for crop produce storage</li> <li>• Equipment available and its uses, limitations and OHS requirements</li> <li>• Chemical handling and dangerous goods requirements</li> <li>• Identify common storage pests</li> <li>• Identify the place for storage areas</li> <li>• Identify and check the seed moisture content of grains before storage.</li> <li>• Understand how samples are taken from storage produce</li> <li>• Identify kinds of storage facilities</li> <li>• Understand the storage conditions according to environmental situation.</li> <li>• Recognize how storages are prepared, placement and direction of storage.</li> <li>• Identify the main environmental factors and pest that affect quantity and quality in storage.</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge and Attitudes of:</p> <ul style="list-style-type: none"> <li>• Commodity types, varieties and grades</li> <li>• Handling requirements for gas cylinders</li> <li>• Insect life cycles and optimum conditions for development</li> <li>• Integrated pest management principles and the procedures used within the organization</li> <li>• Legislative requirements, and procedures relating to the purchase, transport, storage, use and disposal of pesticides and fumigants</li> <li>• Client's sampling and classification requirements</li> <li>• Common storage pests and their general control methods</li> <li>• Marketing requirements and options for crop produce storage</li> <li>• Equipment available and its uses, limitations and OHS requirements</li> <li>• Site hazards and sound management practices and processes to minimize noise, odours, and debris from storage operations</li> <li>• Chemical handling and dangerous goods requirements</li> <li>• Developments and options available for maintaining or improving the quality of produce during storage.</li> <li>• Identify the main environmental factors and pest that affect quantity and quality in storage</li> <li>• Understanding crop produce storage systems</li> </ul>
Required Skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Silo and temporary storage configuration and operation</li> <li>• Hermetic storage identification and application</li> </ul>

	<ul style="list-style-type: none"> <li>• Grading of horticultural crop produce</li> <li>• Identify the range of applicable pesticides, application methods and handling requirements</li> <li>• Setup and operate fumigation and pesticide application equipment</li> <li>• Sample loads and produce in the storage, and conduct a sample analysis</li> <li>• Create, maintain, and keep clear and tractable records</li> <li>• Operate a range of communication equipment, including in emergency situations</li> <li>• Inspect and test silos</li> <li>• Identify insects, pests and other factors that affect stored produce quality</li> <li>• Set up and operate inert atmosphere equipment</li> <li>• Handle and mix chemicals for baiting, fumigation, spraying, and other forms of application</li> <li>• Interpret and monitored information on pests</li> <li>• Plan and schedule pest control including amending plans during the operations</li> <li>• Calculate mass and volumes of grain and horticultural produce</li> <li>• Observe, identify and react appropriately to environmental implications and OHS hazards.</li> <li>• Collect, analyse and organize information by observing and measuring the impact of pests and contaminants.</li> <li>• Plan and organize activities in arranging for samples to be taken of the, and in getting those samples laboratory tested.</li> <li>• Work with others and in teams in working safely to store and monitor grain in silos and other storage facilities.</li> <li>• Use mathematical ideas and techniques in calculating sampling results, loadings, and volumes of storages.</li> <li>• Solve problems through identifying deterioration in the product quality and selecting an appropriate response.</li> <li>• Appropriate action to be taken in contingency situations</li> </ul>
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Crop Production Level IV	
Unit Title	Demonstrate Improved Crop Technologies and Practices
Unit Code	<a href="#">AGR CRP4 08 0322</a>
Unit Descriptor	<p>This unit defines knowledge, skills and attitude required in establishing demonstrations of new crop production technologies and practices.</p> <p>It includes problem identifications, need assessment, select appropriate crop technologies and practices, demonstration plots selection and establishment.</p> <p>Furthermore; conducting group extension events, monitoring and evaluation of demonstration plots are integral part of the competency. It also includes facilitation of farmer's field days and field school in order to strengthen the farmer-to-farmer knowledge exchange. This competency addresses feedback and data collection, analysis and document best practice for future use.</p>

Element	Performance Criteria
1. Prepare for demonstration	<p>1.1. Situations are identified where existing knowledge can be used as the basis for demonstrating <b>new crop technologies and practices</b></p> <p>1.2. Problem identification and need assessments is realised following <b>participatory approaches</b> of <b>stockholders</b> and organizational requirement.</p> <p>1.3. Sources of information and availability of new crop technologies and practices are assessed</p> <p>1.4. New technologies and practices are selected based on the need assessment, availability, <b>environmental considerations</b>, problem solving ability, growing season and <b>organization affordability</b></p> <p>1.5. Detail plan of implementation is prepared by considering technology specification, growing season, organisation goal and guidelines.</p> <p>1.6. Training and awareness creation activities about the selected new crop technology and practices are conducted in order to create common understanding and easy work flow among actors.</p> <p>1.7. All <b>required inputs</b> to implement the demonstration are prepared based on demonstration plan.</p> <p>1.8. Demonstration data recording sheet is prepared</p>
2. Demonstrate Crop Technologies and practices	<p>2.1. A <b>demonstration plots</b> are selected based on the <b>selection guidelines/requirement</b></p> <p>2.2. Demonstration plots are prepared and necessary amendments are conducted based on the standard guidelines</p> <p>2.3. The new technology or practice is established in the prepared plots according to the recommendations.</p> <p>2.4. All required managerial practices/operations are undertaken based</p>

	<p>on the guidelines at the correct time.</p> <p>2.5. If the observed problems cannot be resolved it should be reported to the supervisor and/or technology owner.</p>
3. Monitor and evaluating crop demonstration	<p>3.1 Demonstration plots monitored regularly based on the plan</p> <p>3.2 <b>Field days</b> and other group extension events are organised for participants at the demonstration site based on the plan</p> <p>3.3 Feedback is sought from participants where appropriate for further scaling out of the new technology or practice.</p> <p>3.4 Data is recorded, analysed, interpreted and reported to the supervisor.</p>

Variables	Range
New crop technologies and practices	<p>May include but not limited to:</p> <p>Application of new techniques, practices, input to increase the growth, development, yield, quality and easy harvest of crop products.</p> <ul style="list-style-type: none"> <li>• New crop varieties (seeds, cutting materials, rhizomes)</li> <li>• Agronomic practices (seed rate, spacing, method of sowing/planting)</li> <li>• Fertilizer applications (amount, rate, time of application)</li> <li>• Soil amendment techniques and practices</li> <li>• Irrigation methods</li> <li>• Crop rotation</li> <li>• Improved crop storage technologies</li> </ul>
Participatory approaches	<p>May include but not limited to:</p> <p>The active involvement and empowerment of stakeholders (actors) includes:</p> <ul style="list-style-type: none"> <li>• sharing of knowledge and experience</li> <li>• recognising and encompassing different perspectives</li> <li>• working in teams on practical tasks</li> <li>• the development of shared understanding and jointly owned plans or other products</li> </ul>
Stakeholders	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Host farmer/community</li> <li>• Farmer organisations</li> <li>• Commodity Associations</li> <li>• government extension departments.</li> <li>• Private sector e.g., fertilizer, seed and chemical companies.</li> <li>• Researchers</li> <li>• Development partners /NGOs</li> <li>• Universities and colleges and</li> <li>• Local leadership</li> </ul>

Environmental Considerations	May include but not limited to: May include recycling, safe disposal of packaging (e.g. Cardboard, polystyrene, paper, plastic) and correct disposal of waste materials by an authorized body
organization affordability	May include but not limited to: <ul style="list-style-type: none"> <li>organization affordability is the maximum price the consumer could able to pay for the technology.</li> </ul>
required inputs	May include but not limited to: <ul style="list-style-type: none"> <li>fertiliser,</li> <li>seed,</li> <li>labour</li> <li>herbicides</li> </ul>
Demonstration plots	May include but not limited to: <ul style="list-style-type: none"> <li>A demonstration plot is a field that is used for teaching, sharing ideas and showcasing a proven crop technologies/practice</li> <li>Piece of land</li> <li>Plant</li> </ul>
selection guidelines/requirement	May include but not limited to: Have a basic understanding on <ul style="list-style-type: none"> <li>the history of the field</li> <li>Slope of the land</li> <li>soil structure, texture, pH</li> <li>soil fertility</li> <li>Soil should be representative of the area</li> <li>Water availability</li> <li>labour availability</li> </ul>
Field day	May include but not limited to: A group extension event conducted at the site of any type of demonstration. May be organized at the <ul style="list-style-type: none"> <li>time of planting</li> <li>when fertilisers or other inputs are provided</li> <li>mid-season when differences in crop growth are apparent</li> <li>harvest time when yields, costs and benefits can be compared</li> </ul>
Participants	May include but not limited to: <ul style="list-style-type: none"> <li>Farmers</li> <li>Agricultural extension workers</li> <li>Researchers</li> <li>NGOs</li> <li>Universities</li> </ul>
Feedback	May include but not limited to: <ul style="list-style-type: none"> <li>Surveys,</li> <li>Questionnaires,</li> <li>Interviews and meetings.</li> </ul>
All necessary data recorded	May include but not limited to: <ul style="list-style-type: none"> <li>Location (Ward, village, host farmer, GPS coordinates)</li> </ul>



	<ul style="list-style-type: none"> <li>• The theme of the demo</li> <li>• Plot size</li> <li>• Plant spacing</li> <li>• Practices carried out (land preparation, liming, fertilizer/manure application, planting, weeding, thinning, etc.),</li> <li>• dates and time taken (labour days) and input quantities,</li> <li>• Dates for specific physiological stages (germination %, flowering, pegging, silking etc.)</li> <li>• Incidences like hail and animal damage</li> <li>• Crop growth stages</li> <li>• Pests and disease prevalence and control measures</li> <li>• Rainfall data</li> <li>• Area, Production and Yield data</li> <li>• General remarks</li> </ul>
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<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>• Understand existing knowledge for demonstrating new crop technologies and practises</li> <li>• Implement new crop technology demonstration procedures and guidelines</li> <li>• Identify new crop technologies, practices and selection criteria's</li> <li>• Able to prepare demonstration plan, input preparation and provide training.</li> <li>• Plan and organize demonstration activities</li> <li>• Calculate resource requirements</li> <li>• Prepare written plans and procedures for implementation by others</li> <li>• Observe, identify and react appropriately to problems observed in demonstration plots</li> <li>• Able to coordinate field days and other group extension events</li> <li>• Communicate ideas and information by clearly explaining to staff, and concerned body regarding the purpose, requirements, and processes</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Understand guidelines to demonstrate new crop technologies and practices</li> <li>• Recognize problem identification and need assessment principles</li> <li>• Identify source of new crop technologies and practises</li> <li>• Understand new technology and practises selection criteria</li> <li>• Recognized demonstration plan preparation principles and</li> </ul>

	<p>procedures</p> <ul style="list-style-type: none"> <li>• Understand required inputs and resources for demonstration</li> <li>• Understand demonstration plot selection guidelines</li> <li>• Recognize the new technology demonstrations and implement managerial practices</li> <li>• Understand guidelines for monitoring demonstration plots</li> <li>• Able to understand recorded, analysed, interpreted and reported data's</li> <li>• Understand site identification and evaluation procedures</li> <li>• Able to locate appropriate sources of information regarding new technologies and practices</li> <li>• Understand best practices from the field day events</li> </ul>
Required Skills	<p>Demonstrate skills of:</p> <ul style="list-style-type: none"> <li>✓ Conduct problem identification and need assessment</li> <li>✓ Select new crop technologies and practices</li> <li>✓ Prepare demonstration plan</li> <li>✓ Prepare and conduct training plan</li> <li>✓ Calculate required inputs and costs</li> <li>✓ Prepare data recording sheet</li> <li>✓ Select demonstration plots</li> <li>✓ Implement managerial practices</li> <li>✓ Record, analyse, interpret and report demonstration data</li> <li>✓ Identify demonstration sites</li> <li>✓ Ability to assist in the decision-making process</li> <li>✓ interpreting technical manuals</li> <li>✓ Evaluate and apply new technology and practices to assist in solving organizational problems</li> <li>✓ Prepare best practices formats and</li> <li>✓ Documentation and compilation of best practices</li> </ul>
Resources Implication	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting.</p>

<b>Occupational Standard: Crop Production Level III</b>	
<b>Unit Title</b>	<b>Seed multiplication and quality control</b>
<b>Unit Code</b>	<b><u>AGR CRP4 09 0322</u></b>
<b>Unit descriptor</b>	<p>This unit covers the knowledge, skills and attitude required in the selection of quality seed or planting materials, multiplication of improved crop seeds and other planting materials.</p> <p>It includes planning and preparing for seed multiplication, preparing land and sowing, maintaining the field, managing weeds and pests, harvesting, grading of seeds. Processing/post-harvest seed treatments of seeds and storage.</p>

<b>Element</b>	<b>Performance Criteria</b>
1. Select quality seed/ planting materials	<p>1.1. Based on crop type quality parameters and <i>seed quality assessments</i> attributes are recognized</p> <p>1.2. Causes of <i>seed quality deterioration</i> determinants are identified</p> <p>1.3. <i>Seed quality standards</i> are used for seed/planting material selection</p> <p>1.4. A portion of the crop to be used as seed is selected based on its health, vigour, and grain size and <i>measures</i> are taken when required.</p> <p>1.5. Seed treatment application is identified and appropriate pre-seeding treatments are applied in full consideration of <i>detrimental environmental impacts</i></p>
2. Plan and prepare land for seed multiplication	<p>2.1 Production requirements for seed/planting material based on supply, quantity, quality, <i>client</i> preferences and demand is determined.</p> <p>2.2 Production scheduled for seed multiplication is prepared based on environmental conditions and market requirements</p> <p>2.3 Proper site selection for seed multiplication based on the minimum seed standards are employed</p> <p>2.4 Required tillage/ploughing equipment's are selected, prepared and the land cultivate according the <i>crop</i> requirement.</p> <p>2.5 <i>Soil toxicity problems</i> and common nutrient deficiency assessed and identified based on the crop type.</p> <p>2.6 Soil amendment practices are applied based on the guidelines.</p> <p>2.7 Machineries, equipment's and other farm inputs used for sowing are prepared.</p>
3. Seed production Establishment	<p>3.1 The quantity of seed/planting material required to sow is calculated based on the size of area and required quantity of seed needed to produce.</p> <p>3.2 Soil and weather conditions are monitor for optimal seeding conditions.</p> <p>3.3 Keeping appropriate <i>isolation distance</i> based on available guidelines</p>

	<p>for <b><i>cross and self-pollinated crops</i></b> to produce <b><i>certified seeds</i></b>.</p> <p>3.4 Seeding and fertilizer applications are conducted in line with plant growing cycle and the work plan.</p> <p>3.5 Clean machinery and equipment when seeding operation is completed</p>
4 Maintain the field	<p>4.1 Crop condition and growth requirements are monitored and appropriate measures implement based on the requirement.</p> <p>4.2 Rouging, dates, selling and inspection of the field ensured for production of certified seeds based on the guidelines.</p> <p>4.3 Appropriate agronomic practices are applied</p> <p>4.4 Monitor soil moisture content and apply water/irrigation, if any deficiency as per the crop requirement and growth stage.</p> <p>4.5 Field drainage is monitored and maintained based on the guidelines.</p>
5 Control weeds, pests and diseases	<p>5.1 Weed infestation and other crop pest occurrences are assessed.</p> <p>5.2 Appropriate weed and other pest control methods are implemented following principles of integrated pest management standards or organization code of practice.</p> <p>5.3 Side effects of pest control methods to other plants, animals or external environment are identified.</p> <p>5.4 Effectiveness of control methods assessed in reference to specified organisational standards.</p> <p>5.5 Late growing weeds are Carefully monitored and controlled to ensure the maximum purity of the seed during harvesting.</p>
6 Harvest the crop	<p>6.1 Internal and external inspections are coordinated and conducted before harvesting for seed certification.</p> <p>6.2 Crop maturity is evaluated based on the guidelines and determine appropriate time of harvesting.</p> <p>6.3 Based on the classification standards samples are taken and moisture content determined.</p> <p>6.4 Necessary harvesting equipments are prepared and harvesting operations and transportation undertaken</p> <p>6.5 Hygiene standards are identified for the crop and complete for each paddock based on harvest strategy and plan.</p> <p>6.6 The quality of the seed is maintained by proper checking and adjusting harvester ancillary equipment, including their height and other settings.</p>
7. Seed Processing and treatments	<p>7.1. <b><i>Seed treatments</i></b> are applied where appropriate and according to the organizations production and marketing requirements.</p> <p>7.2. Seeds are graded, packaged and labelled according to organization work procedures.</p>

	<p>7.3. <b>Post-harvest treatments</b> are selected and applied according to harvested produce requirements, the organization integrated pest management strategy and the marketing plan.</p> <p>7.4. Seed samples collected and forwarded to the analysing body, according to the guidelines.</p>
8. Store seeds and evaluate the stored seed	<p>8.1 Storage facilities are selected and maintained in proper hygiene before seeds are transfer according to the organizations OHS and hygiene guidelines.</p> <p>8.2 Seeds are stored under conditions that maintain its quality and germination capacity.</p> <p>8.3 Periodic checks and laboratory testing of seed in long-term storage are conducted for quality factors and viability according to organization requirements.</p> <p>8.4 Seed labelling and storage <b>records</b>, tests and inspections should be maintained and kept as described in the seed storage program in clear and accurate way and take appropriate corrective action when required</p> <p>8.5 Forward the records kept to the <b>appropriate person</b> for analysis and decision-making.</p>

Variable	Range
seed quality assessments	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Seed moisture test</li> <li>• purity test</li> <li>• Germination test</li> <li>• Seed Vigor test</li> <li>• Seed health test</li> </ul>
seed quality deterioration	<p>May include, but not limited to:</p> <p>It is the losses of seed quality, viability, vigour caused by</p> <ul style="list-style-type: none"> <li>• Genetic purity</li> <li>• Physical/Mechanical mixture</li> <li>• Physiological problem</li> <li>• Production environmental</li> <li>• Harvesting time</li> <li>• Appropriate packaging</li> <li>• Traceability</li> </ul>
seed quality standards	<p>May include, but not limited to:</p> <p>The minimum limit of germination, varietal purity, physical purity, seed inspection, laboratory standards and other quality attributes of prescribed seed as set by the authorized authority.</p>
Measures	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>• Removing pests and weeds, as well as enhancing the nutrients of the area.</li> <li>• Rouging of off-types and undesirable weeds, grading out weed seeds and small grains and other impurities</li> </ul>

	<ul style="list-style-type: none"> <li>Enhancing the nutrient levels with pre-harvest applications, and careful harvesting to prevent cracked and damaged grain.</li> </ul>
Detrimental environmental impacts	<p>May include, but not limited to:</p> <p>Persistent application of chemicals to a particular area of soil over time can lead to a change in the soil performance and any inappropriate disposal of containers or chemicals can contaminate soils, crops and water.</p>
Client	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>Retail customers and commercial clients.</li> <li>Farmers and private investors, companies, community groups, government agencies, NGOs or a combination of these entities.</li> </ul>
Crop	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>Grains cereals</li> <li>Pulses</li> <li>Forage seed</li> <li>Vegetable seeds</li> <li>Cotton</li> <li>Oils seeds</li> <li>Fruit</li> </ul>
Soil toxicity problems	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>The contamination of soil with anomalous concentrations of toxic substances.</li> <li>Such as acidity, salinity, alkalinity</li> </ul>
Isolation distance	<p>May include, but not limited to:</p> <p>The minimum distance helped to avoid pollen contamination or cross pollination between varieties.</p>
Cross pollinated crops	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>The cross-pollination is defined as the deposition of pollen grains from a flower to the stigma of another flower. Commonly, the process is done by insects and wind.</li> <li>cross-pollination can be observed in crops such as fababean, noug, sunflower, and others</li> </ul>
Self-pollinated crops	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>In this process, the pollen grains transfer from the stigma of the same or genetically similar flower.</li> <li>Self-pollination can be observed in crops such as oats, barley, linseed, wheat, and others.</li> </ul>
Certified Seeds	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>Seed certification is commonly used as seed quality assurance system based on regulatory frameworks, procedures, and standards.</li> </ul>
Seed treatments	<p>May include, but not limited to:</p>

	<ul style="list-style-type: none"> <li>Applied to seed or planting materials to control or reduce fungal and insect damage prior to planting or storage</li> </ul>
Post-harvest treatments	<p>May include, but not limited to:</p> <ul style="list-style-type: none"> <li>Removal of dirt and foreign material</li> <li>Drying</li> <li>Germination tests</li> <li>Purity tests</li> <li>Calculating expiry date</li> <li>Applying colouring materials</li> <li>Fungicides and insecticides by mixing or fumigation</li> <li>Observing quarantine requirements and storing in a controlled environment.</li> </ul>
Records	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>Information from each season useful in building a history for the organization, and for input into subsequent year's decision-making.</li> <li>Records of each step: results of calculations, location of the area used for seed growing, origin of the seed, varieties used, soil types used for growing seed, seed improvement methods used, and time of harvest.</li> <li>Conditions, and length of time in storage.</li> </ul>
Appropriate person	<p>May include but not limited to:</p> <p>This is the person who will make decisions on the production and operations planning of activities.</p>

### Evidence Guide

Critical Aspects of Competence	<p>Demonstrate knowledge, attitude and skills to:</p> <ul style="list-style-type: none"> <li>Identify crop types and seed class (breeder seed, basic and pre basic seeds)</li> <li>Preparation of seeds, seeding methods and application techniques</li> <li>Seed quality standards, seed certification, packaging</li> <li>Method of pollination</li> <li>Describe Basic type of seeds</li> <li>Type of certified seeds and hybrid seeds</li> <li>Identify fertilizer types, rates of application and crop nutrient requirements</li> <li>Describe types of herbicides, insecticides and other pesticides, and alternative pest control methods (non-chemical)</li> <li>Describe effects of weather conditions (normal and adverse) on seeding and fertilizing applications</li> <li>Demonstrate techniques of crossing</li> </ul>
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	<ul style="list-style-type: none"> <li>• Principles of isolation distance</li> <li>• Describe seed grading techniques</li> <li>• Describe seed selection procedures and criteria's</li> <li>• Understand seed storage principles and treatments</li> </ul>
Required knowledge and attitude	<p>Demonstrate knowledge and attitude of:</p> <ul style="list-style-type: none"> <li>• Definition of seeds and planting material</li> <li>• Establishment and maintenance of a range of improved seed and other planting materials multiplication of various crop varieties in relation to client needs and the standards of the country</li> <li>• Establishment procedures, plant selection and culture</li> <li>• Practices for a range of crops variety's seed and other planting materials production and multiplication.</li> <li>• How to maintain Isolation distances and field requirements to produce seed</li> <li>• Identifying crop types, preparation of seeds, seeding methods and application techniques</li> <li>• Identify method of pollination and their implication for seed production</li> <li>• Define basic seeds, certified seeds, hybrid seeds</li> <li>• Understand parental lines and their maintaining methods</li> <li>• procedures for cleaning, securing and storing machinery,</li> <li>• equipment and materials</li> <li>• Pests and disease recognition on seed production</li> <li>• Economic, aesthetic or environmental thresholds for a range of weeds and pests.</li> <li>• Environmental issues of ploughing soil for planting</li> <li>• A range of pre-planting treatments, their purpose and method of application</li> <li>• Fertilizer types and type of seeds identification</li> <li>• production and multiplication of various crop varieties</li> <li>• Feld, storage and laboratory standards of seed</li> <li>• Seed grading and selecting quality seed</li> <li>• records and documentation required for tracking and handling of seed</li> <li>• environmental controls and codes of practice applicable to the enterprise</li> <li>• Relevant legislation and regulations relating to OHS, contractor engagement, chemical use and application, vehicle and plant use, and to the use, handling and sale of seed</li> <li>• Sound management practices and processes to minimize noise, odors, and debris from sowing operations.</li> </ul>



Required skills	<p>Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Use range of seed and other planting materials</li> <li>• Implement methods of ploughing a range of soil types</li> <li>• Ploughing soil for planting</li> <li>• Apply a range of pre-planting treatments, their purpose and method of application</li> <li>• Identifying crop types</li> <li>• Prepare seeds, seeding methods and application techniques</li> <li>• Conduct appropriate seed tests</li> <li>• Pollinate crops</li> <li>• Pests and disease recognition.</li> <li>• Grade seeds based on the criteria</li> <li>• Conduct post-harvest seed processing</li> <li>• Conduct appropriate seed tests</li> <li>• Roughing and field inspection</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Observation/Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational standard : Crop Production Level IV	
<b>Unit Title</b>	<b>Develop value chain analysis</b>
<b>Unit Code</b>	<a href="#"><u>AGR CRP4 10 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills, and attitude needed to Understand value chain ,Identify concepts of value chain ideas Develop the value chain and Upgraded value addition

<b>Elements</b>	<b>Performance Criteria</b>
1. Understand concepts of value chain	1.1 <i>Concept of value chain</i> are understood 1.2 Value chain scopes are understood and identified 1.3 <i>Principle of value chain</i> are understood and identified 1.4 Value chain <i>characteristic</i> are understood and identified 1.5 Value chain <i>Importance</i> are discussed and understood 1.6 <i>Concept of value addition</i> are understood and determined

2. Identify Value chain analysis	<p>2.1 <b>Dimension</b> and <b>structures</b> of Value chain are identified and interpreted</p> <p>2.2 <b>Value chain actors</b> are identified according to the objective and interest or need of chain actors</p> <p>2.3 <b>Value chain maps</b> are illustrated for different <b>agricultural products</b></p> <p>2.4 Value chain techniques for <b>value addition</b> are identified and analyzed</p> <p>2.5 <b>Contract farming</b> system is established to promote value chain.</p>
3. Develop value chain	<p>3.1 Value chain <b>parameters</b> are analyzed to compare the gaps between the existing and the benchmark.</p> <p>3.2 <b>Constraints and gaps</b> are collected, analyzed and ranked according to the priority used to develop value chain</p> <p>3.3 <b>Steps of value chain</b> development are identified</p> <p>3.4 Value Chain <b>selection techniques</b> are identified to develop value chain</p> <p>3.5 Potential <b>interventions</b> for value chain development are identified</p>
4. Upgrade value addition	<p>4.1 <b>Environmental considerations</b> are understood to upgrade value addition development</p> <p>4.2 Value chain actors are identified for <b>Value addition</b></p> <p>4.3 Value chain is <b>upgraded</b> for agricultural products to measure performance of value chain development</p> <p>4.4 Customer feedbacks are collected, organized and documented to improve Customer satisfaction</p>

Variable	Range
Concept value chain	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Market oriented products</li> <li>• General Principle</li> <li>• Value chain actor</li> <li>• Mapping</li> <li>• Value addition</li> </ul>
Principles of value chain	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Value chain mapping</li> <li>• Identifying the distribution of benefits of actors</li> <li>• Examining the role of upgrading</li> <li>• Governance in the value chain</li> </ul>
Characteristic	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Inbound logistic</li> <li>• Operation</li> <li>• Out bound logistic</li> <li>• Marketing</li> <li>• Sales</li> </ul>

	<ul style="list-style-type: none"> <li>• Services</li> </ul>
Importance	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Simple and better way to identify gaps and technologies.</li> <li>• Increases efficiency and systemic competitiveness of local enterprise</li> <li>• Primary targets involvement between local sector and sub sector</li> <li>• Reduces production costs and improves profitability</li> <li>• Improves customer satisfaction by providing quality product and service</li> </ul>
Dimension	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Sourcing of Inputs and supplies</li> <li>• Production capacity and technology</li> <li>• End-markets and trade</li> <li>• Governance of value chains</li> </ul>
Structures	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Input sector:</li> <li>• Farm/production sector:</li> <li>• Product sector</li> </ul>
Value chain actors	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Farmers,</li> <li>• Traders,</li> <li>• Processors,</li> <li>• Transporters</li> <li>• Wholesalers</li> <li>• Retailers and final consumers</li> </ul>
Agricultural sectors	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Crop farming</li> <li>• Forestry</li> <li>• Livestock</li> <li>• Fisher and aquaculture</li> <li>• Agricultural cooperative</li> <li>• Agricultural extension service</li> </ul>
Parameters	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Yield</li> <li>• Quality</li> <li>• Cost</li> </ul>

	<ul style="list-style-type: none"> <li>• Time</li> </ul>
Technology constraints	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Marketability</li> <li>• Profitability</li> <li>• Capability and Usefulness</li> <li>• Functionality</li> <li>• Import Substitution</li> <li>• Feasibility</li> <li>• Adaptability</li> <li>• Potential Impact to the MSE</li> <li>• Woman Empowerment</li> <li>• Employment</li> </ul>
Steps of value chain	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Value chain selection</li> <li>• Data collection</li> <li>• Value chain mapping</li> <li>• Value analysis</li> <li>• Gap identification</li> <li>• Prioritizing constraints</li> <li>• Technology identification &amp; categorization</li> </ul>
Selection technique	<p>May include, but not limited to</p> <ul style="list-style-type: none"> <li>• Integration economic</li> <li>• Environmental</li> <li>• Social</li> <li>• Institutional</li> </ul>
Environmental considerations	<p>May include , but not limited to:</p> <ul style="list-style-type: none"> <li>• Sustainability of the land use system for production and processing</li> <li>• Sources of energy</li> <li>• Efficiency of energy use</li> <li>• Greenhouse gas emissions</li> <li>• Water use efficiency and possibilities of contamination</li> <li>• Quantity and character of chemicals being used</li> <li>• Waste production and management</li> </ul>

Value addition	<p>May include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• measured against its contribution to the customer</li> <li>• Technical benefits/features</li> <li>• Location benefits/features</li> <li>• Aesthetic benefits/features</li> <li>• Information benefits/features</li> </ul>
Contract farming	<p>May include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Agreement between buyer and seller</li> <li>• Farmer and processing making firm for production</li> <li>• Supply of agricultural product</li> </ul>
Upgraded	<p>May include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Farm crop</li> <li>• Milk and Milk Products</li> <li>• Meat and Meat Products</li> <li>• Poultry Products</li> <li>• Fish and Fish Products</li> <li>• Honey and Honey Products</li> </ul>

Evidence Guide	
Critical Aspects of Competence	<p>A Candidate must demonstrate the ability to:</p> <ul style="list-style-type: none"> <li>• Understand concept of value chain</li> <li>• Identify Value chain actors</li> <li>• Apply techniques for value addition</li> <li>• Understand selection technique to develop value chain</li> <li>• Identify potential interventions to value chain analysis</li> <li>• Evaluate value chain addition</li> <li>• Contract farming system is established to promote value chain</li> <li>• Describe value chain upgraded and identify environmental issues for value chain development</li> </ul>
Required Knowledge and Attitude	<p>A candidate must demonstrate the knowledge and attitude to :</p> <ul style="list-style-type: none"> <li>• Understand concepts of value chain</li> <li>• Understand and Recognize characteristic of value chain</li> <li>• Understand dimension and structures of value chain</li> <li>• Identify principles of value chain for agricultural production</li> <li>• Identify value chain actors and Illustrate value chain mapping in agricultural product</li> <li>• Identify value chain analysis improve vale chain development</li> <li>• Understand the Bench mark analyze to develop value chain analysis</li> </ul>

	<ul style="list-style-type: none"> <li>• Observe environmental issue to upgrade Value chain</li> <li>• Determine value chain upgrade and focus on Value chain addition</li> </ul>
Required Skills	<p>A candidate must demonstrate the Skills to :</p> <ul style="list-style-type: none"> <li>• Identify concepts of value chain</li> <li>• Recognize and describe characteristic of value chain</li> <li>• Describe dimension and structures of value chain</li> <li>• Apply principles of value chain for agricultural production</li> <li>• Classify value chain actors and Illustrate value chain mapping in agricultural sector</li> <li>• Analyze the Bench mark to develop value chain analysis</li> <li>• Apply value addition and determine value chain upgrade development value chain analysis</li> <li>• Contract farming system is established to promote value chain</li> <li>• Describe value chain upgraded and identify environmental issues for value chain development</li> </ul>
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
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