The availability of this product is due to the financial support of the National Department of Agriculture and the AgriSETA. Terms and conditions apply.
Before we start...

Dear Learner - This Learner Guide contains all the information to acquire all the knowledge and skills leading to the unit standard:

**Title:** Apply Crop Protection Products Effectively and Responsibly  
**US No:** 116125  
**NQF Level:** 2  
**Credits:** 4

The full unit standard will be handed to you by your facilitator. Please read the unit standard at your own time. Whilst reading the unit standard, make a note of your questions and aspects that you do not understand, and discuss it with your facilitator.

This unit standard is one of the building blocks in the qualifications listed below. Please mark the qualification you are currently doing:

<table>
<thead>
<tr>
<th>Title</th>
<th>ID Number</th>
<th>NQF Level</th>
<th>Credits</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Certificate in Animal Production</td>
<td>48976</td>
<td>2</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>National Certificate in Mixed Farming Systems</td>
<td>48977</td>
<td>2</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>National Certificate in Plant Production</td>
<td>48975</td>
<td>2</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

Please mark the learning program you are enrolled in:

Your facilitator should explain the above concepts to you.

This Learner Guide contains all the information, and more, as well as the activities that you will be expected to do during the course of your study. Please keep the activities that you have completed and include it in your **Portfolio of Evidence.** Your PoE will be required during your final assessment.

This Learner Guide contains all the information, and more, as well as the activities that you will be expected to do during the course of your study. Please keep the activities that you have completed and include it in your **Portfolio of Evidence.** Your PoE will be required during your final assessment.

**What is assessment all about?**

You will be assessed during the course of your study. This is called **formative assessment.** You will also be assessed on completion of this unit standard. This is called **summative assessment.** Before your assessment, your assessor will discuss the unit standard with you.

Assessment takes place at different intervals of the learning process and includes various activities. Some activities will be done before the commencement of the
program whilst others will be done during programme delivery and other after completion of the program.

The assessment experience should be user friendly, transparent and fair. Should you feel that you have been treated unfairly, you have the right to appeal. Please ask your facilitator about the appeals process and make your own notes.

How to use the activity sheets...

Your activities must be handed in from time to time on request of the facilitator for the following purposes:

♦ The activities that follow are designed to help you gain the skills, knowledge and attitudes that you need in order to become competent in this learning module.

♦ It is important that you complete all the activities and worksheets, as directed in the learner guide and at the time indicated by the facilitator.

♦ It is important that you ask questions and participate as much as possible in order to play an active roll in reaching competence.

♦ When you have completed all the activities and worksheets, hand this workbook in to the assessor who will mark it and guide you in areas where additional learning might be required.

♦ You should not move on to the next step in the assessment process until this step is completed, marked and you have received feedback from the assessor.

♦ Sources of information to complete these activities should be identified by your facilitator.

♦ **Please note** that all completed activities, tasks and other items on which you were assessed must be kept in good order as it becomes part of your **Portfolio of Evidence** for final assessment.

**Enjoy this learning experience!**
How to use this guide …

Throughout this guide, you will come across certain re-occurring "boxes". These boxes each represent a certain aspect of the learning process, containing information, which would help you with the identification and understanding of these aspects. The following is a list of these boxes and what they represent:

**What does it mean?** Each learning field is characterised by unique terms and definitions – it is important to know and use these terms and definitions correctly. These terms and definitions are highlighted throughout the guide in this manner.

You will be requested to complete activities, which could be group activities, or individual activities. Please remember to complete the activities, as the facilitator will assess it and these will become part of your portfolio of evidence. Activities, whether group or individual activities, will be described in this box.

**Examples** of certain concepts or principles to help you contextualise them easier, will be shown in this box.

The following box indicates a summary of concepts that we have covered, and offers you an opportunity to ask questions to your facilitator if you are still feeling unsure of the concepts listed.

**My Notes …**

You can use this box to jot down questions you might have, words that you do not understand, instructions given by the facilitator or explanations given by the facilitator or any other remarks that will help you to understand the work better.
What are we going to learn?

What will I be able to do? ................................................................. 6
Learning outcomes ........................................................................ 6
What do I need to know? .............................................................. 6

Session 1 Implement a pre-application plan.................................. 7
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SAQA Unit Standard
What will I be able to do?

When you have achieved this unit standard, you will be able to:

- Apply agrochemical or crop protection products (CPP) products in a safe, effective and responsible manner with consideration to the environment.
- Deal with emergencies related to the use of agrochemicals.
- Gain an understanding of sustainable agricultural practices as applied in the animal, plant and mixed farming sub-fields.
- Participate in, undertake and plan farming practices with consideration for their environment.

Learning Outcomes

At the end of this learning module, you must be able to demonstrate a basic knowledge and understanding of:

- Interpretation of pictograms, colour coding and symbols.
- Legal implications of misuse/abuse i.e. off-label use.
- Potential hazards associated with agrochemicals.
- Cleaning and maintenance of equipment.
- General symptoms of poisoning.
- Impact of product on the environment, humans and other organisms.
- Basic storage principles and requirements.
- Principles and methods of mixing.
- Empty container and waste disposal.
- Emergency procedures.
- Legislation and Codes of Practice.
- First aid.
- Hygiene.
- Contamination.

What do I need to know?

It is expected of the learner attempting this unit standard to demonstrate competence against the unit standard:

- **NQF Level 1 (ABET 4); Unit Standard Number** 116204; Recognize pests, diseases and weeds on crops
- **NQF Level 2 (E); 116065; Store and control agrochemical or CPP products effectively and responsibly**
Session 1

Implement a pre-application plan

After completing this session, you should be able to:

SO 1: Implement a pre-application plan

In this session we explore the following concepts:

- Plant protection products (Registration, Identification, Availability)
- Application Methods
- Application equipment
- Protective Gear and Safety Equipment

1.1 Introduction

Crops attract a great variety of pests and diseases that cause external and internal damage to the crop and plant. **Unit standard 116125: Crop Protection – Application** concerns itself with the application of crop protection and therefore the implementation of the crop protection program. It is assumed that the learner already has a basic understanding of the identification of pests and diseases and of the control measures used.

Although some pests and diseases in a field or orchard are controlled manually, the greater majority are controlled through the use of chemicals. The crop protection application methods covered in this unit standard refer to the chemical control of pests and diseases.

The term **Crop Protection Manager** is used in this learning material when referring to the person responsible for the implementation of the crop protection program. In practice, this function may be fulfilled by the farmer or the general manager of the farming operation.

Proper planning for protecting crops from pests and diseases is critically important. Poor planning could result in financial losses due to a reduced crop or a poor quality crop, and possible damage to the health of trees. Time and money will also be lost if incorrect or unnecessary applications are made.

Planning entails two steps. Firstly, a crop protection program is compiled to control the pests and diseases commonly found in the area where the farm is located. The crop protection manager decides which chemicals to use, in what concentration to apply the chemicals, and the schedule of application. This information is incorporated in a crop protection program, which is normally compiled before the
start of the season and strictly adhered to as the season progresses. There may be minor changes made during the season if circumstances in the field change.

Pre-application planning is done before each stipulated application on the crop protection program, and may be best accomplished by using a simple checklist. We will look at the checklist at the end of this session, after considering the various components of this planning process.

A proper plan for the application of plant protection products, a thorough understanding of the following components is required:

♦ Plant protection products
♦ Application methods
♦ Application equipment
♦ Health and safety

1.2 Plant protection products

The first step in the pre-application planning is to identify the product indicated in the crop protection program. Plant protection products are generally classified as insecticides, fungicides or herbicides.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide</td>
<td>The overall term used for all classified Crop protection products (CPP’s) or agro-chemicals</td>
</tr>
<tr>
<td>Insecticides</td>
<td>Insecticides are plant protection products (PPP’s) that are used to control insects.</td>
</tr>
<tr>
<td>Fungicides</td>
<td>Fungicides are plant protection products (PPP’s) that are used to control fungi.</td>
</tr>
<tr>
<td>Herbicides</td>
<td>Herbicides are plant protection products (PPP’s) that are used to control weeds.</td>
</tr>
</tbody>
</table>

**Plant Protection Product Registration**

Only chemicals that have been registered with the National Department of Agriculture in accordance with Act 36 of 1947 are permitted for use in South Africa. These products are listed in the following Government publications, which are updated from time to time:

♦ Guide for the Control of Plant Pests
♦ Guide for the Control of Plant Diseases

There is a section in these publications covering citrus pests and diseases where remedies for specific problems are listed. If these books are not available, the crop
The crop protection manager may need to consult a representative of one of the agrochemical companies.

**Plant Protection Product Identification**

The first step in identifying a product is to consult the chemical label. All chemicals must, by law, have a label on the container when it is supplied to the end-user.

The following information appears on the product label:

- Full instructions on how to use the chemical are indicated, together with detailed information on the uses for which the product is registered. The instructions must be read carefully and adhered to strictly. This will ensure that the best results are attained, that the safety of the user and others is not at risk, and that the environment is not excessively harmed. It is an offence to use a chemical in a manner for which it was not registered.

- A physical description of the product is supplied, including its colour and whether it is in fluid, powder or granular form. The crop protection manager should inspect the chemical in the container to ensure that it answers to this physical description. If not, the container and its contents should be discarded in the prescribed manner.

- The chemical composition of the product is indicated on the label.

- The toxicity of the product is indicated, along with instructions for its safe handling.

- The pre-harvest interval (PHI) of the product is indicated. The PHI, also known as the Withholding Period, refers to the period after application of a chemical treatment during which time the fruit may not be harvested. PHI’s vary considerably from chemical to chemical and need to be checked by the crop protection manager when he compiles the crop protection program. It must also be checked as part of the pre-application planning.

- The product expiry date is stated, being the date on or before which the chemical should be used. Chemicals should be used before the expiry date to make sure that the chemical is still effective.

Please Note: All chemicals leave a residue on the fruit. There are very specific regulations regarding the chemical residue levels that are allowed, especially if they are exported. Minimum residue levels (MRL’s) are prescribed for all plant protection products registered with the Department of Agriculture. The PHI indicates the period of time during which the chemical residue will be too high and beyond the regulatory limits. During this time the fruit must not be harvested.

**Plant Protection Product Availability**

The crop protection program indicates the concentration at which the product must be used, and the quantity required per tree or hectare. It may also indicate the total...
quantity of a chemical required for the application, but if not, the crop protection manager can calculate this by using the information provided.

The crop protection manager must ensure that a sufficient quantity of the chemical is available before application commences. In this regard, he needs to consult with the person in charge of procurement (buying) and the inventory manager.

Please complete Activity 1 at the end of this session.

**1.3 Application methods**

Plant protection products can be applied in various ways. The manner of application should be stated on the crop protection program.

Application methods include:

- Foliar spray application
- Trunk application
- Soil drench

There are many variations of application methods. The decision on which method to use depends on the specific requirements and purpose.

**Foliar Spray Application**

The most common method of applying insecticides and fungicides to plants (trees on an orchard farm) is by applying a foliar spray. This means that the spray material is applied to the leaves of the trees. There are three main types of foliar spray applications, being:

- Light cover spray
- Medium cover spray
- Full cover spray

**Light Cover Spray**

As the name suggests, these sprays are applied at low volume and with a light covering of the tree canopy. The droplet size is small; therefore the spray is applied in a fine mist. The application of chemical bait is usually done by aerial spraying at low volume.
The volume of spray material applied per tree during a light covering spray varies, depending on tree size and shape, but ranges from half a litre to three litres per tree.

♦ Medium Cover Spray

Medium covering sprays are the most commonly form of application. It wets the foliage of the tree to the point of run-off. (Run-off means to the point where water starts dripping from the leaves.)

The tree canopy is not necessarily penetrated, but some of the branches may be slightly wet.

The volume of spraying material applied per tree during a medium cover spray varies, depending on the size and shape of the tree, but ranges from 10 to 20 litres per tree.

♦ Full Cover Spray

Full covering sprays are designed to thoroughly wet the tree canopy and to penetrate the inside of the canopy, drenching the branches and framework of the tree as well.

The volume of spraying material applied per tree during a full cover spray varies, depending on the tree size and shape, but ranges from 20 to 50 litres per tree.

■ Trunk Application

Some chemicals can be applied directly to the trunk of the citrus tree. These chemicals are systemic, meaning that they are absorbed through the bark and being translocated within the tree to the area where they are required.

■ Soil Drench

This method implies the diluting of a chemical in water and pouring it onto the soil around the trunk of the tree where it is absorbed by the roots and translocated within the tree. These chemicals are also systemic. Certain chemicals can also be applied through a drip irrigation system which allows its uptake by the roots.

1.4 Application equipment

Once the method of application has been determined, the equipment required for the application is identified and checked. Application equipment and measuring equipment is required during most applications. The crop protection manager determines the equipment requirements by taking into account:

- The area or number of trees to which the chemical must be applied.
- The time period in which the application must be completed.
- The number of farm workers available.
Once the equipment requirements have been determined, the crop protection manager must consult with: 1) the person responsible for mechanical equipment to ensure that sufficient equipment (tractors and spraying machines) will be available. 2) The person responsible for the stores to ensure that sufficient measuring equipment and chemicals are available.

The crop protection manager must also ensure that all equipment is in a good working order, as breakdowns during application can cause delays that may result in ineffective pest and disease control. Spraying machines and tractors are normally serviced before the start of a season but must be checked regularly. The crop protection manager must consult with the person responsible for mechanical maintenance in this regard.

The application equipment that is required is specific to the application method.

**Foliar Applications**

Foliar applications can be applied in a number of ways, being:

- Knapsacks
- Handguns
- Mist blowers
- Crop sprayer aircraft
  - Knapsacks
    - Newly planted trees, up to the age of one year, may be sprayed with a knapsack as they require very little spray volumes.
    - Be careful not to use a knapsack for the application of insecticides after it was used for the application of herbicides due to possible damage to trees.
  - Handguns
    - Trees between the age of two and four years old, depending on the cultivar planted and the area in which it is situated, are too big to be sprayed with knapsacks, therefore one will use handguns.
    - A handgun implies a spaying cart with a hosepipe and spray gun held by an operator when applying an insecticide. With handguns, as opposed to knapsacks, a much higher volume of spraying material can be applied in less consuming times.
  - Mist blowers
    - The most popular automatic spraying machines are called mist blowers. These machines work on the principle of air displacement. The air within the tree is "blown out" by the high speed fan on the spraying machine and replaced with chemical-filled air. There are many different types of mist blowers. They can be broadly classified into low, medium and high profile machines. The choice of machine depends on the type of spray required.
For example, low- and medium profile machines would not be suitable to apply a full cover spray to large mature trees.

- **Low Profile Machines** are double-sided mist blowers without any tower or deflector.
- **Medium Profile Machines** are raised, double-sided machines with or without a single-sided deflector or a raised machine with a short tower.
- **High Profile Machines** are single or double-sided mist blowers that have tall towers and cover the tree canopy from top to bottom.

Tractors are used to pull spraying machines. Power from the tractor is transferred to the spraying machine by means of a power take-off (PTO) enabling the pump, fan and spray tank agitator to operate. The PTO is a short sprocket at the back of the tractor which is connected to the spraying machine by means of a PTO shaft.

![Figure 1.1: PTO Shaft](Image)

Photograph from the Wikipedia Encyclopaedia, Wikipedia Foundation Inc

- **Crop Spraying Aircraft**

  Where large areas have to be covered in a short period of time, aerial applications (very expensive) is often used. Aerial applications can however only deliver light covering sprays, and are therefore generally only used for bait sprays.

- **Trunk Applications**

  The quantity of chemicals, when applied in a trunk-application-form, must be measured very accurately. Specialised equipment, which is calibrated very accurately, is used for this purpose. The most common applicator is called a Calibra.

  Some farmers use a paint brush for trunk applications. The quantity of product required is calculated according to the diameter of the tree trunk. There are tables available that indicate how much chemical to apply to trees of different sizes.

- **Soil Drench**

  The chemical solution is applied to the soil by using measuring cups or jugs which ensure with relative accuracy that the correct quantity is applied.
Health and Safety

All chemicals should be considered hazardous until indicated otherwise. Plant protection products can be hazardous to humans, animals and to the environment. When PPP’s are being applied, health and safety regulations must be strictly obeyed.

In terms of planning the PPP applications, the requirements for protective gear and safety equipment for that particular chemical must be known to all who will take part in the application. The contact numbers for emergency services must be displayed prominently in a place where all workers have access to. (Changing room?)

1.5 Protective gear and safety equipment

It is of utmost importance that the user is adequately protected when using plant protection products. Pictograms are displayed on product labels advising on the protective gear and safety equipment that are necessary when handling a particular chemical.

<table>
<thead>
<tr>
<th>Advice Pictograms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear gloves</td>
</tr>
<tr>
<td>Wear overalls</td>
</tr>
<tr>
<td>Wear eye protection</td>
</tr>
<tr>
<td>Wear respirator</td>
</tr>
<tr>
<td>Wear boots</td>
</tr>
<tr>
<td>Wash after use</td>
</tr>
<tr>
<td>Wear overalls</td>
</tr>
<tr>
<td>Wear apron</td>
</tr>
</tbody>
</table>

The biggest risk to the person that handles and applies PPP’s is poisoning! The chemical can enter a person’s body in the following three manners:

♦ By way of the mouth (orally)
♦ Through contact with the skin (dermal contact)
♦ By breathing (inhalation)

The most common manner of poisoning is through dermal contact. The following protective clothing must be available to those who use PPP’s to eliminate the risk of poisoning.

♦ Cotton Overalls – Cotton, in comparison with lightweight synthetic alternatives, has shown to be superior in durability, protectiveness and comfort. A two-piece overall is preferable.
Apron – An apron is used when mixing chemicals in case of spillage.

Raincoat and Hat – This protecting gear is used when foliar spraying is applied with mist blowers to protect the tractor driver against skin contact.

Goggles – Eye protection when working with chemicals is essential.

Unlined Rubber Gloves – Wearing rubber gloves decreases the possibility of skin contact.

Rubber Boots – Rubber boots or gumboots are worn to further decrease the chance of dermal exposure.

Facemask – A facemask is used as protection against inhalation.

Respirator – A respirator protects the user more effectively against inhalation, as it provides a separate supply of oxygen. Respirators are used if specified on the product label.

**Contact Details of Emergency Services**

Contact details of emergency services must be readily available to all persons who use PPP’s. Display emergency telephone numbers close to the telephone so that they are easily noticeable and easy to find.

The following is a list of helpful numbers that should be available:

- Bateleur (a call centre that provides emergency advice) – 083-1233-911
- Poisons Information Centre (University of the Free State) – (051) 444-2134
- Poisons Information Centre (Red Cross WMC Hospital) – (021) 689-5227
- Tygerberg Pharmaceutical and Toxicology Consultation Centre – (021) 931-6129
- Local doctor
- Local hospital
- Ambulance service

**Pre-Application Checklist**

A pre-application checklist can now be compiled from the above information. The format of the pre-application checklist is not standard, and different farms may use different methods or formats for this purpose.

It is however essential that this type of information is recorded in a format that is easy to use for the persons responsible for the application. The checklist must contain all the necessary information to avoid confusion and the need to consult various records.

A pre-application is prepared for every application that has to be done according to the crop protection program. The pre-application checklists can then be used during the application to verify that the application is done correctly.
After the application has been completed, the pre-application checklist is filed with the application reports as part of the records kept for the farm.

Below is an example of a pre-application checklist.

<table>
<thead>
<tr>
<th>Pre-Application Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crop Protection Program Instructions:</strong></td>
</tr>
<tr>
<td>Application Date</td>
</tr>
<tr>
<td>Target Pest(s)/Disease(s)</td>
</tr>
<tr>
<td>Chemical or CPPs</td>
</tr>
<tr>
<td>PHI’s</td>
</tr>
<tr>
<td>CPP Concentration</td>
</tr>
<tr>
<td>Application Method</td>
</tr>
<tr>
<td>Spray Type</td>
</tr>
<tr>
<td>Other Instructions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CPP Requirements:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPP</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Equipment Requirements:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Worker Requirements:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Other Requirements:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes:</td>
</tr>
</tbody>
</table>

| Signed: | Date: |
To protect a crop against pests and diseases one need a compilation of a crop protection program and pre-application planning.

The most important components of pre-application planning are the plant protection products, application methods, application equipment and health and safety requirements.

Plant protection products are classified as pesticides, fungicides and herbicides.

Plant protection products must be registered with the Department of Agriculture for specific uses, and may only be used for the purpose for which they are registered.

The information displayed on the product label is full usage instructions, a physical description, the chemical composition, the toxicity, the pre-harvest interval and the expiry date of the product.

The crop protection manager must ensure that the required products are available in sufficient quantities.

Application methods mostly used are foliar sprays, trunk applications and soil drenching.

The three main types of foliar applications are light covering, medium covering and full covering spraying.

The equipment requirements are calculated based on the area of application, the period available for the application and the number of workers available.

Knapsacks, handguns, mist blowers (spraying machines) and crop spraying aircraft are commonly used for foliar applications, depending on the size of the trees and the spraying requirements.

Calibra applicators or paintbrushes are mostly used for trunk applications.

Measuring cups and jugs are used for soil drenching.

The health and safety requirements include the use of protective gear and safety equipment and displaying emergency contact details in an accessible place.

The protective gear and safety equipment that are required is indicated on the label of each product with pictograms.

The pre-application checklist must include all the information required to complete the application.
<table>
<thead>
<tr>
<th>Concept (SO 1)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product is identified and available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product expiry date is checked.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment and safety equipment is checked for good working condition and availability.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective gear is available and in good working condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact detail of emergency services is available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal handling facilities are prepared.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My Notes ...

........................................
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........................................
........................................
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........................................
........................................
........................................
........................................
........................................
As a group, take a walk about on a farm where crop protection is about to be applied or is currently being applied.

Fill in the detailed checklist concerning that farm to use in future as a pre-application plan.

The checklist should be drafted in the following format:

<table>
<thead>
<tr>
<th>Pre-application checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
</tr>
<tr>
<td>Block or orchard where application has to be made:</td>
</tr>
<tr>
<td>Reason for the protective application:</td>
</tr>
<tr>
<td>Name of the product to be used:</td>
</tr>
<tr>
<td>Volume of product that is required:</td>
</tr>
<tr>
<td>Special instructions or warnings for use and application of the product:</td>
</tr>
<tr>
<td>Equipment needed for application:</td>
</tr>
<tr>
<td>Protective gear that should be worn:</td>
</tr>
<tr>
<td>Emergency gear and / or equipment that has to be available:</td>
</tr>
<tr>
<td>Special facilities needed to mix chemicals or for the application of the product:</td>
</tr>
<tr>
<td>Climate conditions that should prevail before an application:</td>
</tr>
<tr>
<td>People to inform of spray application action:</td>
</tr>
<tr>
<td>Animal control actions prior to application:</td>
</tr>
<tr>
<td>Emergency contact information:</td>
</tr>
<tr>
<td>Names of workers who is responsible for the spray action:</td>
</tr>
<tr>
<td>Name &amp; Signature of the manager / foreman who is responsible for the application:</td>
</tr>
</tbody>
</table>

Facilitator comments:  

Assessment:
As part of this learning program, you are required to take part in and practice how to mix the correct pest control products at a correct dosage rate. Accordingly, it is required from you to work on a farm and perform this duty at least two times before your final assessment.

During this practical task, pay attention to the following areas and make keynotes as reminders for yourself:

| Names and examples of pest control products for crops: | Names and examples of pest control products for produce: |
| Names and examples of pest control products for animals: | Examples of colour codes, symbols and pictograms that I have observed and what they mean: |
| How the product is correctly mixed according to the product’s instructions. | A simple correct mixing procedure that I have learnt: |
| A list of the correct and sufficient mixing apparatus that should be available and how it is used. | How to store apparatus safely and correctly. |
| A list of the correct and sufficient cleaning/sterilisation apparatus that should be available and how it is used. | Facilitator comments: |

**Assessment:**
Session 2 Mixing Pesticides

After completing this session, you should be able to:
SO 2: Mix correct pest or disease control products at correct dosage rates

In this session we explore the following concepts:
- Safe-handling of chemicals
- Mixing requirements
- Storage of crop protection chemicals
- Disposal of empty containers
- General sanitation

2.1 Introduction

Mixing CPPs for crop protection applications correctly and accurately is essential. If a too low concentration of CPP is used, the crop will not be protected effectively. On the other hand, if the concentration is too high, it can result in overdosing animals and damaging the crop. A financial loss is unavoidable!

Mixing CPPs does not only involve measuring correct quantities and combining the ingredients. The person responsible for the mixing must be aware of the nature of the CPPs that is being handled, the safety requirements for working with such CPPs, the appropriate equipment that is required, and the correct mixing procedure.

Mixtures are normally mixed immediately before application, and should not be stored in mixed form. It is therefore essential that the person responsible for mixing the CPPs has all the required CPPs, equipment and information available to complete the task without delay.

2.2 Safe-handling of chemicals

It is essential that the person responsible for mixing chemicals has a thorough understanding of the nature of the chemicals that will be handled, especially with regard to the toxicity of the chemicals, to ensure that the correct safety precautions are taken.

Colour codes, symbols and pictograms are used on the product labels of all chemicals to indicate its toxicity and the manner in which it should be handled.
**Colour Codes**

Colour codes are used to indicate the hazard classification of the chemical. All agricultural chemicals are classified in terms of their toxicity. This information is displayed on the product’s label and informs the user of the potential hazard if not used in the correct manner.

<table>
<thead>
<tr>
<th>Group</th>
<th>Group Description</th>
<th>Hazard Statement</th>
<th>Colour Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Extremely Hazardous</td>
<td>Very Toxic</td>
<td>Red</td>
</tr>
<tr>
<td>Ib</td>
<td>Highly Hazardous</td>
<td>Toxic</td>
<td>Yellow</td>
</tr>
<tr>
<td>II</td>
<td>Moderately Hazardous</td>
<td>Harmful</td>
<td>Blue</td>
</tr>
<tr>
<td>III</td>
<td>Slightly Hazardous</td>
<td>Caution</td>
<td>Green</td>
</tr>
<tr>
<td>IV</td>
<td>Acute hazard unlikely in normal use</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above table indicates the terminology used in classifying chemicals according to their potential hazards. This means that chemicals in Group Ia and Ib will be lethal when a very small quantity is swallowed. A much larger quantity of the substance in Group IV is necessary to be lethal.

**Symbols**

Internationally recognised symbols are also used to indicate the toxicity of chemicals in group I and group II, as indicated in the table below.

<table>
<thead>
<tr>
<th>Group</th>
<th>Hazard Statement</th>
<th>Symbol Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia – Extremely Hazardous</td>
<td>Very Toxic</td>
<td>Skull and Crossbones</td>
<td><img src="image" alt="Skull and Crossbones" /></td>
</tr>
<tr>
<td>Ib – Highly Hazardous</td>
<td>Toxic</td>
<td>St. Andrew’s Cross</td>
<td><img src="image" alt="St. Andrew’s Cross" /></td>
</tr>
<tr>
<td>II – Moderately Hazardous</td>
<td>Harmful</td>
<td></td>
<td><img src="image" alt="Harmful" /></td>
</tr>
</tbody>
</table>

**Pictograms**

Pictograms are used to indicate the storage requirements for the product, the type of product, the requirements for protective gear and clothing, and the danger that the product holds for animals.
### Storage Pictograms

Keep locked away and our of reach of children

### Activity Pictograms

- **Application**
- **Handling dry concentrate**
- **Handling liquid concentrate**

### Advice Pictograms

- **Wear gloves**
- **Wear protection over nose and mouth**
- **Wear eye protection**
- **Wear respirator**
- **Wear boots**
- **Wear overalls**
- **Wear apron**
- **Wash after use**

### Warning Pictograms

- **Dangerous / harmful to livestock and poultry**
- **Dangerous / harmful to livestock**
- **Dangerous / harmful to poultry**
- **Dangerous / harmful to wildlife and birds**
- **Dangerous / harmful to wildlife**
- **Dangerous / harmful to birds**
- **Not for aerial application**
- **Dangerous / harmful to fish and water bodies**
2.3 **Mixing requirements**

Apart from the chemicals, the following items are required during the mixing process:

- Protective clothing.
- Measuring equipment.
- Mixing equipment.

Clean water and a bar of soap must also be readily available in case a person’s skin is contaminated with chemical spillage. A person must also wash up after handling the chemicals.

### Protective Clothing

The following protective clothing is always worn when handling and mixing chemicals:

- Rubber gloves.
- Cotton overall.
- Rubber boots (gumboots).
- Plastic apron.
- Eye protection (goggles).

If it is indicated on the product label, a facemask or respirator must be used.

### Measuring Equipment

To measure the correct quantity of a liquid chemical, an assize-measuring container is required. To measure wettable powders or granules, a scale weighing accurately, is needed.

Electronic scales generally allow for more accurate measurements, but hand-scales can also be used. It is however essential that scales are serviced and calibrated regularly. Scales must be zeroed carefully before the chemicals are weighed.

### Calculating the quantity of Chemicals or CPPs Required

The example provided for calculating the quantity of pesticide required, is based on a tree crop. The standard practice for tree crops is that recommendations for the concentration of crop protection CPPs to be made in **millilitres** (ml) or **grams** (g) per 100ℓ of **water**. This is also the manner in which it is shown on the crop protection program.
The person responsible for mixing the spraying material needs to have a thorough understanding of this notation. Below are a few examples of notations:

<table>
<thead>
<tr>
<th>Target Pest(s) / Disease(s)</th>
<th>CPP</th>
<th>Notation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red scale</td>
<td>Methomyl</td>
<td>100g / 100ℓ + mineral oil at 1.75ℓ</td>
<td>100g Methomyl plus 1.75ℓ of mineral oil per 100ℓ clean water</td>
</tr>
<tr>
<td>Thrips, bollworm, aphids &amp; mealybug</td>
<td>Tokuthion</td>
<td>50ml / 100ℓ + wetter/buffer at 50ml</td>
<td>50ml Tokuthion plus 50ml wetter/buffer per 100ℓ clean water</td>
</tr>
<tr>
<td>Red scale, thrips, blackspot</td>
<td>Agrimec, Dithane</td>
<td>15ml / 100ℓ + mineral oil at 300ml</td>
<td>15ml Agrimec plus 200g Dithane plus 300ml mineral oil per 100ℓ clean water</td>
</tr>
</tbody>
</table>

To mix the above spraying materials, one has to calculate the quantities of the various ingredients depending on the total quantity of spraying material required. The amount of water is normally used as a basis, i.e. if 500ℓ of spraying material is required, 500ℓ of clean water will form the basis of the calculation. (Using the examples above, calculating will be as follow):

<table>
<thead>
<tr>
<th>Notation</th>
<th>Spray Material Required</th>
<th>Calculation</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>100g/100ℓ + mineral oil at 1.75ℓ</td>
<td>500ℓ</td>
<td>(100g/100ℓ + mineral oil at 1.75ℓ) x 5 = 500g/500ℓ + 8.75ℓ mineral oil</td>
<td>500g CPP 500ℓ clean water 8.75ℓ mineral oil</td>
</tr>
<tr>
<td>50ml/100ℓ + wetter/buffer at 50ml</td>
<td>2,000ℓ</td>
<td>(50ml/100ℓ + wetter/buffer at 50ml) x 20 = 1,000ml(1ℓ)/2,000ℓ + 1,000ml(1ℓ) wetter/buffer</td>
<td>1ℓ CPP 2,000ℓ clean water 1ℓ wetter/buffer</td>
</tr>
<tr>
<td>15ml/100ℓ + 200g/100ℓ + mineral oil at 300ml</td>
<td>1,000ℓ</td>
<td>(((15ml + 200g)/100ℓ + mineral oil at 300ml) x 10 = (150ml + 2,000g(2kg))/1,000ℓ + 3,000ml (3ℓ) mineral oil</td>
<td>150ml CPP 1 2kg CPP 2 1,000ℓ clean water 3ℓ mineral oil</td>
</tr>
</tbody>
</table>
Mixing Procedure

The mixing procedures for different pesticides differ. In some cases it may be required that the compounds are pre-mixed in a separate container. In general the procedure is to fill the spray tank halfway. The measured pesticide is added (the measuring equipment used can also be rinsed in the tank) and the tank is then filled to the correct level. Stir thoroughly. The pesticide label will specify the procedures to be followed. Read these carefully and apply these procedures.

As example for a mist blower, the following steps are taken:

1. Measure the chemical ingredients accurately, using the appropriate equipment (assize measuring container for liquids and weighing scale for powders or granules).
2. Add the chemical ingredients to a 10ℓ bucket of clean water.
3. Mix thoroughly.
4. Fill the spray tank half with water.
5. Add the 10ℓ mixture to the spray tank on the mist blower and mix.
6. Add the remainder of the water to the spray tank, stirring the mixture continuously.

2.4 Storage of crop protection chemicals

To ensure a safe working environment and to enable one to adequately deal with accidents such as fires and spillage, proper storage of CPP’s is essential. The basic principles are as follows:

♦ Store CPPs in a secure, well-ventilated, cool and dry building that does not allow access to children, animals or unauthorised persons.

♦ There must be easy access to washing facilities with running water, soap and towels. It is important that an eye-flushing bottle is available in the event that eyes are contaminated.

♦ The storage facility should have a smooth, damp-resisting cement floor.

♦ The storage facility should have at least two 9 kg dry-powder fire extinguishers on hand. These must be located outside the storeroom.

♦ No food products, animal feed or seeds may be taken into the facility.

♦ Do not allow any eating, drinking or smoking in the storage facility.

♦ Separate pesticides, fungicides, herbicides and growth-regulators from each other within the storage area. Ensure that each storage area is well demarcated so that there can be no accidental mixing of products. It is recommended that herbicides are stored completely separately.

♦ Keep powders and granular products stored separately to avoid contamination in the event of spillage. Always store powders and granules on the upper shelves and liquids on lower shelves.
Group stored CPPs according to their hazard potential, e.g. store red-band (group 1a and 1b) CPPs in the same part of the store.

Products should be used on a first-in-first-out basis. This should ensure that CPPs are used before reaching their expiry date.

Bags and containers that are not placed on shelves should be stacked on pallets to prevent a build-up of moisture.

All containers and bags must be adequately marked. In the event that a label is destroyed or lost, the container must be marked with a marking pen, clearly stating the container’s contents. The label should always be visible.

An accurate stock movement recording system, indicating the quantities of each CPP purchased, issued and subsequently returned, must be in place. From the recording system, one should be able to determine the exact type and quantity of CPPs on hand at any given time.

The containers of CPPs that have been opened and partly used should be resealed and returned to the store.

2.5 Disposal of empty containers

Empty CPP containers must under no circumstances be re-used for any purpose whatsoever. Even if the container has been washed thoroughly the risk of contamination remains high. Empty containers must be disposed of in the manner described below.

Empty containers must be rinsed by filling it to about a quarter with clean water, closing and shaking it well. Pour the rinse water into the spray tank. Repeat this process at least three times. Puncture the container after rinsing to ensure that it cannot be re-used.

Once containers have been punctured they should be diminished (flattened) in bulk and buried at a disposal site in a pit. The disposal site must be:

- At least 50m from the nearest water source (dam, river and borehole);
- On relatively high ground or where the ground water is at least 2m deep;
- Not in sandy soils that leach easily; and
- Fenced in and a signpost.

Waste bags, paper and mildly contaminated items must be burned, while severely contaminated items and redundant CPPs must be disposed of using a high-temperature incinerator, which can also be used for empty containers. A professional waste disposal company may be contacted in this regard.
2.6 General sanitation

Ensure that a wash trough or large basin is available in or close to the CPP storage facility. This will allow the washing of contaminated clothing on site and prevent staff from wearing the clothing home where it may or may not be washed.

Equipment, such as scoops, buckets, measuring cups, etc. must be washed at the end of a working day. All protective clothing and equipment must be kept in good condition and cleaned regularly.

Have a spade, broom and a supply of dry sand on hand which can be used in case of CPP spillages. Sawdust must never be used for this purpose as it presents a fire hazard, and when mixed with certain CPPs, can result in explosion.

Please complete Activity 3 at the end of this session.

My Notes …

• PPP used for foliar applications must be mixed correctly and accurately immediately before application.
• The person responsible for mixing the chemicals must take note of the safety requirements when handling the chemicals by checking the colour codes, symbols and pictograms that are used on the product labels.
• Colour codes are used to indicate the hazard classification of the chemical.
• Internationally recognised symbols are used to indicate the toxicity of chemicals that are extremely, highly and moderately hazardous.
• Pictograms are used to indicate other information about the product, including the required protective gear and clothing.
• Apart from the chemicals, protective clothing, measuring equipment and mixing equipment is required during the mixing process.
• The amount of chemicals that are required is calculated from the crop protection program. The same volume of water as the volume of spraying material that is required is used as a basis.
• Buffers are used to adjust the pH of water.
• Spraying oils often form part of spraying materials because they assist in controlling pest and diseases.
• The mixing procedure involves measuring the correct quantities of chemicals, mixing these in a bucket, adding the mixed chemicals to half the volume of water in the spray tank and adding the remainder of the water while stirring the mixture.
• Plant protection products must be stored in a safe, secure room that complies with GAP requirements.
• Empty chemical containers must not be re-used for any purpose. They must be rinsed, punctured and disposed of, either by being buried or by being incinerated.
• All protective clothing and equipment must be washed after use.
<table>
<thead>
<tr>
<th>Concept (SO 2)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour codes, symbols and pictograms are interpreted correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product is correctly mixed according to products instructions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct mixing procedure is applied.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct and sufficient mixing apparatus is available and used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct storing apparatus is available and used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct and sufficient cleaning/sterilisation apparatus is available and used.</td>
<td></td>
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</tbody>
</table>

My Notes ...

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Complete the pre-application checklist below for a 50ha orchard (24,800 trees)

**Pre-Application Checklist**

<table>
<thead>
<tr>
<th>Crop Protection Program Instructions:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application Date</strong></td>
</tr>
<tr>
<td><strong>Target Pest(s)/Disease(s)</strong></td>
</tr>
<tr>
<td><strong>CPPs</strong></td>
</tr>
<tr>
<td><strong>PHI’s</strong></td>
</tr>
<tr>
<td><strong>CPP Concentration</strong></td>
</tr>
<tr>
<td><strong>Application Method</strong></td>
</tr>
<tr>
<td><strong>Spray Type</strong></td>
</tr>
<tr>
<td><strong>Other Instructions</strong></td>
</tr>
</tbody>
</table>

**CPP Requirements:**

<table>
<thead>
<tr>
<th>CPP</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Quantity</th>
<th>Check</th>
<th>Available</th>
<th>Expiry</th>
</tr>
</thead>
</table>

**Equipment Requirements:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Check</th>
<th>Available</th>
<th>Condition</th>
</tr>
</thead>
</table>

My Name:

My Workplace:

My ID Number:
### Worker Requirements:

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Other Requirements:

- Note 1
- Note 2
- Note 3
- Note 4
- Note 5

### Notes:

- Note 1
- Note 2
- Note 3
- Note 4
- Note 5

### Signed:

**Date:**

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### Facilitator comments:

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### Assessment:

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Pesticide application

After completing this session, you should be able to:
SO 3: Apply pest control product to crop or farm animals.

In this session we explore the following concepts:

- Influence of climatic conditions
- Calibration of equipment
- Protective gear
- Application of crop protection products

3.1 Introduction

This session focuses on the application of agro-chemicals or CPP’s after the pre-application planning has been done and the CPPs have been mixed for application.

3.2 Influence of climatic conditions

Climatic conditions play an important role when it comes to the application of CPP’s, especially when the product is applied by way of spraying.

**Wind**

Foliar sprays should not be applied when wind speed exceeds 12 km/h. High wind speeds will negatively affect spray coverage of the tree, which could result in poor control of the target pest or disease. Excessive wind will also result in spray drift, which could damage other crops, pollute water supplies and harm the environment.

**Rain and dew**

Trees must be dry before foliar sprays are applied. If trees are wet, spraying material is diluted and less effective. One cannot spray at all while it is raining.

As a general rule, six hours of dry weather is required after an application. If more than 10 mm of rain falls before this time, the application should be re-applied.

**Temperature**

Most CPP’s are applied during the summer months. Oil sprays must not be applied if temperatures are expected to exceed 30°C. It is for this reason that oil sprays are
often applied at night in warmer areas. It is very risky to apply oil under very hot conditions as fruit burn will occur. Some products are also sensitive to ultraviolet light (UV) and should also be applied after nightfall.

3.3 Calibration of equipment

**Calibration** Calibration in terms of pesticide application refers to the process of calculating and/or setting the delivery rate of the application using the application equipment. This may be done purely on the volume delivery per time interval or be based on an area volume rate.

**Spray equipment calibration**

In order to ensure that the targeted pest or disease is controlled adequately, it is essential that the spraying mixture is applied in a sufficient quantity to cover the crop or animal. In addition the coverage must be uniform. It is extremely important that spraying equipment must be calibrated correctly before it is used to apply spraying material, as the calibration of the equipment will determine the quantity of spraying material that will be applied to each tree, field or animal.

Spraying machines have a pump that pumps liquid from the spray tank through nozzles. These nozzles consist of spinners and discs. The spinner determines the droplet size, angle of the spray and a hollow or full cone. The discs have different size holes, which will determine the quantity of spraying material delivered. The quantity of spraying material delivered will also depend on the pressure of the pump (see table 3).

The following information is required to complete the calibration:

- Litres required per tree, animal or per hectare.
- Tree spacing in the row.
- Tractor speed.
- Number of nozzles to be used.
- Pump pressure.

The key is to work out how many litres per minute the spraying machine must deliver if it travels at a fixed speed, and how many trees or field (m²) are passed at this speed.
### Example of a mist blower for an orchard

Litres required per tree = 25ℓ  
Tree spacing = 3.0m  
Tractor speed = 33.3 meters per minute (2.0 km/hour)

**Trees sprayed** = 33.3 m/min divided by 3.0m tree spacing = 11.1 trees sprayed per minute  
**Total litres required per minute** = 11.1 trees x 25ℓ/tree = 277.5 ℓ/min  

This applies to a spraying machine that sprays both sides. For a machine that sprays on one side only, divide by 2: $277.5 \div 2 = 138.8$ ℓ/min

Number of nozzles on spraying cart = 72  
Litres required per nozzle = $277.5 \div 72$ nozzles = 3.85 litres/nozzle

Pump pressure = 20 bar (2,000 kPa)

From the table, look under the 2000 kpa column and select a combination of spinners and discs to give 3.85 (or close to) litres per minute per nozzle. In this case, D4 disc + 45 spinner. It is important to select a combination of nozzles that will give the most efficient coverage. A popular combination for a good medium covering spray is to alternate 45 and 56 spinners with D3 discs to give good outside canopy coverage (45 spinners) and some degree of penetration (56 spinners).
### Table 3.1: Nozzle Delivery at Various Pressures in Litres/minute

Before the spraying machine starts with the application, the coverage must be checked in case a fine tuning is required. Possibly a few nozzles should be closed to avoid wastage or maybe the nozzle size towards the top of the spraying machine needs changing to ensure better coverage of the tree.

It is important to remember that the speed of the PTO should be 540 rpm. This aspect is often ignored and can lead to incorrect pressure being delivered by the pump and thus lower volumes of spraying material being applied.

The nozzles and spinners referred to above are made from metal, ceramic or plastic. The advantage of ceramic nozzles and spinners are the fact that they do not wear easily and can be used for many years. Conversely, nozzles and spinners manufactured from metal wear easily and must be replaced at the beginning of each season. Ceramic nozzles and spinners are not as versatile as the metal type as they lack in different sizes. Also, ceramic nozzles and spinners are relatively expensive and break easily if they are not handled with care.

<table>
<thead>
<tr>
<th></th>
<th>700 kPa (100 psi)</th>
<th>1000 kPa (150 psi)</th>
<th>1400 kPa (200 psi)</th>
<th>2000 kPa (300 psi)</th>
<th>2700 kPa (400 psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 spinner D1</td>
<td>0.405</td>
<td>0.470</td>
<td>0.526</td>
<td>0.620</td>
<td>0.697</td>
</tr>
<tr>
<td>D1.5</td>
<td>0.492</td>
<td>0.586</td>
<td>0.660</td>
<td>0.790</td>
<td>0.900</td>
</tr>
<tr>
<td>D2</td>
<td>0.606</td>
<td>0.720</td>
<td>0.800</td>
<td>0.950</td>
<td>1.060</td>
</tr>
<tr>
<td>D3</td>
<td>0.680</td>
<td>0.790</td>
<td>0.910</td>
<td>1.060</td>
<td>1.210</td>
</tr>
<tr>
<td>D4</td>
<td>0.870</td>
<td>1.060</td>
<td>1.210</td>
<td>1.440</td>
<td>1.660</td>
</tr>
<tr>
<td>D5</td>
<td>1.060</td>
<td>1.290</td>
<td>1.440</td>
<td>1.740</td>
<td>2.000</td>
</tr>
<tr>
<td>D6</td>
<td>1.210</td>
<td>1.480</td>
<td>1.700</td>
<td>2.050</td>
<td>2.340</td>
</tr>
<tr>
<td>25 spinner D1</td>
<td>0.590</td>
<td>0.700</td>
<td>0.795</td>
<td>0.966</td>
<td>1.100</td>
</tr>
<tr>
<td>D1.5</td>
<td>0.780</td>
<td>0.930</td>
<td>1.060</td>
<td>1.250</td>
<td>1.440</td>
</tr>
<tr>
<td>D2</td>
<td>0.950</td>
<td>1.100</td>
<td>1.290</td>
<td>1.550</td>
<td>1.740</td>
</tr>
<tr>
<td>D3</td>
<td>1.100</td>
<td>1.330</td>
<td>1.520</td>
<td>1.820</td>
<td>2.080</td>
</tr>
<tr>
<td>D4</td>
<td>1.710</td>
<td>2.050</td>
<td>2.350</td>
<td>2.840</td>
<td>3.250</td>
</tr>
<tr>
<td>D5</td>
<td>2.050</td>
<td>2.460</td>
<td>2.840</td>
<td>3.410</td>
<td>3.940</td>
</tr>
<tr>
<td>D6</td>
<td>2.065</td>
<td>3.220</td>
<td>3.680</td>
<td>4.500</td>
<td>5.190</td>
</tr>
<tr>
<td>45 spinner D1</td>
<td>0.720</td>
<td>0.850</td>
<td>0.970</td>
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<td>1.320</td>
</tr>
<tr>
<td>D1.5</td>
<td>0.950</td>
<td>1.170</td>
<td>1.320</td>
<td>1.630</td>
<td>1.850</td>
</tr>
<tr>
<td>D2</td>
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<td>1.440</td>
<td>1.660</td>
<td>2.010</td>
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<tr>
<td>D3</td>
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<td>1.667</td>
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<tr>
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<td>2.120</td>
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<td>2.950</td>
<td>3.600</td>
<td>4.200</td>
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<tr>
<td>D5</td>
<td>2.690</td>
<td>3.250</td>
<td>3.750</td>
<td>4.620</td>
<td>5.300</td>
</tr>
<tr>
<td>D6</td>
<td>3.520</td>
<td>4.350</td>
<td>5.090</td>
<td>6.210</td>
<td>7.200</td>
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<tr>
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<tr>
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<td>1.780</td>
<td>2.080</td>
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<td>2.010</td>
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<td>D4</td>
<td>3.300</td>
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<tr>
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<td>6.410</td>
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<td>9.080</td>
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<tr>
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<td>6.600</td>
<td>7.720</td>
<td>9.320</td>
<td>11.450</td>
<td>13.170</td>
</tr>
</tbody>
</table>
3.4 Protective gear

Before application commences, the person applying the CPP’s must be adequately supplied with protective clothing and safety equipment.

The degree of protection required will depend on the type of chemical; e.g. if a Group 1 chemical is applied with a mist blower, full protection for the tractor driver is required, while minimum protection is required for a Group 4 chemical applied via the soil drench method. The wearing of protective clothing when handling chemicals are discussed in detail in session 1.

Maximum protection includes:

♦ Cotton overall;
♦ Rain hat, rain coat and trousers;
♦ Gum boots and goggles;
♦ Respirator, with appropriate cartridge; and
♦ Rubber gloves

Minimum protection includes:

♦ Cotton overall;
♦ Gum boots; and
♦ Rubber gloves

3.5 Application of crop protection products

Application of Spraying Material

Once all the necessary preparations for the application of the spraying material have been made, the following steps are taken:

♦ Mist blowers

• The mist blower is attached to a tractor and the PTO is connected.
• The spraying machine is filled with water and the chosen discs and spinners are inserted into the nozzles.
• The pH of the water is checked to determine whether a buffering agent is required.
• The spraying machine is tested in the orchard/field with water to determine whether the theoretical calibration that was done initially gives the correct spray coverage to the tree/field, measured by observation.
• Minor adjustments are usually necessary to ensure good coverage and to prevent wastage of spraying material.
Apply Crop Protection Products Effectively and Responsibly

Primary Agriculture  
NQF Level 2  
Unit Standard No: 116125

• The spraying material is mixed in the spray tank as prescribed.
• Before spraying starts, the protective clothing of the tractor driver is checked.
• Full instructions are given to the driver regarding the correct gear that the tractor should be in, the pump pressure required, and where the accelerator should be set in order to attain the correct PTO revolutions (540rpm).

❖ Handguns and Knapsacks

The spraying material is prepared in the same way as described above. The manner in which it is applied depends on the type and model of the equipment used. Please follow the manufacturers’ instructions.

❖ Soil Drench

In soil drench applications, the chemical is prepared and the correct quantity is measured in a container.

The chemical is then poured around the base of the tree, around the trunk in an even manner or as per labelled instructions.

❖ Trunk Applications

Trunk applications vary somewhat depending on the product. Generally, the chemical is painted onto the trunk of the tree.

The instructions of the manufacturer must be followed carefully with trunk applications.

✦ Summary

• The climatic conditions that must be taken into account for foliar applications are wind, rain, dew and temperature.
• If the wind is too strong during application it will result in spray-drift that may harm the environment and water sources. (Other people in the vicinity?)
• Trees must not be wet when they are sprayed, as this will dilute the spraying material and make the chemicals less effective.
• If the spraying material contains oil, it must not be applied when it is too hot, as is can burn the fruit. Certain chemicals are also sensitive to ultraviolet light.
• Spraying equipment must be calibrated before being used to ensure that the spraying material will be applied at the correct rate.
• The most important step in the calibration of mist blowers is selecting the correct combination of spinners and discs to deliver the correct volume of spray.
• The tractor driver, or any person that applies spraying material, must wear the appropriate protective gear and clothing for the chemicals that are being applied.
• For foliar applications, the mist blower is connected to the tractor, set up and tested, and then filled with spraying material. Full instructions must be given to the tractor driver.
• Applications with handguns and knapsacks are done according to the manufacturers’ instructions.
• The methods used for trunk and soil applications depend on the product and are according to the manufacturers’ instructions.
### Concept (SO 3)

<table>
<thead>
<tr>
<th>Activity</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>As allowed by weather conditions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct calibration parameters are adhered to.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application methods are according to product instructions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective gear is used correctly.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**My Notes**

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Please complete Activity 4 at the end of this session.

My Notes ...
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My Notes ...

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Version: 01
Version Date: July 2006
As part of this learning program, you are required to take part in and practice how to apply pest control products to crops or farm animals. Accordingly it is required from you to work on a farm and perform this duty at least two times prior to your final assessment.

During this practical task, pay attention to the following areas and make keynotes as reminders for yourself:

<table>
<thead>
<tr>
<th>Names and samples of pest control products for crops:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The allowed weather conditions that should prevail before application should take place:</td>
</tr>
<tr>
<td>The calibration procedures &amp; parameters that should be adhered to:</td>
</tr>
<tr>
<td>Product instructions for application:</td>
</tr>
<tr>
<td>Application methods that can be applied for this product:</td>
</tr>
<tr>
<td>Safety gear that should be worn prior to and during application:</td>
</tr>
<tr>
<td>Step-by-step procedures to follow during the application:</td>
</tr>
</tbody>
</table>

**Facilitator comments:**

**Assessment:**
Session 4

Health and safety during pesticide application

After completing this session, you should be able to:
SO 4: Take the necessary safety and health precautions whilst applying pest control products.

In this session we explore the following concepts:
- Protective clothing and gear
- Personnel regulations, Communication with Workers and Non-authorised workers
- Product Storage
- Disposal of Waste and Empty Containers
- Soil and Water Contamination
- Climatic Conditions
- Designated Areas

4.1 Introduction

In the previous sessions the using of protective gear and clothing while applying crop protection products was mentioned. In this session we will look more closely at the various safety and health precautions that are necessary.

4.2 Protective clothing and gear

In the sessions 1 and 3 the using of the protective gear that a person handling CPP’s must wear to prevent contamination through inhalation or skin contact was mentioned. In this section, we will look at the manner in which protective gear and clothing must be maintained and how it is correctly utilised.

Maintenance of Equipment and Gear

All protective clothing and safety equipment must be in good condition at all times. Before protective clothing is utilised, the user must ensure that:

- All items are free of holes to prevent the penetration of CPP onto garments worn underneath or onto the skin.
- All items have been washed properly after previous use.
- All buttons, zippers and ties are working well.
♦ Elastic used in clothing and facemasks are not perished or stretched out.
♦ Cartridges for respirators must be replaced on a regular basis according to the manufacturer’s specification.
♦ Torn or perished protective clothing should be replaced.

**Utilisation of PPE’s or Protective equipment and gear**

The use of protective clothing must be strictly enforced at all times. Each individual should have his or her own protective clothing and equipment that fits well and is properly maintained.

Safety precautions do not end when the spray application is complete. All equipment has to be cleaned, maintained and stored in good condition in preparation for future use.

Operators should change their clothing and bath once spraying is completed. Working clothes should also be washed immediately.

## 4.3 Personnel regulations, communication with workers and unauthorised workers

All workers must be fully trained in workplace safety regulations and these regulations should be enforced at all times. These rules must include:

♦ Rules regarding the conduct of personnel when handling CPPs, being:
  • No smoking, drinking or eating is allowed in the vicinity where CPPs are mixed, applied or stored.
  • No person under the influence of alcohol or other drugs is allowed to handle CPPs.

♦ Safety regulations regarding the use of CPP application equipment.
♦ Regulations regarding proper utilisation of protective clothing and equipment.
♦ Regulations on how to handle CPPs safely.
♦ Prescriptive regulations on how CPP spills, leakages and other emergencies should be handled.

Instructions concerning the application of CPP, the concentration to be used, the field to be sprayed and the type of spray coverage required must be given in writing on a daily basis and signed by the supervisor.

In the interest of safety, under no circumstances are any unauthorised workers allowed to handle or be associated with handling or application of CPPs.
On the day of application, all personnel working in the vicinity of the orchard/field that are to be sprayed, whether they are directly involved in the spraying operation or not, must be informed of the activity to ensure that they will not wander into the area and be contaminated by accident.

4.4 **Product storage**

In Session 2, the rules for storing CPPs are discussed in detail. Please refer to this section.

4.5 **Disposal of waste and empty containers**

Empty containers should be dealt with as described in Session 2.

4.6 **Soil and water contamination**

Take care that spray drift does not contaminate water sources such as dams, streams, springs, etc.

Filling points where CPPs are mixed and spray machine tanks filled should be situated at least 50m from any water source, including boreholes. A suitable drainage system (a French drain) is required to safely drain away spilt CPPs and excess water.

4.7 **Climatic conditions**

As mentioned in Session 3, climatic conditions should be taken into account when CPPs are applied using the foliar spray method.

The supervisor should conceder of the expected weather conditions for the day by using various media that are available, such as radio, television, websites, etc. This will assist in the planning for resource allocation for the following day. If rain is expected, delay the planned spraying until such time as the weather clears. If very hot weather is expected, the spray can be delayed and applied as an evening/night application or stopped when high temperatures are reached. High winds will also affect the decision to delay or suspend spray operations.
4.8 **Designated areas**

Adequate signs (approved by the authorities) that are easily observable should be placed in locations designated for a specific purpose. These signs must give a brief message such as:

- Danger;
- No Entry;
- No smoking;
- No drinking and eating;
- Fire-extinguisher location;
- First Aid Equipment location;
- Emergency Exit

These signs are informative, giving a clear instruction in a way that it is understandable to everybody, irrespective of their language.

CPPs should only be mixed in areas designated for the purpose. These areas should be clearly marked and unauthorised personnel should not be allowed into these areas while CPPs are being handled.

![Figure 4.1: Examples of Signs](image-url)
- Protective gear and clothing must be checked regularly to ensure that it is intact and in working condition.
- Each worker must have his / her own protective gear and clothing which must be washed after each working day.
- Safety regulations must be in place and familiar to all the workers and enforced strictly.
- Care must be taken during the preparation for and application of foliar sprays to ensure that chemicals do not contaminate water sources and soil.
- Signs must be used at all areas designated for specific purposes.

Please complete Activity 5 at the end of this session.

<table>
<thead>
<tr>
<th>Concept (SO 4)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>A full set of protective clothing/gear is worn correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective clothing/gear is in good working condition and state of repairs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct utilisation of protective clothing/gear is applied.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No smoking, drinking, eating, alcohol or drugs allowed in area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product is stored correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste and empty containers are disposed of correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil and water contamination is avoided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application occurs under correct climate conditions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unauthorised workers are prevented from coming into contact with chemicals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rest of the worker community is informed of activity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designated areas are used for mixing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product is applied to targeted organisms only.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As part of this learning program, you are required to take part in and practice how to apply pest control products to crops or farm animals. Accordingly it is required from you to work on a farm and perform this duty at least two times prior to your final assessment. During your practical learning experience, you should take special notice of the necessary health and safety requirements that are applied.

During this practical task, discuss each of the points below in your group and make keynotes as reminders for yourself:

<table>
<thead>
<tr>
<th>Key notes to remember:</th>
<th>Possible consequences if this is not adhered to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protecting self and co-workers</td>
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<tr>
<td>Protecting non-targeted organisms;</td>
<td></td>
</tr>
<tr>
<td>Protecting the environment.</td>
<td></td>
</tr>
<tr>
<td>A full set of protective clothing/gear is worn correctly.</td>
<td></td>
</tr>
<tr>
<td>Protective clothing/gear is in good working condition and state of repairs.</td>
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<td></td>
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<tr>
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<td></td>
</tr>
</tbody>
</table>
In this session we explore the following concepts:

- Post-Application Procedures
- Cleaning of Equipment
- Personal Hygiene

5.1 Introduction

Once the CPP’s have been applied in the prescribed manner, certain steps must be taken to clean, maintain and store the used equipment and to ensure that no further contamination can take place. In this session, we will look at these post-application procedures.

5.2 Post-application procedures

The following procedures must be followed after completing the application, some of which are discussed in more detail in the remainder of this session:

- Clean all mixing and application equipment thoroughly and store in the prescribed manner.
- Clean all protective clothing and equipment thoroughly and store in the prescribed manner.
- Collect and dispose of empty containers and other waste products correctly, as discussed in section 6 of session 2, and ensure that no empty containers are reused.
- Apply personal hygiene and safety.
- Notify CPP manager of completion of work.
5.3 Cleaning of equipment

Once the spraying operation has been completed, all machinery must be washed with clean water and stored for future use.

If spraying equipment is not cleaned properly after use, the danger of contamination remains, and people, animals and the environment may be placed at risk. In addition, certain CPPs are corrosive and spraying equipment that is not properly washed may be damaged.

- **Spraying Equipment**
  
  Spraying machines must be washed in an area with adequate, safe drainage such as a filling point with a good French drain and at least 50m away from any water sources.
  
  ♦ Once parked at the filling point, remove the filter, normally situated near the pump.
  
  ♦ Rinse the filter with clean water so that all residues are removed.
  
  ♦ Fill the spraying tank with water while the agitator (mixing mechanism) is running. Water will pour through the open filter rinsing the tank. The tank is considered clean only once all pesticide residues have been removed.
  
  ♦ Wash the outside of the spraying machine with a cloth to remove all spray residues.
  
  ♦ Only now the spraying machine can be park in its designated area.

- **Protective Clothing and Equipment**
  
  As described in section 1 of session 4, each item of protective clothing and equipment must be:
  
  ♦ Washed in soap and water.
  
  ♦ Examined for damage, especially for holes in clothing.
  
  ♦ If damaged, repaired or discarded.

- **Other Equipment**
  
  All other equipment, such as brushes, knapsacks, mixing equipment, etc., must be washed with an appropriate liquid soap and well rinsed in a suitably well-drained area.
5.4 Personal hygiene

On completing the spraying task, all persons involved should bath and dress in CLEAN clothing. Do not put on the clothes that were used for the spraying operation unless they have been laundered properly.

- After the application of a PPP has been completed, all the following steps must be followed:
  1. Clean all mixing and application equipment thoroughly and store in the prescribed manner.
  2. Clean all protective clothing and equipment thoroughly and store in the prescribed manner.
  3. Collect and dispose of empty containers and other waste products correctly, as discussed in section 6 of session 2, and ensure that no empty containers are reused.
  4. Apply personal hygiene and safety.
  5. Notify the crop protection manager that the work has been completed.

Please complete Activity 6 at the end of this session.

<table>
<thead>
<tr>
<th>Concept (SO 5)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparatus is cleaned thoroughly.</td>
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<td></td>
</tr>
<tr>
<td>Waste products and empty containers are collected, cleaned and discarded.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empty containers are not used for other purposes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective gear is cleaned, maintained and stored correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal hygiene is applied.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As part of this learning program, you are required to take part in, and practice how to apply pest control products to crops or farm animals. Accordingly, it is required from you to work on a farm and perform this duty at least two times prior to your final assessment. During your practical learning experience, you should take special notice of the necessary post application procedures that are required once you return from the block or orchard.

During this practical task you must discuss (in your group) each of the points below and make keynotes as reminders to yourself:

<table>
<thead>
<tr>
<th>Key notes to remember:</th>
<th>Possible consequences if this is not adhered to:</th>
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<tbody>
<tr>
<td>Apparatus is cleaned thoroughly.</td>
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<td></td>
</tr>
<tr>
<td>Personal hygiene is applied.</td>
<td></td>
</tr>
</tbody>
</table>

Facilitator comments:

Assessment:
Apply Crop Protection Products Effectively and Responsibly

Primary Agriculture

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Unit Standard No: 116125

Session 6

Reporting problems

After completing this session, you should be able to:

SO 6: Monitor and report on the process, problems and unusual occurrences to supervisor

In this session we explore the following concepts:

♦ Monitoring the Application Process
♦ Reporting Problems and Unusual Occurrences

6.1 Monitoring the application process

Monitoring and managing spraying operations is critical in the control of pests and diseases. Timing of control measures to be taken is of major importance as certain pests, e.g. thrips or bollworm, or diseases, such as blackspot, can cause severe damage to the citrus crop within days if not controlled in time.

The following steps must be taken and monitored continuously:

♦ Ensure that all necessary information, such as fields to be sprayed, spray covering and CPP attributes (especially toxicity) are well communicated to tractor drivers and other personnel involved, as well as other workers that may be active in the area.

♦ Check that all personnel concerned are wearing suitable protective clothing. Take into account the toxicity of the CPP as indicated on the product label.

♦ Check that the correct CPPs are used and that each spraying tank is mixed with the correct concentration as recommended on the label.

♦ If applicable, check pH of the water and adjust with a buffer if necessary.

♦ You must check that the accelerator is set at the correct revolutions to obtain the desired PTO speed (require 540 rpm) are attained on the tractor.

♦ Check whether the pump on the spraying machine is operating at the correct pressure.

♦ Check that correct discs and spinners have been inserted into the nozzles.

♦ Check that the agitator of the spraying machine is functioning adequately and that the CPPs placed inside the spray tank are well mixed.
Check spray coverage on the trees and ensure that the physical wetting is as desired.

Ensure that all nozzles are spraying onto the tree. You may have to close or alter the direction of nozzles.

Check that the quantity of litres being applied per tree is within an acceptable range of dosage required. This can be done by comparing the number of tanks used against the number of trees sprayed.

Check that the number of tanks sprayed and the quantity of CPP used coincide.

Observe climatic conditions and react accordingly. Stop spraying if it starts raining or is too windy or too hot.

Finally, the effectiveness of the spray against the target pest must be determined. In the case of thrips or bollworm, results should be noticeable in 24 hours.

### 6.2 Reporting problems and unusual occurrences

Many of the points referred to above are fairly simple. It is however very important to consult with the supervisor or crop protection manager if you are unsure about anything.

Management must prescribe reporting procedures to all employees to ensure that these procedures are obeyed. The procedures must be applied and enforced at all times. Do not wait, report problems or unusual occurrences immediately. Rather be safe than sorry.

- The prescribed procedures for the preparation and application of plant protection products must be monitored carefully.
- Problems and unusual occurrences must be reported to the crop protection manager or supervisor immediately.
Please complete Activity 7 at the end of this session.

<table>
<thead>
<tr>
<th>Concept (SO 6)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application process is monitored.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problems and unusual occurrences are reported to the supervisor.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My Notes …
Complete the following worksheet:

1. Think of the crop protection application process that you have taken part in during your practical learning.

2. Write down in your own words how the process was monitored by the foreman, team leader and / or farm manager.
3. Can you think of any problems that occurred during the application process? Write them down and explain in detail why they occurred.
4. If you could think of no problems in the previous question, write down at least one potential problem that could have occurred, and what should be done to ensure that it does not happen again.

5. Write down a simple step-by-step procedure which must be followed by workers on the farm in order to report the progress of the application process verbally.
6. Draw a simple form that workers can fill in when reporting problems or unusual occurrences.

Facilitator comments:

Assessment:
Dealing with Emergencies

After completing this session, you should be able to:

SO 7: Deal appropriately and effectively with emergencies

In this session we explore the following concepts:

- Procedures for Minor Spills and Leakages
- Procedures in Case of Poisoning
- Emergency Procedures to be Administered by Qualified Medical Personnel
- Incident Reports

Emergency situations occur even where every precaution has been taken to prevent it from happening. It is essential that all authorised personnel handling CPPs are aware of the steps that must be taken in case of an emergency.

Spills, leakages and poisoning are the most common emergency situations that occur where CPPs are handled.

7.1 Procedures for minor spills and leakages

Equipment

The following equipment should be available and easily accessible at all times in areas where CPPs are stored and must be used when a CPP spill or leakage occurs:

- Two sets of protective clothing, including respirators and facemasks;
- Two brooms;
- Two shovels;
- 50kg powdered lime*; and
- A number of open-top drums in which to place spilled CPPs.

Personnel can react immediately in a case of emergency if the above mentioned equipment is in place.

Lime is suitable as a general purpose absorbent for liquid CPP’s due to its alkaline nature. It assists the degradation of most toxic substances such as organophosphates.
Clean-up Procedures

All persons that regularly work within a CPP storage area must be able to cope if a spill or leakage occurs.

- Apply first aid to anyone affected by the CPP and obtain medical attention immediately.
- Isolate the area; remove and keep all unauthorised people away from this area.
- Every person involved in the cleaning up operation must wear protective clothing;
- Attempt to enclose the spill or leakage as far as possible by constructing an absorbent barrier of sand or lime around the spilt material;
- Place leaking containers, if any, into open-top drums and label the drums clearly for future reference or disposal;
- Collect the spilt material and absorbent substance with shovels and brooms and place it into open-top drums for disposal;
- Ventilate the building as much as possible by opening all doors and windows;
- If the spillage is on soil or gravel, dig up the area and remove the contaminated soil;
- If the spillage is on concrete, neutralise the CPP with lime or a 10% solution of sodium carbonate (Na₂CO₃) or alternatively, with 5% sodium hydroxide (NaOH);
- Clean all equipment used during the clean-up operation thoroughly, including laundering protective clothing, and store for future use; and
- Dispose of the open-top drums and its contents

7.2 Procedures in case of poisoning

The local doctor must be advised in advance which CPP’s are going to be used during the season. Supply him with a copy of every CPP’s label that will be used. This should enable him to have appropriate antidotes on hand.

Every person that works with CPPs or comes into contact with CPPs should be thoroughly aware of the symptoms of poisoning. A list of the symptoms should be displayed prominently within the work area. It can be similar to the figure below:
General Signs and Symptoms of Poisoning (AVCASA, 2001)

- Headache
- Dizziness
- Nausea
- Tremors of Tongue and Eyelids
- Salivation
- Cramps
- Vomiting
- Sweating
- Muscular Weakness
- Anxiety
- Blurred Vision

In the event of poisoning, arrange for medical attention as soon as possible, or arrange for transporting the affected person to a hospital or clinic. While this is being done, administer the following first aid procedures:

♦ Determine which CPP caused the poisoning.

♦ If the product is known, consult the label for the specific first aid procedures.

♦ Determine how the CPP was taken in, i.e. by mouth, through the skin or by inhalation.

♦ Make sure that the breathing tract is open.

♦ If the patient is unconscious, turn them onto their stomach.

♦ Start artificial respiration if the person is not breathing.

♦ If the patient absorbed the CPP via the skin, remove the patient from the contamination point, remove all contaminated clothing and wash affected areas with soap and water.

♦ If the eyes have been affected, wash with clean water for at least 15 minutes.

♦ If the CPPs have been swallowed do NOT induce vomiting unless it is specifically specified on the chemical's label.

♦ Keep the patient warm.
7.3 Emergency procedures to be administered by qualified medical personnel

The following emergency procedures can be administered to a person that has been poisoned, but may ONLY be administered by qualified, authorised medical personnel:

- Organophosphate poisoning – Atropine by injection.
- Organochlorine poisoning – Treatment will depend on symptoms. Control convulsions and maintain tissue oxygenation.
- Carbamate poisoning – Atropine by injection.

7.4 Incident reports

An incident normally refers to an accident or a near accident at the workplace where:

- Workers were or could have been injured or killed;
- Safety was compromised; or
- Property was damaged

In an effort to understand the causes of the accident, an incident report is written by the supervisor or manager responsible for the work being conducted. Incident reports are necessary as it compels persons involved to explore every angle of the accident (or near accident) in an attempt to prevent any similar accidents in future. Serious accidents are to be reported to the Department of Labour who will conduct their own investigation, which may lead to the prosecution of the responsible person if negligence is found to be the cause.

An incident report should at least contain the following information:

1. Date of occurrence
2. Place of occurrence
3. Name of department manager
4. Name(s) of injured person(s)
5. Description of injuries, illness or damage to property
6. Full description of how the accident took place
7. Names of witnesses to the accident
Procedures for emergency situations must be in place and known to all personnel.
The most common emergencies are poisoning and spillages.
The symptoms of poisoning must be displayed prominently in the area where chemicals are stored and handled.
When a person shows symptoms of poisoning, medical attention must be arranged as soon as possible, and first aid must be administered in the meantime.
The equipment for containing and cleaning spillages must be on hand at all times.
The procedures for containing and cleaning spillages must be followed carefully.
Incident reports must be completed for any incident in which workers were or may have been injured or killed, during which safety was compromised, or in which property was damaged.

Please complete Activity 8 at the end of this session.

<table>
<thead>
<tr>
<th>Concept (SO 7)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor spills are contained, absorbed, collected and disposed of.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the case of human poisoning a medical doctor is contacted immediately.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisor is informed and requested to contact poison information centre to assess situation and advice on next step.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident is reported to the supervisor.</td>
<td></td>
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</tbody>
</table>
As part of a crop protection application, you need to be aware of the fact that an emergency situation could arise.

Divide the class into 3 groups and choose a scenario from a hat. (The facilitator will assist you)

As a group, you have to present an emergency situation to the other groups in the class that will demonstrate how procedures are conducted.

Write keynotes for yourself:
## Scenario 1

<table>
<thead>
<tr>
<th>What happened during the scenario?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What caused the emergency to arise?</td>
<td></td>
</tr>
<tr>
<td>It was the following kind of emergency:</td>
<td></td>
</tr>
<tr>
<td>• Chemical spills</td>
<td></td>
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<tr>
<td>• Human poisoning</td>
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<tr>
<td>• Animal poisoning</td>
<td></td>
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<tr>
<td>• Environmental contamination.</td>
<td></td>
</tr>
<tr>
<td>Explain how the emergency was dealt with; in other words, how minor spills are contained, absorbed, collected and disposed of.</td>
<td></td>
</tr>
<tr>
<td>Was a medical doctor or a vet required to deal with the situation?</td>
<td></td>
</tr>
<tr>
<td>How was the Supervisor informed</td>
<td></td>
</tr>
<tr>
<td>Did the supervisor contact a poison information centre to assess situation and get advice on next step.</td>
<td></td>
</tr>
<tr>
<td>Explain what type of incident report was completed.</td>
<td></td>
</tr>
</tbody>
</table>
Scenario 2

<table>
<thead>
<tr>
<th>What happened during the scenario?</th>
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<th>Explain what type of incident report was completed.</th>
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Scenario 3

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<td></td>
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</table>
Am I ready for my test?

♦ Check your plan carefully to make sure that you **prepare in good time**.
♦ You have to be found **competent** by a qualified **assessor** to be declared competent.
♦ Inform the assessor if you have any **special needs** or requirements **before** the agreed date for the test to be completed. You might, for example, require an interpreter to translate the questions to your mother tongue, or you might need to take this test orally.
♦ Use this worksheet to help you prepare for the test. These are **examples** of **possible questions** that might appear in the test. All the information you need was taught in the classroom and can be found in the learner guide that you received.

1. **I am sure** of this and understand it well
2. **I am unsure** of this and need to ask the Facilitator or Assessor to explain what it means

<table>
<thead>
<tr>
<th>Questions</th>
<th>1. I am sure</th>
<th>2. I am unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What herbicides/fungicides/pesticides are required for my crop?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. When do these herbicides/fungicides/pesticides have to be applied?</td>
<td></td>
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<tr>
<td>3. What is the purpose of these agro-chemicals?</td>
<td></td>
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<tr>
<td>4. At what dosage must these agro-chemicals be mixed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. What are the rules regarding the mixing of these agro-chemicals?</td>
<td></td>
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<tr>
<td>6. What are the rules regarding the application of these agro-chemicals?</td>
<td></td>
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</tr>
<tr>
<td>7. What safety clothing must be worn when mixing or applying these agro-chemicals?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. With what equipment must these agro-chemicals be applied?</td>
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<td></td>
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<tr>
<td>9. How must excess of the agro-chemicals be discarded?</td>
<td></td>
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<tr>
<td>10.</td>
<td>How must empty containers of the agro-chemicals be discarded?</td>
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<tr>
<td>11.</td>
<td>How must equipment be cleaned after application of these chemicals?</td>
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<tr>
<td>12.</td>
<td>How are these agro-chemicals received?</td>
<td></td>
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<tr>
<td>13.</td>
<td>How are these agro-chemicals stored?</td>
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<tr>
<td>14.</td>
<td>What documentation has to be filled out regarding these agro-chemicals?</td>
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My Notes ...

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Checklist for practical assessment …

Use the checklist below to help you prepare for the part of the practical assessment when you are observed on the attitudes and attributes that you need to have to be found competent for this learning module.

<table>
<thead>
<tr>
<th>Observations</th>
<th>Answer Yes or No</th>
<th>Motivate your Answer (Give examples, reasons, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you identify problems and deficiencies correctly?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you able to work well in a team?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you work in an organised and systematic way while performing all tasks and tests?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you able to collect the correct and appropriate information and / or samples as per the instructions and procedures that you were taught?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you able to communicate your knowledge orally and in writing, in such a way that you show what knowledge you have gained?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you base your tasks and answers on scientific knowledge that you have learnt?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you able to show and perform the tasks required correctly?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you able to link the knowledge, skills and attitudes that you have learnt in this module of learning to specific duties in your job or in the community where you live?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The assessor will complete a checklist that gives details of the points that are checked and assessed by the assessor.
- The assessor will write commentary and feedback on that checklist. They will discuss all commentary and feedback with you.
- You will be asked to give your own feedback and to sign this document.
- It will be placed together with this completed guide in a file as part of your portfolio of evidence.
- The assessor will give you feedback on the test and guide you if there are areas in which you still need further development.
Paperwork to be done ...

Please assist the assessor by filling in this form and then sign as instructed.

<table>
<thead>
<tr>
<th>Learner Information Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit Standard</strong></td>
</tr>
<tr>
<td><strong>Program Date(s)</strong></td>
</tr>
<tr>
<td><strong>Assessment Date(s)</strong></td>
</tr>
<tr>
<td><strong>Surname</strong></td>
</tr>
<tr>
<td><strong>First Name</strong></td>
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<tr>
<td><strong>Learner ID / SETA</strong></td>
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<tr>
<td><strong>Registration Number</strong></td>
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<tr>
<td><strong>Job / Role Title</strong></td>
</tr>
<tr>
<td><strong>Home Language</strong></td>
</tr>
<tr>
<td><strong>Gender:</strong> Male: Female:</td>
</tr>
<tr>
<td><strong>Race:</strong> African: Coloured: Indian/Asian: White:</td>
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<tr>
<td><strong>Employment:</strong> Permanent: Non-permanent:</td>
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<tr>
<td><strong>Disabled</strong> Yes: No:</td>
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<tr>
<td><strong>Date of Birth</strong></td>
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<tr>
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<tr>
<td><strong>Email Address</strong></td>
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<tr>
<td><strong>Postal Address</strong></td>
</tr>
<tr>
<td><strong>Signature:</strong></td>
</tr>
</tbody>
</table>
Bibliography

Books:

♦ A Guide for the Control of Plant Diseases available from the Directorate Communication, Private Bag X144, Pretoria, 0001
♦ The Crop Protection Industry in Perspective, AVCASA: Technicon Pretoria (2001)

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Acknowledgements

■ **Project Management:**
  M H Chalken Consulting
  IMPETUS Consulting and Skills Development

■ **Donors:**
  Citrus Academy

■ **Authenticator:**
  Rural Integrated Engineering

■ **Technical Editing:**
  Mr R H Meinhardt

■ **Language Editing:**
  Mr D Erasmus

■ **OBE Formatting:**
  Ms P Prinsloo

■ **Design:**
  Didacsa Design SA (Pty) Ltd

■ **Layout:**
  Ms A du Plessis
  Ms N Matloa
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SOUTH AFRICAN QUALIFICATIONS AUTHORITY
REGISTERED UNIT STANDARD:

Apply crop protection and animal health products effectively and responsibly

<table>
<thead>
<tr>
<th>SAQA US ID</th>
<th>UNIT STANDARD TITLE</th>
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<td>116125</td>
<td>Apply crop protection and animal health products effectively and responsibly</td>
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<tr>
<th>SGB NAME</th>
<th>PROVIDER NAME</th>
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<tr>
<td>SGB Primary Agriculture</td>
<td>NSB 01-Agriculture and Nature Conservation</td>
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<tr>
<th>FIELD</th>
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<td>Agriculture and Nature Conservation</td>
<td>Primary Agriculture</td>
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<tr>
<th>ABET BAND</th>
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<th>NQF LEVEL</th>
<th>CREDITS</th>
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<td>Level 2</td>
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<th>SAQA DECISION NUMBER</th>
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<td>2004-10-13</td>
<td>2007-10-13</td>
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PURPOSE OF THE UNIT STANDARD

A person achieving this unit standard will be able to apply agrochemical products in a safe, effective and responsible manner with consideration to the environment. Furthermore, the person will be able to deal with emergencies related to the use of agrochemicals.

Learners will gain an understanding of sustainable agricultural practices as applied in the animal-, plant and mixed farming sub fields. This unit standard focuses on the application of agro-chemicals in primary agriculture.

They will be able to participate in, undertake and plan farming practices with knowledge of their environment. This unit standard will instil a culture of maintenance and care for both the environment as well as towards farming infrastructure and operations.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

The learner should be competent in literacy and numeracy at ABET level 4 or the equivalent:

- NQF 1: Recognise pests and diseases and weeds on crops.
- NQF 2: Store and control agrochemical products effectively and responsibly.

UNIT STANDARD RANGE

Whilst range statements have been defined generically to include as wide a set of alternatives as possible, all range statements should be interpreted within the specific context of application.

Range statements are neither comprehensive nor necessarily appropriate to all contexts. Alternatives must however be comparable in scope and complexity. These are only as a general guide to scope and complexity of what is required.

UNIT STANDARD OUTCOME HEADER
Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1
Implement a pre-application plan.

OUTCOME RANGE
Pre-application plan includes but is not limited to product, equipment, protective gear, emergency equipment, facilities, and climate conditions.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
Product is identified and available.

ASSESSMENT CRITERION 2
Product expiry date is checked.

ASSESSMENT CRITERION 3
Equipment and safety equipment is checked for good working condition and is available and prepared for use.

ASSESSMENT CRITERION 4
Protective gear is available and in good working condition.

ASSESSMENT CRITERION 5
Contact detail of emergency services is available.

ASSESSMENT CRITERION 6
Animal handling facilities are prepared.

SPECIFIC OUTCOME 2
Mix correct pest control products at correct dose rate.

OUTCOME RANGE
Pest control products include but are not limited to crop, produce and animals.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
Colour codes, symbols and pictograms are interpreted correctly.

ASSESSMENT CRITERION 2
Product is correctly mixed according to products instructions.

ASSESSMENT CRITERION 3
Correct mixing procedure is applied.

ASSESSMENT CRITERION 4
Correct and sufficient mixing apparatus is available and used.

ASSESSMENT CRITERION 5
Correct storing apparatus is available and used.

**ASSESSMENT CRITERION 6**
Correct and sufficient cleaning/sterilisation apparatus is available and used.

**SPECIFIC OUTCOME 3**
Apply pest control product to crop or farm animals.

**ASSESSMENT CRITERIA**

**ASSESSMENT CRITERION 1**
As allowed by weather conditions.

**ASSESSMENT CRITERION RANGE**
Weather conditions include but are not limited to temperature, moist, wind drift.

**ASSESSMENT CRITERION 2**
Correct calibration parameters are adhered to.

**ASSESSMENT CRITERION 3**
Application methods are according to product instructions.

**ASSESSMENT CRITERION 4**
Protective gear is used correctly.

**SPECIFIC OUTCOME 4**
Take the necessary safety and health precautions whilst applying pest control products.

**OUTCOME RANGE**
Protecting self and co-workers; protecting non-targeted organisms; protecting the environment.

**ASSESSMENT CRITERIA**

**ASSESSMENT CRITERION 1**
A full set of protective clothing/gear is worn correctly.

**ASSESSMENT CRITERION 2**
Protective clothing/gear is in good working condition and state of repairs.

**ASSESSMENT CRITERION 3**
Correct utilisation of protective clothing/gear is applied.

**ASSESSMENT CRITERION 4**
No smoking, drinking, eating or under the influence of drugs takes place.

**ASSESSMENT CRITERION 5**
Product is stored correctly.

**ASSESSMENT CRITERION 6**
Waste and empty containers are disposed of correctly.

**ASSESSMENT CRITERION 7**
Soil and water contamination is avoided.

**ASSESSMENT CRITERION 8**
Application occurs under correct climate conditions.

**ASSESSMENT CRITERION 9**
Non-authorised workers are prevented from coming into contact with chemicals.

**ASSESSMENT CRITERION 10**
Rest of the worker community is informed of activity.

**ASSESSMENT CRITERION 11**
Designated areas are used for mixing.

**ASSESSMENT CRITERION 12**
Product is applied to targeted organisms only.

**SPECIFIC OUTCOME 5**
Apply post-application procedures.

**ASSESSMENT CRITERIA**

**ASSESSMENT CRITERION 1**
Apparatus is cleaned thoroughly.

**ASSESSMENT CRITERION 2**
Waste products and empty containers are collected, cleaned and discarded.

**ASSESSMENT CRITERION 3**
Empty containers are not used for other purposes.

**ASSESSMENT CRITERION 4**
Protective gear is cleaned, maintained and stored correctly.

**ASSESSMENT CRITERION 5**
Personal hygiene is applied.

**SPECIFIC OUTCOME 6**
Monitor and report on the process, problems and unusual occurrences to the supervisor.

**OUTCOME RANGE**
Verbally or in writing.

**ASSESSMENT CRITERIA**

**ASSESSMENT CRITERION 1**
Application process is monitored.

**ASSESSMENT CRITERION 2**
Problems and unusual occurrences are reported to the supervisor.

**SPECIFIC OUTCOME 7**
Deal appropriately and effectively with emergencies.

**OUTCOME RANGE**
Emergencies include but are not limited to chemical spills, human and animal poisoning and environmental contamination.

**ASSESSMENT CRITERIA**

**ASSESSMENT CRITERION 1**
Minor spills are contained, absorbed, collected and disposed of.

**ASSESSMENT CRITERION 2**
In the case of human poisoning a medical doctor is contacted immediately.

**ASSESSMENT CRITERION 3**
Supervisor is informed and requested to contact poison information centre to assess situation and advice on next step.

**ASSESSMENT CRITERION 4**
Incident is reported to the supervisor.

**UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS**
The assessment of qualifying learners against this standard should meet the requirements of established assessment principles.

It will be necessary to develop assessment activities and tools, which are appropriate to the contexts in which the qualifying learners are working. These activities and tools may include an appropriate combination of self-assessment and peer assessment, formative and summative assessment, portfolios and observations etc.

The assessment should ensure that all the specific outcomes, critical cross-field outcomes and essential embedded knowledge are assessed.

The specific outcomes must be assessed through observation of performance. Supporting evidence should be used to prove competence of specific outcomes only when they are not clearly seen in the actual performance.

Essential embedded knowledge must be assessed in its own right, through oral or written evidence and cannot be assessed only by being observed.

The specific outcomes and essential embedded knowledge must be assessed in relation to each other. If a qualifying learner is able to explain the essential embedded knowledge but is unable to perform the specific outcomes, they should not be assessed as competent. Similarly, if a qualifying learner is able to perform the specific outcomes but is unable to explain or justify their performance in terms of the essential embedded knowledge, then they should not be assessed as competent.

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

Performance of specific outcomes must actively affirm target groups of qualifying learners, not unfairly discriminate against them. Qualifying learners should be able to justify their performance in terms of these values.

- Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
- Any institution offering learning that will enable achievement of this unit standard or assessing this unit standard must be accredited as a provider with the relevant ETQA.
Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

**UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE**

The person is able to demonstrate a basic knowledge of:

- Interpretation of pictograms, colour coding and symbols.
- Legal implications of misuse/abuse i.e. off-label use.
- Potential hazards associated with agrochemicals.
- Cleaning and maintenance of equipment.
- General symptoms of poisoning.
- Impact of product on the environment, humans and other organisms.
- Basic storage principles and requirements.
- Principles and methods of mixing.
- Empty container and waste disposal.
- Emergency procedures.
- Legislation and Codes of Practice.
- First aid.
- Hygiene.
- Contamination.

**UNIT STANDARD DEVELOPMENTAL OUTCOME**

N/A

**UNIT STANDARD LINKAGES**

N/A

**Critical Cross-field Outcomes (CCFO):**

**UNIT STANDARD CCFO IDENTIFYING**

Problem solving relates to specific outcomes:

- Implement a pre-application plan.
- Mix correct pest control products at correct dose rate.
- Monitor and report on the process, problems and unusual occurrences to the supervisor.

**UNIT STANDARD CCFO ORGANIZING**

Self-organisation and management relates to all specific outcomes.

**UNIT STANDARD CCFO COLLECTING**

Information evaluation relates to specific outcomes:

- Implement a pre-application plan.
- Mix correct pest control products at correct dose rate.
- Take the necessary safety and health precautions whilst applying pest control products.

**UNIT STANDARD CCFO COMMUNICATING**

Communication relates to specific outcomes:

- Implement a pre-application plan.
- Mix correct pest control products at correct dose rate.
- Take the necessary safety and health precautions whilst applying pest control products.

**UNIT STANDARD ASSESSOR CRITERIA**

N/A

**UNIT STANDARD NOTES**

N/A
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