NQF Level: 4 US No: 116278

Learner Guide

Primary Agriculture

System for food safety and quality management

My name: . . . . . .

Company: . . . . . .

Commodity: . . . . . Date: . . . . . .

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Department:
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REPUBLIC OF SOUTH AFRICA

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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:	Use language and communication in occupational learning programmes			
US No:	**8979**	**NQF Level:** 3	**Credits:** 5	

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:

Title	ID Number	NQF Level	Credits	Mark
National Certificate in Animal Production	48979	4	120	❒
National Certificate in Plant Production	49009	4	120	❒

Please mark the learning program you are enrolled in:

Your facilitator should explain the above concepts to you.

Are you enrolled in a:	Y	N
Learnership?	❒	❒
Skills Program?	❒	❒
Short Course?	❒	❒

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.

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, 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 hand this 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 characterized 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.

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What are we going to learn?

What will I be able to do?

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

- Implement a management system related to food safety, production practices, as well demonstrate environmental and social awareness within the agricultural supply chain. Learners will gain an understanding of sustainable agricultural practices as applied in orchard farming. This unit standard focuses on the application of food safety principles in primary agriculture.
- Be fully competent in food safety practices whereby providing the environment for the application of quality practices and thus strengthen agricultural practices in general. 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 Outcomes

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

- Principles of regulatory and legal aspects with reference to the specific agricultural enterprise.
- A basic understanding of food-borne illnesses.
- A basic knowledge of the Impact of food safety and quality in trade.
- A thorough understanding of contamination risks and preventative measures.
- Contamination risks.
- Contamination preventative measures.
- A basic understanding of risk factors related to food safety.
- Be familiar with the principles of food safety and quality.
- Basic principles of environmental and conservation management.
- Basic principles of waste and pollution management.
- Basic principles of natural resource management.
- Local legislation such as Occupational Health and Safety, Health and Welfare,
- A basic understanding of procedures of internal audits, traceability, and management skills.

What do I need to know?

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

- NQF3: Literacy and Numeracy
- 2: 116125, Apply crop protection effectively and responsibly
- 3: 116240, Explain store inputs categories, labelling and storage methods
- 3: 116271, Monitor and supervise a food safety and quality management system in the agricultural supply chain

My Notes ...

Revision of Level 3

Health, Social and Environmental Issues Related to the Agricultural Environment

- Food safety is an essential public health function according to a resolution that was adopted by the World Health Organisation.
- Food-borne diseases are a major threat to public health and affect the social and economical well-being of societies.
- Global trends in food consumption mean that food is consumed far from where it is produced, and that food from a single source is consumed by a great number of people.
- The Codex Alimentarius Commission establishes international food standards to protect the health of consumers, and to ensure fair practices in the food trade, on which member countries base their food safety legislation and regulations.
- In South Africa, the Agricultural Products Act (APS) prescribes food safety standards.
- Regulations for specific commodities are based on and empowered by the APS, and standards and requirement checklists are in turn based on the regulations.
- The PPECB is an assignee of the DoA, and conducts, amongst others, quality assurance inspections in terms of food safety regulations, and food safety audits.
- EurepGAP prescribes a set of food safety and quality standards for all products that are exported to the European Union and the United Kingdom.
- Communicable diseases are of importance in plant production because is impacts on worker health and productivity.
- Workers that contract diseases that are infectious must be removed from the workplace until they no longer pose a danger to the health of other workers.
- The environmental impact and sustainability of food production is usually addressed on an industry level through Improvement Programmes, Crop and Fruit Quality Management Research, Disease Management Research, and Integrated Pest Management Research.
- The most significant contribution that individual growers can make to sustainability and minimising environmental impact is by applying Integrated Crop Production (ICP) principles.
- Awareness amongst workers with regard to food safety issues are created through skills development, workshops and road shows by commodity organisations, awareness campaigns, incentives and disciplinary enforcement by employers, warning signs, and inspections.
- Checklists are handy as a guideline for the information that should be disseminated to workers.
- Recordkeeping enables traceability, which should allow one to trace a fruit from where the consumer buys it back to the tree it grew on in the orchard, with details of all the processes that it was subjected to in between.

Non-Conformance and Food Safety

- Everyone involved in the production process has a responsibility towards food safety and must be aware of what is required to ensure that food is safe for human consumption.
- Non-conformance must be reported immediately and the reporting must be escalated until appropriate action is taken.
- The seven principles of HACCP is a good general approach to food safety monitoring.
- Periodic reports and checklists must be developed for each critical control point that is identified with the specific aim to detect non-compliance and non-conformance as soon as it occurs.
- Informal reporting relies on every person having a thorough understanding of the requirements and principles of food safety and on a tiered verbal reporting system that normally follows the chain of command.
- The response in case of non-conformance must include steps to immediately correct the problem, to isolate the area in which the problem occurred, to determine the impact of the problem and take steps to rectify the situation, to determine the cause of the problem, and to ensure that the problem does not recur.

Traceability

- Traceability depends on the completeness of the recordkeeping systems throughout the supply chain.
- ISO develops voluntary international standards for products and services and defines traceability as the ability to trace the history, application, or location of that which is under consideration.
- The purpose of traceability is to allow one to determine the point at which deviations or non-conformance occurred if it is found that the safety of the product has been compromised.
- Traceability if a legislative requirement.
- The most basic penalty for non-compliance is that no produce will be accepted, shipped or sold if it does not comply with the minimum standards for traceability.

Record keeping

- Recordkeeping is essential for complying with a major food safety requirement, being traceability.
- Checklists are available to ensure that the correct records are kept.
- Quality management systems that are commonly used are ISO, EurepGAP and HACCP.
- ISO reflects international consensus on the standards that are required by governments, business and society.

- EurepGAP aims to develop widely accepted standards and procedures for the global certification of Good Agricultural Practices (GAP).
- HACCP is a commonsense approach designed to identify and control food safety hazards, and monitor the controls established.

Internal Audits

- Internal audits aim to monitor and probe the integrity of any quality management system continuously.
- There are no specific rules for internal audits, but it is closely related to the type of quality management system that is in place.
- Regardless of the size of the entity or the approach to internal audits, there are key elements that must be included in all internal audit systems.
- Conducting an internal audit mostly includes measuring and monitoring, evaluation, and reporting.

Implementing Food Safety and Quality Principles

- Observing sanitation standard operating procedures eliminate the risk of food contamination.
- Maximum residue levels are prescribed by legislation, but also by importing country's standards.
- A document indicating maximum residue levels and pre-harvest intervals is developed by the Citrus Growers Association.
- HACCP provides a handy tool for implementing food safety principles.
- Hazard analysis involves identifying all possible hazards to food safety at every point.
- Critical control points are identified as points at which control can be applied.
- Critical operational limits are established for each critical control point.
- Critical control points are monitored and operations are measured against operational limits.
- Procedures for corrective action are developed in case of a loss of control.
- Records are kept of all operations at critical control points.
- The soundness, effectiveness, and implementation of the system are verified.
- Recordkeeping is essential for traceability and effective management.
- The types of records that must be kept are prescribed by legislation and standards authorities.

Session 1 Manage a traceability system

After completing this session, you should be able to:
SO 1: Manage a traceability system demonstrating operational efficiency in the agricultural supply chain.

In this session we explore the following concepts:

- Traceability
- Record Keeping

1.1 Introduction

Traceability is the ability to trace and follow a food product or any substance intended to be, or expected to be incorporated into, a food product through all stages of production, packing, processing, handling and distribution. Traceability refers to the completeness of the information about every step in a process chain.

Traceability is one of the most important corner stones of food safety implementation. In this chapter, we will briefly revise certain concepts and checklists that were discussed in detail at previous levels, before looking at how traceability is implemented in the pre-harvest production environment along with the recordkeeping systems that are essential for traceability.

1.2 The purpose of Traceability

Consumer protection is and essential aspect in the agricultural production environment. Traceability allows the grower to provide proof of the origin of all fresh produce, and therefore presents a measure of protection for the grower and the consumer. For grain production, traceability is problematic because it gets mixed but less critical because it is normally cooked and not consumed in a fresh form like fruit.

It is critical that all employees in the supply chain understands the importance of food safety and the related traceability of it. Traceability serves the following purposes:

- ***Security*** – It is a legal requirement that any defective product that presents a risk to the consumer must be able to be recalled immediately. Traceability allows this by ensuring that the origins of the product can be determined.
- ***Investigation*** – If a product is found to be defective, at least two things have gone wrong. Firstly, the product itself was not produced, handled or packed in the prescribed manner, and secondly, the product may already have passed through quality control points where the defect should have been detected. Traceability allows for the necessary investigation to determine where these deviations occurred.
- ***Production Management*** – Traceability can lead to a greater understanding of the company's capabilities, making it possible to meet production targets in a shorter time and at a lower cost. Traceability can also be a starting point for the statistical methods of process control (SPC).
- ***Stimulus for Technical Progress*** – There is always a risk that a production unit that is profitable and that is meeting its objectives may become complacent. Implementing traceability systems forces management to assess the use of technology within the organisation and the skills levels of the employees.
- ***Consumer Information*** – Traceability allows the producer to collect information about consumers and their spending habits, which allows him to better define and understand his target market.

1.3 Traceability in the supply Chain

Supply chains exist in production, manufacturing and service organisations, and they are principally concerned with the flow of products and information between supply chain member organisations. Supply chains are concerned with processes such as the procurement of products (sourcing), their transformation into finished product (production and packing), and distribution of that product to consumers.

An agricultural supply chain is a series of distinct activities that take place in order to take the product from field or orchard to market. The demand chain is the supply chain in reverse, seen from the consumer's point of view. The following diagram show a supply chain where exporting is part of it:

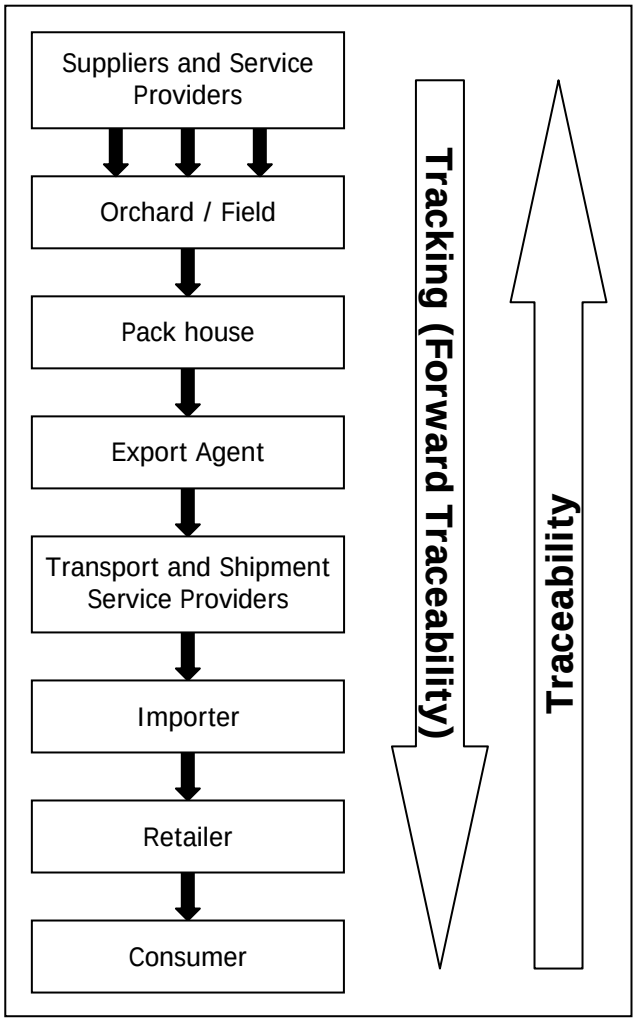

Figure 1.1: Fresh Produce Supply Chain

Tracking: Tracking is the ability to follow a path of a specified unit and / or batch of product through the supply chain as it moves between organisations towards the final point-of-process, point-of-sale or point-of-service. Tracking is also referred to as **forward traceability**.

Tracing: Tracing is the ability to identify the origin, movements and relevant associated information of a particular unit and / or batch of product located within the supply chain by reference to records held upstream. Tracking is also referred to as **backward traceability**.

In order to meet consumer demands for consistent supply of top quality, safe and nutritious foods, the design and implementation of full backward and forward traceable supply chains from farm to end-user has become an important part of the overall food quality assurance system.

Farmers, post-harvest handling operators, marketers, researchers and policy makers need a sound understanding of the concepts and implications of supply chain traceability to assist in developing and implementing appropriate

technological interventions to meet consumer demands for traceable agricultural supply chains.

In line with the supply chain, traceability represents the ability to identify the farm where it was grown and sources of input materials, and the ability to conduct full backward and forward tracking to determine the specific location and life history in the supply chain by means of records.

1.4 Elements of Traceability

Traceability adds value to the overall quality management system by providing the communication linkage for identifying, verifying and isolating sources of non-compliance to agreed standards and customer expectations.

On previous levels we examined traceability in its obvious and simplistic form, but it is important to remember that traceability have many different elements. Some of these elements are directly related to the Good Agricultural Practices (GAP) that is discussed in detail in Chapter 2 of this guide.

There are six important elements of traceability, which in combination constitute an integrated agricultural and food supply chain traceability system. They are:

- **Product Traceability**

  Product traceability determines the physical location of a product at any stage in the supply chain to facilitate logistics and inventory management, product recall and dissemination of information to consumers and other stakeholders.

- **Process traceability**

  Process traceability ascertains the type and sequence of activities that affect the product during the growing and post-harvest operations, meaning what happened to it, where and when. These include interactions between the product and physical, mechanical, chemical, environmental and atmospheric factors and the absence or presence of contaminants.

- **Genetic Traceability**

  Genetic traceability determines the genetic constitution of the product, which relates in terms of food production to the plant material that was used in the orchard.

- **Input Traceability**

  Input traceability determines the type and supplier of inputs such as fertiliser, chemical sprays, irrigation water, and the presence of additives and chemicals used for the preservation of the product.

- **Disease and pest Traceability**

  Disease and pest traceability traces the epidemiology of pests and biotic hazards such as bacteria, viruses and other pathogens that may contaminate food.

- **Measurement Traceability**

  Measurement traceability relates individual measurement results through an unbroken chain of calibrations to accepted reference standards. To achieve this, measuring and test equipment and measurement standards are calibrated utilising a reference standard whose calibration is certified as being traceable to a national or international standard.

  The other aspect of measurement traceability relates to the property of the measurements, including data and calculations, generated throughout the supply chain and their relationship to the requirements for quality. By focusing on the quality of measurements, rather than on a property of an instrument, it is possible to assure that the measurements are indeed adequate for the intended use. To achieve this, each measured data must specify the environmental, operator, and geospatial and temporal factors, which are not related to the instrument but impact on the quality of the data.

1.5 Recordkeeping for Traceability

As we have already seen, traceability is the ability to trace and follow a food product from the orchard to the basket, or back from the basket to the field or orchard. It is logical that effective recordkeeping is the cornerstone of traceability and the implementation of a traceability system.

We also already know that traceability and supporting records for fresh produce are essential components of all quality management systems (QMS).

Checklists and compliance criteria have been developed to be used as an aid and self-assessment tool for food business operators (FBO's) in implementing the food safety system. The same checklists are used by PPECB auditors to verify that the system is in place.

In the table below, the checklists and compliance criteria that have to be completed by law in order to ensure effective traceability are set out.

Note that checklist and compliance criteria for SA GAP and on-farm pack houses have now been consolidated, therefore making it equally applicable to primary growers and secondary processors and packaging establishments.

Operation	*Checklists and Compliance Criteria*
On-Farm Pack houses	• SAGAP – On-Farm Pack house – Checklist – October 2006 • SAGAP – On-Farm Pack house – Compliance criteria - October 2006
Off-Farm Pack houses	• Off-Farm Pack houses – Checklist – September 2006 • Off-farm Pack houses – Compliance Criteria – September 2006
Processing Plants	• Processing Plants – Checklist – January 2006 • Processing Plants – Compliance Criteria – October 2005
SA GAP	• GAP – Compliance Criteria – June 2006
Cold Stores	• Cold Storage – Checklist – September 2006 • Cold Storage – Compliance Criteria – September 2006
Container Depots	• Container Depots – Checklist – September 2006 • Container Depots – Compliance Criteria – September 2006
Transporters	• Road Transporters – Checklist – September 2006 • Road Transporters – Compliance Criteria – September 2006

Table 1.1: Traceability Checklists and Compliance Criteria

Please complete Activity **1:**
Design a road-show for co-workers

- What is traceability?
- What is the purpose of traceability for the industry that you are involved in?
- How do producers execute traceability?
- How can the operational efficiency of traceability be ensured and supported?
- How does recordkeeping support the efficiency of traceability?
- Which records are kept to ensure traceability?
- How can a fruit producer show evidence of compliance with traceability systems?

Records can be kept manually, by filling the check lists and forms in by hand, or electronically, by recording the information on a computer. Electronic systems have the benefit of also processing the data and additional information can as a result be extracted from these programs.

Computer programs can, for example, deliver graphs and comparisons about the progress of the producer in terms of the quality of his produce. Electronic data can often be used when comparisons are drawn over a period of time. Although manual data can supply the same information, it is a lot more complicated to extract the required information without the assistance of electronic equipment and software.

The records that must be kept in accordance with the requirements of legislations and various food safety accreditation systems serve as evidence of compliance with traceability recommendations because specific information with dates and signatures of responsible parties are found on these documents if they have been filled in correctly.

All workers that are responsible for traceability records must therefore be trained in:

- How to complete the forms and checklists correctly.
- How, where, when and for how long, to report on and file forms and checklists.
- The accountability and responsibility in terms of traceability and the law related to the completion of (or failure to complete) these forms and checklists.

Records must be kept for a specified period in a central, accessible place, under the care of a person appointed for this task. The records must meet standard criteria of tracking and tracing, in order words it should be kept in a systematic and chronological way, by date, batch number, geographical reference point, and delivery or dispatch reference.

1.6 Implementing a Recordkeeping Traceability System

Traceability systems are implemented in most cases as part of the food safety and quality management system. Traceability is in fact a major requirement for such a system.

HACCP (Hazard Analysis Critical Control Point system) principles are often used as the basis for designing and implementing a quality management system. Even is the HACCP system itself is not used as such, the same basic principles should be applied. At previous levels we discussed the principles of HACCP in detail. As a reminder, they are:

- Hazard analysis
- Identification of critical control points
- Establishing critical limits
- Monitoring critical control points
- Establishing procedures for corrective action
- Recordkeeping
- Verification

HACCP provides for the risk, or hazard, assessment that has to be done prior to implementation of a quality control system, and for the ongoing management of identified risks.

ISO 22000 is a commercial food safety management standard that makes use of the HACCP principles and methodology to develop a HACCP plan. A HACCP plan is

a document that describes how an organisation plans to manage and control its food safety hazards, and contains at least the following information:

- Identified critical control points (CCP's)
- Hazards that must be controlled at each CCP
- Control measures for each CCP
- Critical limits to be applied at each CCP
- Procedures for monitoring CCP's
- Procedures for remedial action when limits are exceeded

ISO 22000 provides for combining the HACCP plan with **prerequisite programs** (PRP's) and **operational prerequisite programs** (OPRP's) into a single integrated food safety management strategy.

Prerequisite programs (PRPs) are the conditions that must be established throughout the food chain and the activities and practices required to establish and maintain a hygienic environment. PRPs must be suitable and capable of providing food that is safe for human consumption. PRPs are also referred to as good hygienic practices, good agricultural practices, good production practices, good manufacturing practices, good distribution practices, and good trading practices.

Operational prerequisite programs (OPRPs) are prerequisite programs (PRPs) that are essential. They are essential because a hazard analysis has shown that they are necessary in order to control specific food safety hazards. OPRPs are used to reduce the likelihood that products will be exposed to hazards, that they will be contaminated, and that hazards will proliferate. OPRPs are also used to reduce the likelihood that the processing environment will be exposed to hazards.

My Notes ...

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Please complete Activity **2 and 3:**

2. Group discussion & conclusion

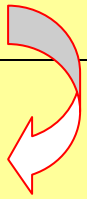
Obtain an example of a recording system from a farm in your area and discuss it critically in your group. If you were the manager of a fruit farm, how will you prove that you comply with traceability standards?

3. Workplace Research

Conduct workplace research to obtain information about implementing a recordkeeping system that will meet all the requirements of traceability – i.e. give a complete list of all the documented records with physical examples attached for each step listed below.

a. Conduct a food safety hazard analysis.
b. Identify your critical control points (CCPs).
c. Establish critical limits for each critical control point.
d. Develop procedures to monitor critical control points.
e. Design corrective actions to handle critical limit violations.
f. Create a food safety record keeping system.
g. Validate and verify your system.

Now draw up a suggested HACCP plan for your farm according to the criteria listed below, and include a summary of information for the following information flow in your workplace:

Risk Assessment	Identify Hazards to food Safety	
	Characterise these Hazards	
	Conduct an exposure assessment	
	Characterise the risk	
Risk Management	Weigh up policy alternatives for the protection of consumer health	
	Weigh up policy alternatives for the promotion of fair trade practices	
	Select the appropriate prevention and control options	
Risk Communication	Identify the role-players in risk communication and to whom risk management findings must be communicated	

Criteria for HACCP plan

a. Critical control points (CCPs)

b. Hazards that will be controlled at each CCP

c. Control measures that will be used at each CCP

d. Critical limits that will be applied at each CCP

e. Procedures that will be used to monitor CCPs

f. Actions that will be taken when limits are violated

Give an overview of which Prerequisite programmes are in use?

Give an overview of which Operational prerequisite programs are in use?

Concept (SO 1)	I understand this concept	Questions that I still would like to ask
The purpose of a traceability system is explained.		
Practices, which will support operational efficiency of a traceability system are identified.		
The record keeping which supports a traceability system is explained.		
Evidence of traceability records provided.		

My Notes ...

Session 2 Implement a record system on the farm

After completing this session, you should be able to:
SO 2: Manage and maintain good agricultural practices (GAP) associated with good manufacturing practices (GMP), good health practices (GHP), good social practices (GSP) and good environmental practices (GEP).

In this session we explore the following concepts:

- Good practices in Agriculture

2.1 Introduction

'Good practices' is a term that has come into use in recent years to describe the good way to do or manage things. This is often put in place of strict regulations where producers are encouraged to comply to Good Practices through education and incentives. Self monitoring then becomes an important tool in the Good Practices System. Guidelines for Good Practices have been developed for just about every activity in every field, from good trading practices to good marketing practices to good fund raising practices.

Good practice guidelines aims to improve the manner in which a variety of business conduct themselves, by integrating for instance good social practices with good agricultural practices.

The management and maintenance of GAP are closely linked with recordkeeping and the concepts and process flow associated with traceability, and should be targeted for internal monitoring, internal audits, and inspections by external auditors and inspectors.

2.2 Good Practices in the Agricultural Supply Chain

In agriculture, good practice guidelines have been developed for the entire supply chain, and they include:

- Good Agricultural Practices (GAP)
- Good Manufacturing Practices (GMP)
- Good Health Practices (GHP)
- Good Social Practices (GSP)
- Good Environmental Practices (GEP)

Good practice guidelines are interactive and integrated, meaning that the requirements of good social practices, good health practices and good environmental practices are included and integrated with good agricultural practices and good manufacturing practices. In crop production and processing, GAP and GMP principles are the therefore generally applied, as this provides for other good practices as well.

Good Agricultural Practices (GAP)

Good agricultural practices are a collection of principles and basic environmental and operational conditions that are necessary for the production of safe, wholesome fruit and vegetables. The term includes practices used in growing, harvesting, sorting, packing and storage operations. GAP principles also aim to ensure the sustainability of agricultural production.

Good Manufacturing Practices (GMP)

Good manufacturing practices are guidelines that manufacturers use to ensure the quality, consistency and safety of products and processes. GMP is often used simultaneously with GAP and includes practices used in sorting, packing, storage and transportation operations.

Good Health Practices (GHP)

Good health practices are guidelines that help reduce the risk of being implicated in the spread of food-borne illnesses through poor personnel hygiene. The scope of these practices is relevant to staff and worker health and hygiene.

Good Social Practices (GSP)

Good social practices address a wide range of environmental issues and are not only applicable to agriculture. These issues include:

- Third bullet – Not bold – Like this***Economically Disadvantaged Producers*** – Good social practices prescribe a strategy for poverty alleviation and sustainable development. Its purpose is to create opportunities for producers who have been economically disadvantaged or marginalised by the conventional trading system.
- ***Transparency and Accountability*** – Good social practices encourages transparent management and commercial relations to deal fairly and respectfully with trading partners.
- ***Capacity Building*** – Good social practices is a means to develop producers' independence. Fair trade relationships provide continuity, during which producers and their marketing organisations can improve their management skills and their access to new markets.
- ***Payment of a Fair Price*** – A fair price in the regional or local context is one that has been agreed through dialogue and participation. It covers not only the costs of production but enables production which is socially just and environmentally sound. It provides fair pay to the producers and takes into account the principle of equal pay for equal work by women and men.
- ***Gender Equity*** – Good social practices means that women's work is properly valued and rewarded. Women are paid for their contribution to the production process and are empowered in their organisations.
- ***Working Conditions*** – Good social practices means a safe and healthy working environment for producers and workers. The participation of children, if any, does not adversely affect their well-being, security, educational requirements and need for play, and conforms to the UN Convention on the Rights of the Child as well as the laws and norms in the local context.
- ***Environment*** – Good social practices actively encourages better environmental practices and the application of responsible methods of production.

Good Environmental Practices (GEP)

Good environmental practices address the following aspects:

- The environmental hazard posed by the product, its production, its use and ultimate disposal
- Substitution by less polluting activities or substances
- The scale of use
- The potential environmental benefit or penalty of substitute materials or activities
- Advances and changes in scientific knowledge and understanding
- Time limits for implementation
- Social and economic implications

- The precautionary principle, i.e. taking preventive measures when there is reason to assume that substances or energy introduced, directly or indirectly, into the natural environment may create hazards to human health, harm living resources and ecosystems, damage amenities or interfere with other legitimate uses of nature even when there is no conclusive evidence of a causal relationship between inputs and their effects.

Please complete Activity **4.**

Give examples

Give at least two examples related to the following concepts, from perspective of the workplace or organisation where you are currently employed

Good Agricultural Practices (GAP)	
Good Manufacturing Practices (GMP)	
Good Health Practices (GHP)	
Good Social Practices (GSP)	
Good Environmental Practices (GEP)	

2.3 The principles of Good Agricultural Practices

GAPs may be applied to a wide range of farming systems and at different scales. They are applied through sustainable agricultural methods, such as integrated pest management, integrated fertilisation management and conservation. They rely on four principles:

- Economically and efficiently produce sufficient, safe and nutritious food
- Sustain and enhance natural resources
- Maintain viable farming enterprises and contribute to sustainable livelihoods
- Meet cultural and social demands of society

The key areas of concern when implementing a GAP program are:

- **Prior land use**
- **Adjacent land use**
- **Water quality and water use practices**
- **Soil fertility management**
- **Wildlife, pest, and vermin control**
- **Worker hygiene and sanitary facilities**
- **Harvesting and post-harvest practices**

Please complete Activity **5.**

Explain in your own words

Explain in your own words what the purpose of Good Agricultural Practice is and how it might be of value to a commercial fruit grower to adhere to and report on their implementation thereof.

2.4 Guidelines for Good Agricultural Practices

The following is a summary of the areas for which GAP guidelines have been developed.

- Land Use and Soil
  - Cultivated land information
  - Current or prior use of adjacent land
- Water Sources and Irrigation Practices
  - Potential contamination associated with water sources
  - Hazards introduced by irrigation practices
  - Chemigation
  - Agricultural water microbiological testing procedures
- Implementation of Soil and Water Conservation Principles – Organic Fertilisers
  - Management of organic fertilisers
  - Hazards associated with animal manure and treatments to reduce the risks
  - Hazards Associated with manure treatment and storage location
  - Precautions for the application of organic fertilisers
  - Keeping complete records of organic fertiliser preparation and use
- Implementation of Soil and Water Conservation Principles – Inorganic Fertilisers
  - Keeping complete records of inorganic fertilisation programs

- Animal Exclusion from Production Areas
  - Methods for keeping animals out of production areas
  - Cleaning surrounding areas
  - Animals and water
- Pest Control
  - Pest Control in fresh produce operations
  - Common pest control procedures
  - Pesticides
  - Pesticide handling
  - Pesticide application
  - Pesticide storage
  - Pesticide residues
  - Pesticide disposal
  - Training and documentation
- Worker Health and Safety
  - Relationship between worker health and hygiene
  - Health programs
  - Worker hygiene training program
  - Drinking water
  - Worker hygiene practices and sanitation facilities
  - Hand washing and hand-washing facilities
  - Basic requirements for and placement of sanitary field stations
- Safety Hazards Associated with Harvesting
  - Physical damage caused by mechanical and / or manual harvesting methods
  - In-field packaging operations
- Safety Hazards Associated with Post-Harvest treatments and handling
  - Post-harvest water quality
  - Cooling considerations

2.5 Managing good Agricultural Practices

Land use and Soil

Agricultural land and land that has been used for activities other than agriculture can be contaminated with pathogenic organisms or toxic chemical substances.

Obtaining a history of the prior use of the land is important because it helps identify these potential hazards. In addition, the failure of prior users to follow Good Agricultural Practices can offer risks of contamination to produce grown on the soil.

It is important to obtain information about the previous use of the land where agricultural production is taking place. This can be done through interviews with prior owners, a review of municipal permits, or from other sources. This background information can help in the identification of situations that can increase the risk for fresh produce contamination.

- Cultivated Land Information

  Information that should be obtained about the history of the land includes if the land is being used or has been used for:

  - Animal feeding or domestic animal production
  - Barns or other housing of farm animals
  - Garbage or toxic waste disposal, sanitary waste management
  - Mining activities, or oil or gas extraction

  Other information that should be obtained includes:

  - If the land has experienced any serious flooding
  - If the land has been treated in an uncontrolled manner with organic or inorganic fertilisers and / or pesticides.

  Prior use of the land for animal feeding or domestic animal production can greatly increase the risk of contamination of fruit and vegetables with pathogens commonly found in the intestinal tract of animals. The potential for contamination from this source is related to the time that has passed since the land was used for animal feeding or production. The risk of contamination will also be influenced by conditions such as atmospheric temperature, sunlight and relative humidity.

  The presence of barns or farm animals a short distance from the cultivation site increases the risk of product contamination. An assessment of the location of the animals and their facilities and an evaluation of drainage systems and water currents flowing near these areas will help determine the potential for contamination. In some instances it may be necessary to create physical

barriers or channels to divert water which may carry contaminants from the animals.

When the land has been used for garbage disposal or as a waste management site, it may contain decomposing organic matter and faecal material. Depending on the garbage contents, soil microbial loads can be extremely high and the soil may also contain harmful chemicals or toxic contaminants.

Land that has been used for mining or petroleum extractions can be contaminated with heavy metals or hydrocarbons. Even if the contamination is located on a small portion of the land, factors such as rainfall and subterranean water flow should be evaluated. Analysis of toxic substances in the soil and a review of the environmental compliance of the extraction operation are recommended when the ground history indicates a high risk for chemical hazards.

Heavy flooding can increase the sources of contamination. Water runoff can introduce pathogens and chemical contaminants from remote areas. Dead animals and standing water that remains after the floodwater have receded can lead to significant bacterial hazards. Individual assessment of each flooding situation is necessary, along with a review of the time that has passed since the flood and other conditions that can mitigate or reduce the risks. When there is concern about the safety of the site, microbiological analyses after the flooding has occurred may assist in identifying contamination.

Even if the investigation of the prior use of the land indicates that it has been used solely for agricultural production, prior production practices should be reviewed. Improper use of organic fertilisers may result in microbiological contamination of the soil, while inorganic fertiliser and / or pesticides used improperly can cause serious chemical hazards. Chemical compounds should have been used according to label recommendations and the products should be registered for use on the specific crop.

- Current or Prior Use of Adjacent Land

  The land owner or operator should research both the present and prior use of adjacent lands to identify potential sources of contamination and precautions that need to be taken to prevent contamination of fresh produce in the orchards.

  Contamination from areas away from the actual growing area can reach produce through a variety of means including water, wind, workers, vehicles, or equipment moving from one area to another.

Water Sources and Irrigation Practices

During agricultural production of fruits and vegetables, water is used for numerous activities in the field, including pesticide and fertiliser applications and irrigation. Other water uses during produce handling include cooling, washing, waxing and the movement of fruit. In addition to activities where water comes in direct contact

with produce, field and pack house workers use water for drinking and hand washing.

Water used in agricultural activities can be contaminated with pathogenic bacteria that may cause severe health problems to consumers. It can be a source of and vehicle for a number of biological hazards. Such micro-organisms are associated with gastrointestinal diseases that, in severe cases, can cause death.

Poor quality water may be a direct source of contamination and also an important vehicle for spreading micro-organisms in the production field. The severity of the hazard resulting from poor quality water will depend on the type and number of micro organisms in the water and their capacity to survive on the produce.

In addition to the quality of the water, other factors that can increase the risk of contamination of produce by water include the stage of development and type of crop, the time between the contact of the produce with the water and harvest, and other water and produce handling practices. Fruits and vegetables with large surface areas, such as leafy vegetables, or those where the surface structure allows pathogens to adhere easily, are at a greater risk of contamination from water.

This risk can be further increased when the contact with contaminated water takes place near harvest time or during post harvest handling.

- Potential Contamination Associated with Water Sources

  Among the most common sources of agricultural water are surface rivers, streams, and open canals. Other sources include reservoirs such as swamps, lakes, tanks, ground water from boreholes and, occasionally, public water systems.

  Surface and reservoir sources vary considerably in their microbial content. Microbial loads of surface water range from several thousand organisms per millilitre after a rainfall to a relatively low number after auto-purification, a normally occurring process in smooth waters.

  Surface waters can be exposed to temporary or intermittent contamination. This contamination can come from raw human and animal wastes, sewage water discharges, and water coming from adjacent areas dedicated to animal production or other contamination. Surface water generally flows some distances before it reaches the crop. It is important to identify upstream sources of contamination to this flow. Elimination of this contamination may involve modification of the water's route or the introduction of intervention methods, such as filters.

  Water destined for agricultural production can easily become contaminated with human and / or animal faeces. It is important to keep animals and children out of the orchards and to provide field workers with properly constructed and maintained restrooms or mobile sanitary units. Water contamination with human faecal material also can occur if wells and water systems are not

properly developed, if septic systems fail or have deficiencies in their design, and from discharges that come from sewage treatment plants.

Wildlife, including insects, rodents, reptiles, and birds, can carry diseases. Since these are found even in the most pristine environments, absolute protection of water is difficult and minimisation of potential contamination by wildlife should be the goal.

It is generally believed that ground water is less likely than surface water to be contaminated with pathogens since ground water generally loses much of its bacterial and organic content after filtration though rock and clay layers. The bacterial content of ground water may vary from a few to a few hundred organisms per millilitre. However, under certain conditions, such as with shallow, old, or improperly constructed wells, the potential for contamination of ground water by surface water is a great risk.

♦ Hazards Introduced by Irrigation Practices

Irrigation is the controlled application of water to the land or field with the purpose of providing the moisture levels required for the appropriate development of the plant. Irrigation plays a major role in achieving cultivable lands, especially in arid and semi-arid regions.

The hazards associated with irrigation practices are influenced by:

- Water source and quality
- Amount of water applied
- Irrigation program
- Irrigation method
- Soil drainage properties
- Pre-harvest interval

The closer to harvest irrigation occurs, the greater the chance for survival of pathogens and for the presence of residual chemicals on the produce. Irrigation methods, such as drip irrigation, where the contact between water and plant is minimised, are generally less likely to cause fresh produce contamination, however, the use of good quality water is still important.

♦ Chemigation

Chemigation refers to the application of chemicals, such as fertilisers or pesticides, through the irrigation system. In crop production, fertilisers are often applied in this way, and this is referred to as **fertigation**.

When chemigation systems are not properly designed, they can result in serious ground water contamination, increasing the risk of chemical contamination of fresh produce. Safety equipment is available that can prevent back-flow and subsequent groundwater contamination. This equipment is relatively inexpensive and can prevent serious hazards.

In the case of fertilisers, it important to know the plant toxicity of the specific fertiliser and to pay close attention to calculated and recommended dosage rates and schedules of application.

Additional safeguards against contamination during chemigation include training and certification of applicators and water analysis at the source and at locations near the water source. In addition, it is important to identify the runoff direction if runoff takes place.

In the case of fertilisers, it important to know the plant toxicity of the specific fertiliser and to pay close attention to calculated and recommended dosage rates and schedules of application.

- Agricultural Water Microbiological Testing Procedures

Microbiological analyses are generally performed as indicators of contamination, especially for the verification of cleaning programs for tanks, wells, or when contamination from a specific source or event is suspected. They are time-consuming and are used to track safety trends, not for daily monitoring activities, and are generally used to verify that the appropriate preventive measures are in place.

Proper records of water microbiological quality are an important good agricultural practice. It is important to document the frequency and results of each water test since changes in results may identify problems.

Testing for specific pathogenic bacteria in water may be inappropriate. They could be present in very small amounts and thus not detected. Furthermore, microbiological characteristics of water can vary considerably depending on such factors as the water source, season, and sampling time. Since waterborne disease is usually the result of faecal contamination of water supplies, it is more efficient to determine if faecal contamination is present than to actually look for the presence of pathogens.

Implementation of Soil and Water Conservation Principles – Organic Fertilisers

Good agricultural practices prescribe the use of soil and water conservation practices, such as channel construction, drain control structures, diversion tanks and vegetative barriers and so on, which act as physical barriers in the event of a contaminated water runoff.

A very important aspect of soil and water conservation is the management of fertilisers that are applied to the soil.

Animal manure and solid biological waste may provide safe, effective fertiliser when properly treated. If the treatment is inadequate, or if no treatment is used, the risk of contamination of fruit and vegetables with pathogenic micro-organisms is extremely high. The rate of survival of contaminants in manure and their transfer

to crops depends on a number of factors. These include soil type, manure application rate, soil pH, composting method, and time of application.

Raw materials commonly used for the production of organic fertilisers include:

- Animal manure
- Post-harvest material
- Organic waste
- Bio-solids / sludge (human waste)

Implementation of Soil and Water Conservation Principles – Inorganic Fertilisers

Inorganic fertilisers are produced through commercial chemical processes. Although the products themselves are generally not a source of microbial contamination, care should be taken to assure that contamination is not introduced through the use of contaminated water to mix the products or unclean equipment used in their application.

Many inorganic fertilisers may cause residues which are unacceptable for export requirements of certain markets. It is therefore very important to keep accurate fertilisation records in order to complete the cycle of traceability as well as to implement the relevant good agricultural practices.

Animal Exclusion from Production Areas

All animals including mammals, birds, reptiles and insects are considered vehicles for contamination with pathogenic organisms. A large number of micro-organisms can be found on the surface of animals' hair, feathers, hide, and skins, and in their respiratory and gastrointestinal systems.

In addition to food-borne pathogens, animals can carry many spoilage micro-organisms, which can greatly reduce the quality and shelf-life of fresh produce. Quality deterioration also can be accelerated by physical damage to the surface of the fruit caused by animals, birds and insects. In addition to lowering quality, the wounded surfaces become an open door to pathogenic and spoilage organisms, greatly increasing the risk of contamination of the internal parts of the produce.

♦ Methods for Keeping Animals Out of Production Areas

Maintain domestic and farm animals away from the fruit orchards and establish physical barriers or vegetation to prevent entry of wild animals. These precautions are especially important near harvest time.

Field workers should not be allowed to bring dogs, cats or other domestic animals into the field, packaging areas or storage facilities.

Dead or trapped animals such as birds, insects, and rats, should be disposed of promptly to avoid attracting other animals. Proper disposal procedures are to bury or incinerate the animal.

- Cleaning Surrounding Areas

  It is important to keep areas around the orchards clean and neat to further protect the plants and fruit. The following general guidelines should be adhered to:

  - Keep the grass short to avoid the presence of rats, reptiles and other pests.
  - Keep all areas free of garbage.
  - Remove all unnecessary equipment. Old and broken equipment provide protection for rats and insects.
  - Remove nests from fields and buildings

- Animals and Water

  Since animals are attracted by water, the presence of water in the orchards and in the fruit packing or storage area should be limited to what is needed for specific uses. In the packhouse, surfaces and floors should be kept clean and as dry as possible to avoid water that may promote bacterial and pest growth.

  Water tanks and storage containers should be capped to prevent access to water sources.

Pest Control

- Pest Control in Fresh Produce Operations

  In fresh produce operations, the term pest applies to all organisms that can damage or contaminate fruit and vegetables during field production, packaging, storage and distribution. Insects, micro-organisms, wild animals and weeds, which can also harbour insects, vermin, etc., should all be considered in a pest control program. This program should also extend to the packhouse, storage facilities and vehicles used for transport.

- Common Pest Control Procedures

  Pests can be controlled through a variety of methods. Table 2.1 describes the various pest control methods that are commonly used.

  When selecting a pest control method, choose one that is approved for local, regional and national level use and apply it appropriately.

Method	***Description***
Biological Control	Biological control uses living organisms for pest control. Biological pesticides fall into three major classes, which is: • Microbial pesticides that contain micro-organisms, such as bacteria, fungi, or viruses, that attacks a specific pest. • Plant pesticides that are substances that plants produce from genetic material that has been added to the plant. • Biochemical pesticides that are naturally-occurring substances that control pests by non-toxic mechanisms, for example pheromones. Some plant growth regulators are naturally-occurring bio pesticides. Biological control also includes the release of parasitic and predaceous insects to control insect pests or weed species.
Plant Resistance	Crop plants are bred to produce varieties that resist insects and other pests. Crop plants are also genetically altered to allow them to withstand herbicides so that only weeds are killed when treated with chemical herbicides.
Cultural Control	Cultural methods include crop rotation, soil tillage, the use of trap crops, changing planting or harvesting time, intercropping with other crops or with varieties that repel pests.
Mechanical and Physical Control	Mechanical and physical methods refer to techniques such as collecting pests with traps, suction devices or by hand, or such as using fire, heat, cold, sound, or physical barriers or screens.
Chemical Control	Chemical control methods make use of conventional pesticides, which are synthetic chemicals that are intended to prevent, destroy, repel or mitigate any pest.
Integrated Pest Management (IPM)	IPM is a pest management approach that uses all available pest control methods, including the judicious use of pesticides, to optimise a crop's ability to resist the pest with the least hazard to humans and the environment. Integrated pest management supports the control of pests through methods that are less dependent on chemicals. In recent years, consumers of fresh produce are becoming more aware of the chemicals that are applied to fresh produce and the demand is therefore for a more integrated pest control strategy.

Pest control programs should include a series of scheduled inspections to identify situations that can encourage the introduction of pests, identify the presence of pests and quantify their number.

♦ Pesticides

Pesticides are toxic chemicals that are used to protect crops, to control household pests and nuisance insects, and to eliminate vectors of human and animal diseases. Vectors are organisms that carry pathogens from one host to another.

Classes of pesticides are commonly named after the pests that they help to control, for instance insecticides control insects, herbicides control weeds, fungicides control fungi, and rodenticides control rodents.

Since pesticides can be extremely harmful, they should be applied, handled and stored in accordance with the instructions given on the label or on the manufacturer's safety data sheet for the product. Because of the potential health hazards associated with pesticides, application rates should be controlled to limit the amount of residues on produce and only pesticides approved for use on a specific product or in food processing facilities should be used.

Registration of a pesticide is a scientific, legal and administrative process to enable authorities to control quality, use levels, labeling, packaging and advertising. Data required for registration of a product include its chemical and physical properties, effectiveness, toxicity for assessment of human health hazards and a prediction of the environmental effects that it may have.

Pesticides should be used only when needed and only in the amounts that will adequately control pests. Minimising the amount of pesticide used reduces costs and helps to protect the environment. The pesticide label is the ultimate source of information for determining the proper application rates for a specific pesticide.

It is recommended that growers document and verify that the pesticides used come from certified distributors, and that competent authorities approved their usage.

- Pesticide Handling

Pesticide handling should be controlled through every phase, from acquisition through storage to use in the fields. It is very important that the persons in charge of handling these products are aware of the possible danger that they hold, and follow the instructions printed on the label or on the information page that usually accompanies the product.

- Pesticide Application

The instructions for application of a particular pesticide should be read carefully before using the product. Information such as restrictions for its use, application rates, approved doses, number of applications and minimal intervals between applications should be carefully considered.

Pesticides are supplied in liquid, solid, or gaseous forms. It is important to follow label instructions for the mixing, loading and handling of the specific pesticide being used and the actual conditions of use. The amount of pesticide concentrate needed to treat a specific site should be carefully calculated. The water used to prepare pesticides should be free of pathogenic organisms.

Special attention should be paid to spray equipment, pumps and nozzles used to apply pesticides. To minimise the potential for over or under treatment, accidents and spills, they should be calibrated for accuracy and checked frequently for malfunctions. Spray equipment should be regularly washed to prevent possible contamination of fruits or vegetables with compounds not authorised for that commodity and to avoid accidental overdosing.

Warning signs should be posted on fields that have recently been treated with pesticides to prevent workers or visitors from inadvertently coming in contact with treatment chemicals. Such signs should only be removed after the established re-entry period into the field has passed so that residual levels are at an acceptable level.

- Pesticide Storage

  The amount of pesticide on hand should be kept to a minimum by buying only what is needed for the season or for the specific application.

  The pesticide storage facility should:

  - Be properly identified and signposted
  - Be away from animal shelters, human habitations and all water sources
  - Have a concrete floor to facilitate clean up in the event of a spill or leak

- Pesticide Residues

  High levels of pesticide residues on crops may be a hazard to humans who eat the produce. To regulate pesticide residues, a legal limit known as the maximum residue limit (MRL) is developed for each pesticide. The MRL is the maximum level of residue of a chemical substance that is legally permitted to remain in or on a crop when sold. This limit is used to provide reasonable assurance that the consumer will suffer no adverse effects from consuming the product, even over a lifetime of exposure.

  Although strict adherence to MRLs might not be feasible for some countries because of economic constraints, those countries relying on food export profits should monitor for and comply with these MRL levels in order to maintain credibility as responsible exporters.

  The Citrus Growers' Association of Southern Africa publishes and updates a document called **The Recommended Usage Restrictions for Plant Protection Products**. This document indicates the MRL for all plant protection products that is registered for use on in South Africa, and the withholding period for each product. The withholding period is the length of time before the fruit is harvested that the product must not be applied in order to ensure that the residue levels will be within the acceptable range when the fruit is harvested. Although this will give a good guideline to all fresh fruit the specific regulations need to be obtained for a specific fruit.

  If the guidelines contained in this document are strictly adhered to and the pesticides are applied in the correct dosages, the risk of exceeding MRLs is limited.

- Pesticide Disposal

  Instructions and restrictions on pesticide disposal are available from the product's manufacturer and may also be established by local environmental regulations.

  Empty pesticide containers should be washed multiple times and taken to an appropriate place for disposal. Empty, properly rinsed containers can be disposed of at most sanitary landfills. In view of the persistent, volatile nature of many pesticides, disposal by burning or burying on the farm is discouraged. Never dispose of pesticides or pesticide containers in unused wells or near water sources.

  Excess spray and rinse water from cleaning of equipment can be sprayed on sites or crops listed on the label.

- Training and Documentation

  Records of training for the proper handling and application of pesticides should include:

  - Employee's name
  - Experience or employment date
  - Position or job performed by the employee
  - Date of training
  - Training topics
  - The institution responsible for training and instruction records or certificates
  - Signature of trainer

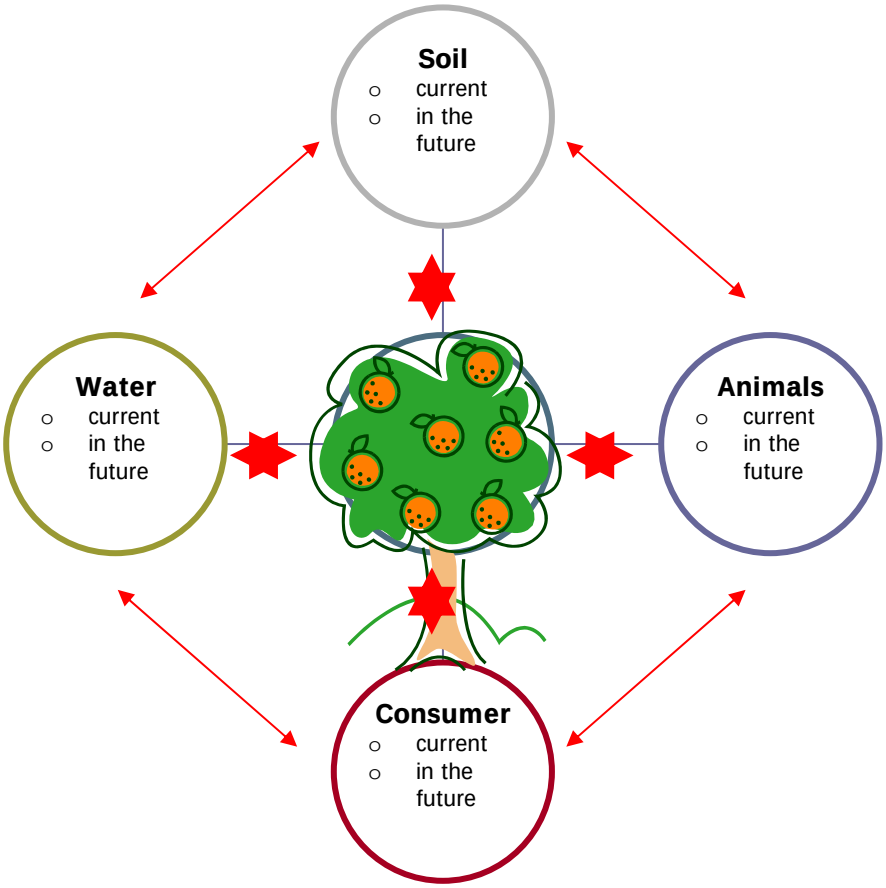
  Pesticide records must contain information on:

  - Crop data (variety, planting date, etc.)
  - Name of pesticides used
  - Place of application
  - Dosage
  - Application dates
  - Time period before harvest
  - Name of the person responsible for the application
  - Date of last equipment calibration

ACTIVITY

Please complete Activity **6.**

Look at the diagram below and summarise what you understand this diagram to mean in terms of the flow process of Good Agricultural Practices



Worker Health and Safety

♦ Relationship between Worker Health and Hygiene

Assuring worker health both increases worker productivity and aids in preventing potential microbial contamination of crops. An infected employee, whether he / she is showing symptoms or not, can easily contaminate fresh produce if they do not practice good hygiene, such as washing their hands after sneezing, touching hair or other body parts, or using the restroom.

General symptoms that flag an employee with the potential for causing microbial contamination of produce include:

- Diarrhoea
- Vomiting
- Dizziness
- Abdominal cramps
- Exposed or open wounds
- Hepatitis or jaundice (yellow colour of the skin)

Employees with gastrointestinal distress or open wounds can contaminate fresh fruits and vegetables through handling. Persons that do not show any symptoms of disease can transmit microbial pathogens. Many micro-organisms can be guests in the human body without evidence of disease and can be spread to others by the human hosts.

Workers should be trained to report any disease symptoms to supervisors.

Sick employees should not participate in activities that involve direct contact with the fresh produce or with packaging material until they have clearance from a licensed healthcare provider.

♦ Health Programs

Ideally, agricultural workers should have access to a health care system that is accessible to them in their workplace. Workers have been shown to be more willing to report symptoms of illness or disease if they have access to healthcare professionals.

Information on and contact details of medical service providers that should be contacted in case of emergency must be prominently displayed.

Any worker with exposed wounds that can directly contaminate fresh produce should have these wounds properly disinfected and covered before participating in production and handling activities. A first aid kit with supplies for treating worker injuries should be readily available at the worksite.

- Worker Hygiene Training Program

  It is also important for employers to provide fruit and vegetable handlers with a training program on good food handling and hygiene practices. The possibility of produce contamination is directly related to the quality of the worker training program.

  Proper hygiene procedures should be established and included in hygiene and health training programs. All employees including supervisors, temporary personnel, part-time and full-time workers should participate in these activities. The level of knowledge required should be set according to the type of operation, responsibilities and type of activities in which the employee participates.

  Training should be reinforced constantly. Demonstrations of procedures are usually more effective than simple verbal instructions. Training should be in the language and dialect of the employees to ensure comprehension and trainers should consider cultural aversions and ingrained practices when planning training.

- Drinking Water

  Water for human consumption should be potable, which means that it should be free of micro-organisms and chemical substances that can jeopardise the health of the person consuming it. Ensuring the availability of potable drinking water for field workers can minimise the risk of them developing disease and consequently contaminating fresh produce.

  Precautions that should be taken for the handling of drinking water in the fields and packing areas include:

  - Water supply systems should be in good condition and operating properly
  - Water should be stored in clean, sanitised containers and tanks
  - Water containers should be washed and sanitised on a daily basis
  - Water storage containers should be closed at all times
  - Containers should be kept out of the sun and away from excessive heat
  - Disposable cups should be provided and each person should use a different cup

  Frequent microbiological and physical evaluation should be performed on drinking water when the water is being stored or treated on site. Simple evaluations of the colour, odour and taste of water should be performed as part of the daily monitoring procedures.

  If any of the water quality tests indicate the quality is not adequate, the water should be replaced to reduce the chances of infection and the proper authorities should be notified of the problem.

- Worker Hygiene Practices and Sanitation Facilities

  The responsibility for reducing or avoiding contamination during primary production falls heavily on agricultural workers. Employers can provide training and other resources to educate workers, but the effectiveness of the program, in the end, relies on the worker's understanding and implementation of personal hygiene and safety practices.

  Therefore, management should provide workers with information about acceptable hygiene practices, ensure it is understood, and send a clear signal to workers about the importance of these practices.

- Hand washing is required:

  - At the beginning of the work day
  - After going to the restroom
  - After smoking or eating
  - After breaks
  - After sneezing, coughing or touching the nose
  - After touching or scratching the skin or wounds
  - After touching dirty equipment and utensils
  - After touching trash on the floor or after handling waste material
  - After touching or handling fertilisers, pesticides, chemicals or cleaning materials

- Sanitary Field Stations

  The basic requirements for sanitary field stations are:

  - Toilets should be connected to an evacuation or sewage system adequately constructed to avoid contamination of fields, water sources or product.
  - Sanitary stations should be in good, clean and sanitary, and should have adequate clean water, soap and paper towels.
  - There should be an adequate number of toilets for the number of employees working. It is recommended that there be at least one toilet for every 20 persons of the same gender.
  - Toilets should be accessible for the personnel, meaning close to their working area, at a maximum distance of 400 meters or a 5 minute walk.
  - Toilet facilities should be separated by at least 400 meters from the water sources.
  - Water stations with potable water for drinking should be in place during the harvest season.

Safety Hazards Associated with Harvesting

Most fresh fruits and vegetables are extremely perishable. The safety and quality of the produce when it reaches the retail market is strongly influenced by the safety and quality of the produce at harvest. Additional factors that affect safety and quality of fresh produce at market include handling, storage temperature, transportation conditions, and the time period between harvest and consumption.

Maintaining safe, high quality produce with an adequate shelf-life depends on both the pre-harvest factors discussed earlier and the control measures taken throughout the distribution chain. This chain begins with harvesting the produce.

The choice of harvesting method depends on the produce characteristics. Mechanical harvesting is recommended for produce that can withstand physical handling. For commodities destined for the fresh market, integrity and appearance are important, and manual harvesting is therefore widely used. Most fruit is almost exclusively harvested manually.

With manual harvest, worker hygiene is especially important since there is a great deal of hand contact with the product that could lead to contamination. Proper sanitation of harvest tools is also critical to product safety.

- Physical Damage

  Physical damage caused during harvesting may lead to:

  - Water loss
  - Increased respiration rate
  - Initiation of ethylene synthesis
  - Fruit discolouration
  - Penetration of micro-organisms

- In-Field Packaging Operations

  The following is recommended for products packed in the production field:

  - All workers involved in field packing operations must follow good hygiene and sanitation practices.
  - Avoid the direct contact of packages, containers or products with the soil.
  - All containers, baskets or empty boxes should be clean and free from visible signs of dirt, oil, grease and chemical contaminants.
  - Packing containers should be stored in a clean dry place away from the field and should be transported and handled with the same sanitary considerations

Post-Harvest Treatments

♦ Post-Harvest Water Quality

Water is a key to a number of post-harvest operations. It is used in dump tanks to reduce physical injury as bins or picking trailers are emptied onto a packing line. It may be used for rinsing at any point on a packing line. It is needed for mixing solutions of waxes and fungicides. Hot water treatment is also used as a quarantine measure for pest control.

Water quality is important in reducing contamination during post-harvest cooling, washing and sanitising operations. The water used for post-harvest operations should be potable and free of disease-causing organisms. Water taken and used directly from rivers or holding ponds should not be used for post-harvest washing or cooling.

Practices that are used to reduce the risk of contamination of produce by post-harvest processing water are as follows:

- Perform periodic water sampling and microbial testing
- Follow appropriate guidelines for pack house water sanitation
- Change water as necessary to maintain sanitary conditions
- Clean and sanitise water contact surfaces, such as dump tanks and wash tanks
- Install backflow devices and legal air gaps to prevent contamination of clean water with potentially contaminated water
- Routinely inspect and maintain equipment designed to assist in maintaining water quality, such as chlorine injectors, filtration systems, and backflow devices

♦ Cooling Considerations

Immediately after harvest the temperature of the fresh produce is high. To extend the shelf-life and quality of fresh fruits and vegetables, products are generally cooled within 24 hours after harvesting. Heat elimination is commonly applied to highly perishable commodities such as fruits.

There are many different types of cooling systems available. Methods that are commonly used to cool fresh produce include:

- **Room cooling**
- **Forced air cooling**
- **Hydro-cooling**
- **Package icing**
- **Vacuum cooling**

Of the commonly used commercial cooling methods, the ones using air and vacuum present the lowest risk for contamination. However, the air introduced in the cooling systems can represent a potential microbial hazard. Micro-organisms found in dust and tiny water droplets can be introduced onto product using these cooling systems. Such micro-organisms can come from outside dust, soil, equipment, and waste products. These micro organisms cannot develop in the air, but air can serve as the vehicle through which they can reach the product.

Cooling methods using water and ice as the cooling mediums have the greatest potential for contamination of fruits and vegetables. Water and ice used for cooling operations are potential contamination sources. Water used in hydro-cooling systems and for ice making should be potable and ice should be made and held under sanitary conditions.

Please complete Activity 7.

Research and Discover

Conduct research regarding the following factors that should be considered in the management of Good Agricultural Practices, based on information from the farm where you are completing your practical duties:

Factors	Your findings	Your findings and recommendations pertaining to the implementation, management and maintenance surrounding Good Agricultural Practices (GAPs)
Soil		
Cultivated Land Information		
Current or Prior Use of Adjacent Land		
Water Resources and Irrigation Practices		
Potential Produce Contamination Associated with Water Sources		
Hazards Introduced by Irrigation Practices		

Water Resources and Irrigation Practices		
Guard against hazards Introduced by Irrigation Practices by managing hazards associated with irrigation practices		
Chemigation		
Agricultural Water Microbiological Testing Procedures		
Implementation of Soil and Water Conservation Principles		
Organic Fertilizers		
Hazards Associated with Animal Manure		
Treatments to Reduce the Risks		
Good Agricultural Practices in the Management of Organic Fertilizers		
Hazards Associated with Manure Treatment and Storage Location		
Precautions for the Application of Organic Fertilizers (Not recommended for Citrus Crops due to the adverse influence on colour development of fruit).		
Keeping complete records of organic fertilizer preparation and use is part of a Good Agricultural Practices program.		

Inorganic Fertilization		
Keeping complete records of Inorganic Fertilization Programs		
Animal Exclusion from production areas		
Methods for Keeping Animals Out of Production Areas		
Cleaning Considerations for Surrounding Areas		
Animals and Water		
Pest Control		
Pest Control in Fresh Produce Operations		
Common Pest Control Procedures		
Pesticides		
Pesticide Handling		
Pesticide Application in the Field		
Pesticide Storage		
Pesticide Residues		
Pesticide Disposal		
Training and Documentation		
Worker Health and Safety		
Relationship between Worker Health and Hygiene		
Relationship between Worker Health and Hygiene		
Health Programs		
Worker Hygiene Training Program		

Worker Health and Safety		
Drinking Water		
Precautions for handling drinking water in the fields and packing areas		
Frequent microbiological and physical evaluation should be performed on drinking water when the water is being stored or treated on site.		
Worker Hygiene Practices and Sanitation Facilities		
Hand washing and hand-washing facilities		
Basic requirements for- and placement of sanitary field stations		
Safety Hazards Associated with Harvesting		
Physical damage caused by mechanical and / or manual harvesting methods		
In-field Packaging Operations		
Post-Harvest Water Quality		
Practices to reduce the risk of contamination of produce by post harvest processing water.		
Cooling Considerations		
Eliminating Field Heat		
Common Cooling Media for Fresh Produce		
Hazards Associated with Air Cooling Methods		
Hazards Associated with Water and Ice Cooling Methods		

Safety Hazards Associated with Harvesting (Cont.)		
Important Considerations Regarding Water Temperature and Microbial Infiltration		
Common Cooling Methods for Fresh Produce		
Safety Hazards Associated with Post-Harvest treatments and handling		

Concept (SO 2)	I understand this concept	Questions that I still would like to ask
Concepts of good manufacturing practices in the agricultural food chain are described.		
The complimentary nature of these regulatory processes and how it impacts on the management of the agricultural enterprise are described.		
The management and maintenance of above processes are explained.		
The flow of the process to achieve the goals is illustrated.		

My Notes ...

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Session 3

Non-Conformances and the effect thereof on quality of the product

After completing this session, you should be able to:
SO 3: Take decisions on reported non-conformances in respect of food safety, production, environmental, and social practices and implement corrective action in the agricultural environment.

In this session we explore the following concepts:

- Non-Conformance

3.1 Introduction

Now that we have examined traceability through effective recordkeeping, and considerations regarding the management and maintenance of Good Agricultural Practices, it is important to examine the implications of non-conformance and explore possibilities for corrective actions.

In the context of food safety management systems, the term “non-conformance” is used not only to describe products that are potentially unsafe because is deviates from set standards, but also to describe the processes and procedures that were deviated from in the first place and caused the deviation in the product.

A food safety management system is designed to consistently produce products that adhere to certain quality and safety standards. The system should be such that as long as all prescribed policies and procedures are adhered to the product is virtually guaranteed to be safe and of good quality.

Assuming that the food safety management system adheres to these requirements, it follows that only non-conformance or non-compliance to the prescribed policies and procedures can result in a product that does not conform to quality and safety standards, because it was produced or manufactured during a period when critical limits were violated or exceeded, or when an organisation has lost control of a prerequisite program (PRP) or an operational prerequisite program (OPRP).

3.2 The Impact of Non-Conformance

Non-conformance to food safety procedures may compromise product quality by causing blemishing, contamination, accelerated decay, or exceeding of maximum residue levels, which would render it unsafe for human consumption or unsuitable for meeting specifications of export markets.

Many export or local contracts are based on the assurance provided by the implementation of and management according to a food safety management systems and adherence to Good Agricultural Practices. The buyer of fresh produce would not be satisfied with a product that does not conform to the standards and specifications. Additionally, it would raise concerns for the buyer if they find repeated instances of non-conformance to the plan.

Regulations of importing countries allow for fruit that do not conform to quality and safety standards to be quarantined and such fruit cannot be sold in that market.

Please complete Activity **8.**

Walk – about

Do a walk-about on your own farm, and identify at least two areas where possible non-conformance to the implemented Food Safety Management System's Protocols and Procedures may potentially occur, and what corrective actions may be applicable.

Stage of process	*Potential Hazards*	*Yes / No*	*Hazard Description*	*Control Measures*	*CCP or CP*	*Critical Limits*	*Monitoring Process*	*Corrective Action*	*Records*

Stage of process	*Potential Hazards*	*Yes / No*	*Hazard Description*	*Control Measures*	*CCP or CP*	*Critical Limits*	*Monitoring Process*	*Corrective Action*	*Records*

3.3 The Role of Traceability and recordkeeping in identifying Non-Conformance

The purpose of traceability and associated recordkeeping was discussed in detail both in the level 3 guide and in Chapter 1 of this guide. As part of the food safety management system, data and records associated with traceability are analysed and interpreted in order to identify instances of non-conformance.

This is done both on an ongoing basis, where the records that relate specifically to identified risk areas, or critical control points, are monitored to ensure that critical limits are maintained. If critical limits are exceeded at any critical control point, the planned corrective action must be taken immediately to eliminate or control the non-conformance.

Records related to traceability is also useful in determining the point at which non-conformance occurred if it is found that the end-product does not conform to safety and quality standards. Because traceability records are designed to provide a complete picture of the process to which the fruit was subject, the point at which the critical limits were exceeded can be identified if non-con-forming fruit is found.

Non-Conformance and Recordkeeping

In 2006, a consignment of fruit was found on arrival in Japan to exceed maximum residue levels. The consignment consisted of 4,000 pallets of fruit. The procedure in such a case prescribes that the entire consignment is rejected until it can be proven that not all the fruit was subjected to the same processes. Because the grower had sound traceability records, he could prove that most of the fruit were not subject to processes where the critical limits were exceeded. The non-confirming fruit was accurately identified and the remainder passed inspection.

3.4 Validation and verification

Validation is a process that is used to ensure that food safety control measures are capable of being effective. The validation process uses evidence to determine whether control measures are capable of controlling food safety hazards and ensuring that products are safe.

Control measures are implemented and managed using operational prerequisite programs (OPRPs) and HACCP plans, and must be validated before they are implemented.

Verification is a process that uses objective evidence to confirm that specified requirements have been met. In the context of most food safety standards, you are expected to verify that your food safety management system has been implemented. You are expected to do at least the following:

- Verify that your Prerequisite programs (PRPs) have been implemented.
- Verify that hazard analysis inputs are updated.
- Verify that your hazard levels are acceptable.
- Verify that Operational prerequisite programs (OPRPs) are implemented and effective.
- Verify that HACCP plan is implemented and effective.
- Verify that procedures are implemented and effective.

3.5 Corrective Actions

Corrective actions are steps that are taken to eliminate the causes of an existing nonconformity. The corrective action process includes causal analysis and is designed to prevent recurrence.

It is difficult to quantify or prescribe corrective actions, as the options would be related directly to the food safety management system and identified deviation or non-conformance. The scope of the corrective actions is also directly related to the class and grade of fruit to be produced and the market for which it is destined.

Planned corrective actions are described in the Quality Management Standard Operations Procedure Manual or in the Standard Operating Procedures manual for the food safety management system. The development of such prescribed corrective actions relates directly to HACCP step 5.

The following principles are applied in terms of taking corrective actions:

- Early identification of the problem through prescribed and regular analysis and interpretation reports
- Open and honest channels of communication regarding the occurrence of non-conformance to avoid health risks to the consumer and limit liability to the grower and its agents
- Rapid and coordinated response to the problem, for example quarantine any affected produce immediately or suspend procedures that caused the problem
- Investigation and confirmation of non-conformance as measured against the critical control points identified in the food safety management system
- Confirmation and identification of source(s) of the non-conformance or non-conforming product(s) by measuring against critical limits
- Take decisive action to prevent future non-conformance instances or the production of similar non-conforming produce

Concept (SO 3)	I understand this concept	Questions that I still would like to ask
Examples of non-conformances and the effect thereof on quality of the product are described.		
The role of traceability and record keeping system in the identification of non-conformances are described.		
The effect of non-conformances is identified and explained.		
Different types of corrective action are described and implemented.		

My Notes ...

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Session 4 Conduct Internal Audits

After completing this session, you should be able to:
SO 4: Conduct internal audits according to the specifications of the trade/market in the agricultural environment.

In this session we explore the following concepts:

- An Audit System

4.1 Introduction

The International Organisation for Standardisation (ISO) describes audits as follows: a systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

The documented food safety management system on a farm can be of the highest quality, but if it is not implemented correctly and consistently and if its prescriptions and procedures are not followed, it is of no real value at all.

Internal audits are used to monitor and probe the integrity of the food safety management system continuously and to thereby ensure that it is implemented as prescribed. The internal auditor conducts regulatory system audits to verify that an establishment's food safety management system, such as the HACCP system and its prerequisite programs, HACCP plans and reassessment procedures, is implemented as described and is continuously effective.

4.2 Elements of Internal Audit System

An organisation's approach to internal audits consists of the policies and procedures that govern its internal audit functions, including auditing schedules. There are no hard and fast rules that prescribe exactly how internal audit systems for food safety should be designed and executed and the approach to conducting an internal audit is often closely related to the quality management system.

There are certain common elements that occur in all internal audit systems, being:

- An audit charter
- Risk assessment process
- An audit plan
- An audit cycle
- Audit work programs
- Audit reports
- Requirements for audit documentation
- Follow-up processes
- Professional development programs

Audit Charter

A mission statement or audit charter outlines the purpose, objectives, organisation, authorities, and responsibilities of the internal auditor, audit staff, audit management, and the audit committee.

Risk Assessment Process

A risk assessment process describes and analyses the risks inherent in a given line of business. The level of risk should be one of the most significant factors considered when determining the frequency of audits.

Auditors should update the risk assessment at least annually, or more frequently if necessary, to reflect changes to internal control or work processes, and to incorporate new lines of business.

Audit Cycle

An audit cycle identifies the frequency of audits. Auditors usually determine the frequency by performing a risk assessment, as noted above, of areas to be audited. While staff and time availability may influence the audit cycle, they should not be overriding factors in reducing the frequency of audits for high-risk areas.

Audit Plan

The audit plan details the internal audit budgeting and planning processes. The plan describes audit goals, schedules, staffing needs, and reporting.

The audit plan should cover at least 12 months and should be developed by combining the results of the risk assessment and the resources required to result in the timing and frequency of the planned audit cycle.

The audit committee should formally approve the audit plan annually, or review it annually in the case of multi-year audit plans. The internal auditors should report the status of planned versus actual audits, and any changes to the annual audit plan, to the audit committee for its approval on a periodic basis.

- **Audit Work Programs**

  Audit work programs that set out for each audit area the required scope and resources, including the selection of audit procedures, the extent of testing, and the basis for conclusions. Well-planned, properly structured audit programs are essential to strong risk management and to the development of comprehensive internal control systems.

- **Audit Reports**

  Written audit reports inform the board and management of individual department or division compliance with policies and procedures. These reports should state whether operating processes and internal controls are effective, and describe deficiencies as well as suggested corrective actions.

  The audit manager should consider implementing an audit rating system approved by the audit committee. The rating system facilitates conveying to the board a consistent and concise assessment of the net risk posed by the area or function audited.

- **Requirements for Audit Documentation**

  The requirements for audit work paper documentation should be clearly described in the audit policies and procedures, including work paper retention policies. This ensures clear support for all audit findings and work performed.

- **Follow-Up Processes**

  Follow-up processes require internal auditors to determine the disposition of any agreed-upon actions to correct significant deficiencies.

- **Professional Development Programs**

  Professional development programs must be in place for the institution's audit staff to maintain the necessary technical expertise.

4.3 Pre-Harvest Internal Audits

A pre-harvest internal audit on a fruit farm is normally conducted as a single audit, usually in the following sequence:

- Chemical storage
- Fertilisers
- Water and irrigation
- Waste disposal and pollution
- Transport from orchard
- Machinery and equipment maintenance

- Personal hygiene
- Training

Below are examples of internal audit documents for each of these points. Please note that these are examples only and that the work papers used on specific farms will depend on the risk assessment and circumstances on that farm.

♦ Chemical Storage

Internal Audit – Food Safety

Chemical Storage			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

	Question	***Y/N***	***Defects***
1.	Are there sufficient warning signs?		
2.	Are there signs for no smoking, eating or drinking?		
3.	Is the storage area always locked?		
4.	Is there a safety gate to the storage facility?		
5.	Are only authorised personnel allowed in the storage area?		
6.	Are there hand washing and showing facilities?		
7.	Are clothing stored separately?		
8.	Is the ventilation adequate?		
9.	Is non-absorbent shelving used?		
10.	Are the powders stacked above the liquids?		
11.	Are the chemical stored in their original containers?		
12.	Is there emergency procedures?		
13.	Is there a pail with sand to clear up spillages?		
14.	Are agrochemicals transported in a safe and secure manner?		
15.	Is there a system in place for the disposal of wastewater?		
16.	Is all documentation up to date?		
17.	Are MRL lists and safety data sheets present and accessible?		
18.	Is the yearly residue analysis available?		

Corrective Action	*Person*	*Target Date*	*Completion Date*	*Signature*	*Verify (Date and Signature)*

- Fertilisers

Internal Audit – Food Safety

Fertilisers			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

Question	*Y/N*	*Defects*
1. Are inorganic fertilisers stored at least 10m from ditches, water courses and other water sources?		
2. Are there retention walls where inorganic fertilisers are stored?		
3. Are all concentrated fertilisers stored under cover?		
4. Are all hazardous and risk areas sign-posted?		
5. Are the personnel trained in the handling of fertilisers?		
6. Are documentation, records, and safety data sheets up to date?		

Corrective Action	*Person*	*Target Date*	*Completion Date*	*Signature*	*Verify (Date and Signature)*

- Water and Irrigation

Internal Audit – Food Safety

Water and Irrigation			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

Question	***Y/N***	***Defects***
1. Have no untreated sewage water been used for irrigation?		
2. Have records been kept of the water volumes deposited during irrigation?		
3. Have routine water analysis been taken of water used from water sources where there is a potential pollution risk?		
4. Have an annual risk assessment for water pollution been completed?		

Corrective Action	***Person***	***Target Date***	***Completion Date***	***Signature***	***Verify (Date and Signature)***

- Waste Disposal and Pollution

Internal Audit – Food Safety

Waste Disposal and Pollution			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

Question	***Y/N***	***Defects***
1. Are there procedures and facilities in place for storage and disposal of hazardous materials?		
2. Is suitable provision made for the removal of waste?		
3. Is waste stored in suitable containers with lids in the orchard?		
4. Are there any indications that the production practices may cause pollution?		

Corrective Action	*Person*	*Target Date*	*Completion Date*	*Signature*	*Verify (Date and Signature)*

- Transport from Orchard

Internal Audit – Food Safety

Transport from Orchard			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

Question	*Y/N*	*Defects*
1. Are the vehicles, trailers and crates cleaned regularly?		
2. Are drivers trained to operate vehicles and machinery?		
3. Are drivers instructed to drive at the proper speed through orchards to minimise dust?		

Corrective Action	*Person*	*Target Date*	*Completion Date*	*Signature*	*Verify (Date and Signature)*

- Machinery and Equipment Maintenance

Internal Audit – Food Safety

Machinery and Equipment Maintenance			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

Question	***Y/N***	***Defects***
1. Are all machinery in a good condition and cleaned regularly (spray machines, trailers, herbicides carts, etc.)?		
2. Are all equipment in a good condition and cleaned regularly (pruning sheers, saws, clippers, etc.)?		
3. Are all maintenance records and schedules in place and up to date?		

Corrective Action	***Person***	***Target Date***	***Completion Date***	***Signature***	***Verify (Date and Signature)***

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- Personal Hygiene

Internal Audit – Food Safety

Personal Hygiene			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

	Question	***Y/N***	***Defects***
1.	Do all workers wash their hands before handling fruit and after using the toilet?		
2.	Do all workers have clean protective clothing, head coverings and footwear?		
3.	Is there no spitting, chewing, eating, smoking, drinking, sneezing, and coughing over fruit?		
4.	Is hair clean, tidy and covered?		
5.	Are no personal items taken into the orchard?		
6.	Are all fingernails short and clean, with no nail varnish and no false fingernails?		
7.	Is no jewelery allowed in the orchard?		
8.	Are all cuts and open sores properly dressed with bandage or a plaster?		
9.	Are all serious skin complaints reported to the health worker?		
10.	Are no transferable or infectious disease carriers allowed to work with fruit? (please report)		
11.	Are incidences of transferable or infectious disease carriers reported to the health worker?		
12.	Are all field toilets equipped with soap, water and disposable towels?		
13.	Are all the toilets kept clean and is there a cleaning schedule available?		

Corrective Action	***Person***	***Target Date***	***Completion Date***	***Signature***	***Verify (Date and Signature)***

♦ Training

Internal Audit – Food Safety

Training			
Auditor		**Responsible Person**	
Signature		**Audit Date**	

Question	***Y/N***	***Defects***
1. Are all personnel operating machinery trained and do they have the necessary certificates?		
2. Are all personnel working with plant protection products trained and do they have the necessary certificates?		
3. Are all personnel trained in food hygiene and food safety and do they have the necessary certificates?		
4. Are all personnel trained in personal hygiene?		
5. Are there at least one person trained in First Aid?		
6. Are there in each harvesting team at least one person trained in basic food handling hygiene?		

Corrective Action	***Person***	***Target Date***	***Completion Date***	***Signature***	***Verify (Date and Signature)***

My Notes ...

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Please complete Activity **9.**

Audit Report

Write a report after investigating the internal and external audits that take place where you are completing your practical duties

- Give details of the role that these audits play in ensuring food safety for the produce from your farm
- Draft process flow of how these audits are conducted.
- Explain in your own words how Standard Operating Procedures are integrated into Internal Audit Procedures
- Give examples of at least 5 different areas related to the HACCP plan or the Food Safety Management Plan upon which Internal Audits are performed regularly. Include copies of standard internal audit criteria and/or checklists for the areas discussed as annexures to the report, and note on each how frequently the internal audits are conducted.
- Give a brief overview of how these internal audits are managed throughout the organisation in order to ensure a systematic record keeping system that will form the basis of a sound traceability system
- Draw conclusions regarding the affectivity of the current internal audit system and make recommendations regarding possible improvements that might benefit the organisation.

Concept (SO 4)	I understand this concept	Questions that I still would like to ask
The purpose, importance and effect of an internal audit are explained.		
The procedure of an internal audit is explained.		
An internal audit is performed.		
The management of such a process is explained and how the results assist with improving certain aspects of the agricultural enterprise.		

My Notes ...

Session 5 Maintain Standard Operational Procedures

After completing this session, you should be able to:
SO 5: Maintain standard operational procedures with regard to agro-chemicals, food safety, quality, and production practices, as well as environmental and social awareness within the agricultural supply chain.

In this session we explore the following concepts:

- Standard operating procedures

5.1 Introduction

Standard operating procedures (SOPs) are written documents that describe step-by-step in detail how a procedure should be done. SOPs describe both technical and administrative operational elements of an organisation.

The standard operating procedure manual for food safety is to a large extent the documentation for a food safety management system. The SOPs contained in the manual is used during an internal audit to measure the actual procedures and processes that are employed.

The development and use of SOPs is an integral part of a successful quality management system. It provides individuals with the information to perform a job properly and facilitates consistency in the quality and integrity of a product through consistent implementation of a process or procedure within the organisation.

SOPs can also be used as a part of personnel training programs, since they should provide detailed work instructions. When historical data are being evaluated for current use, SOPs can be valuable for reconstructing project activities. In addition, SOPs are frequently used as checklists by inspectors when auditing procedures.

Ultimately, the benefits of a valid SOP are reduced work effort, along with improved data comparability, credibility, and legal defensibility.

5.2 Drafting Standard Operating Procedures

Standard operating procedures are often compiled into a standard operating procedures manual. The different standard operating procedures in a manual are typically related to managing one specific outcome or objective and are normally related to each other. The SOP manual related to food safety will for instance hold systematic and sequential procedures related to each of the steps that the organisation will follow in order to ensure food safety.

It is important that each producer examines every aspect of the GAP list and associated HAACP plan and draft specific operating procedures that will ensure food safety principles are adhered to in line with his food safety management system.

A SOP manual should be organised to ensure ease and efficiency of use and to be specific to the organisation that develops it. There is no one correct format – internal formatting varies with each organisation and with the type of SOP being written.

A SOP should be written with sufficient detail so that someone with a basic understanding of the field can successfully reproduce the activity or procedure when unsupervised.

SOPs should be written by individuals knowledgeable with the activity and the organisation's internal structure. These individuals are essentially subject-matter experts who actually perform the work or use the process. A team approach can also be followed, especially for multi-tasked processes where the experiences of a number of individuals are critical.

The organisation should have a procedure in place for determining what procedures or processes need to be documented. The first step in an SOP manual is to determine the policies of the organisation regarding:

- Food Safety
- Traceability
- Good Agricultural and Production Practices
- Quality and Quality Management
- Environmental awareness and conservation
- Social awareness

5.3 Validating Reviewing Standard Operating Procedures

SOPs should be reviewed and validated by one or more individuals with appropriate training and experience with the process. It is especially helpful if the draft SOPs are tested by an individual other than the original writer before the SOPs are finalised.

The finalised SOPs should be approved as described in the organisation's quality management plan. Generally, the immediate supervisor, such as a section or branch chief, and the organisation's quality assurance officer review and approve each SOP. Signature approval indicates that a SOP has been both reviewed and approved by management.

SOPs need to remain current. Therefore, whenever procedures are changed, SOPs should be updated and re-approved.

SOPs should be also systematically reviewed on a periodic basis to ensure that the policies and procedures remain current and appropriate, or to determine whether SOPs are even needed. The review date should be added to each SOP that has been reviewed. If a SOP describes a process that is no longer followed, it should be withdrawn from the current file and archived.

The review process should not be overly cumbersome or SOPs will never get reviewed. The frequency of review should be indicated by management in the organisation's quality management plan, which should also indicate the individual(s) responsible for ensuring that SOPs are current.

5.4 Checklists

Many activities use checklists to ensure that steps are followed in order. Checklists are also used to document completed actions. Any checklists or forms that is included as part of an activity should be referenced at the points in the procedure where they are to be used and then attached to the SOP. Remember that the checklist is not the SOP, but a part of the SOP.

In some cases, detailed checklists are prepared specifically for a given activity. In those cases, the SOP should describe, at least generally, how the checklist is to be prepared, or on what it is to be based. Copies of specific checklists should be kept in the file with the activity results or with the SOP.

5.5 Standard Operating Procedure Document Control and Tracking

Each organisation should develop a numbering system to systematically identify and label their SOPs, and the document control should be described in its quality management plan.

Generally, each page of a SOP should have control documentation notation. A short title and identification (ID) number can serve as a reference designation. The revision number and date are very useful in identifying the SOP in use when reviewing historical data and is critical when the need for evidentiary records is involved and when the activity is being reviewed. When the number of pages is indicated, the user can quickly check if the SOP is complete. Generally, this type of document control notation is located in the upper right-hand corner of each document page following the title page.

The organisation should maintain a master list of all SOPs, and this file should minimally include the date of the current version. This list may be used when audits are being considered or when questions are raised as to practices being followed within the organisation.

My Notes ...

Please complete Activity **10.**

Define and explain

For each of the following questions or concepts – Define and explain your understanding of the concept with a practical example as supporting evidence (to be attached to your learner workbook)

1. What do "standard operating procedures" mean in terms of your workplace?

2. How do standard operating procedures contribute to food safety?

3. Describe at least one Standard Operating Procedure that directly affects food safety

4. What is the link between "Quality" and "Food Safety"?

5. How do production practices influence food safety?

6. How does adherence to good environmental practices contribute to food safety?

7. How can social awareness contribute to food safety?

Concept (SO 5)	I understand this concept	Questions that I still would like to ask
Standard operation procedures of the enterprise are explained.		
Related to food safety, quality, production practices, environmental and social awareness within the agricultural supply chain.		
The management of the different aspects of the agricultural enterprise with respect to traceability and regulatory procedures are described.		

My Notes ...

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*

Questions	1. I am sure	2. I am unsure
Based on your practical experience, design a multi-media presentation in which you identify, discuss and explain the impact of non-conformance to the basic regulatory processes on the trade of the product. Make sure that you refer to the following aspects:		
1. Quality attributes that might be compromised by non-conformance (internal, external, hidden.)		
2. Non-conformation that directly causes deterioration/spoilage factors in fruits		

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.

Observations	Answer Yes or No	Motivate your Answer (Give examples, reasons, etc.)
Can you identify problems and deficiencies correctly?		
Are you able to work well in a team?		
Do you work in an organised and systematic way while performing all tasks and tests?		
Are you able to collect the correct and appropriate information and / or samples as per the instructions and procedures that you were taught?		
Are you able to communicate your knowledge orally and in writing, in such a way that you show what knowledge you have gained?		
Can you base your tasks and answers on scientific knowledge that you have learnt?		
Are you able to show and perform the tasks required correctly?		
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?		

- 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 you 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.

Learner Information Form				
Unit Standard	**116278**			
Program Date(s)				
Assessment Date(s)				
Surname				
First Name				
Learner ID / SETA Registration Number				
Job / Role Title				
Home Language				
Gender:	Male:		Female:	
Race:	African:	Coloured:	Indian/Asian:	White:
Employment:	Permanent:		Non-permanent:	
Disabled	Yes:		No:	
Date of Birth				
ID Number				
Contact Telephone Numbers				
Email Address				
Postal Address			Signature:	

Bibliography

Books:

Encyclopaedia Britannica, South African Version

Wikepedia, International Version

Practical Guide To Food Safety Regulation, H.L. Goodwin

Training and Education for Food Safety, S. Mortimore, C. A. Wallace, R. Smith

Pre-harvest and Post-harvest Food Safety: Contemporary Issues and Future Directions, Ross C. Beier, Suresh D. Pillai, Timothy D. Phillips, and Richard L. Ziprin

Integrated Production Guidelines for Export Citrus, Vol. III – Integrated Pest and Disease Management, Citrus Research International

Technical Guide for the Manufacture of Compost, Ballesteros-Sandoval, V., 1999

Guide to Minimise Microbial Food Safety Hazards for Fresh Fruits and Vegetables, U.S. Food and Drug Administration, FDA, 1998

The Preservation of Fruit and Vegetable Food Products, Holdsworth, S.D., 1985

World Wide Web:

www.technifor.com/htm/Tracea/serve.htm

www.world-food.net/scientficjournal/2003/issue1/pdf/Agriculture/V1N1A101-106traceability.pdf

www.nri.org/NRET/SPCDR/Chapter5/quality-5-7.htm

www.jifsan.umd.edu/PDFs/GAPS_English/II__Good_Agricultural_Pract.pdf

www.praxiom.com/iso-22000-intro.htm

www.sunkist.com/growers/ag_practices/SOPs.doc

Terms & Conditions

Acknowledgements

■ **Project Management:**

IMPETUS Consulting and Skills Development

■ **Donors:**

Citrus Academy

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

REGISTERED UNIT STANDARD:

Implement a food safety and quality management system in the agricultural supply chain

SAQA US ID	UNIT STANDARD TITLE		
116278	Implement a food safety and quality management system in the agricultural supply chain		
SGB NAME		**REGISTERING PROVIDER**	
SGB Primary Agriculture			
FIELD		**SUBFIELD**	
Field 01 - Agriculture and Nature Conservation		Primary Agriculture	
ABET BAND	**UNIT STANDARD TYPE**	**NQF LEVEL**	**CREDITS**
Undefined	Regular	Level 4	3
REGISTRATION STATUS	**REGISTRATION START DATE**	**REGISTRATION END DATE**	**SAQA DECISION NUMBER**
Registered	2004-10-13	2007-10-13	SAQA 0156/04

PURPOSE OF THE UNIT STANDARD

A learner achieving this unit standard will be able to implement a management system related to food safety, production practices, as well demonstrate environmental and social awareness within the agricultural supply chain.

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 food safety principles in primary agriculture.

Competent learners will be fully competent in food safety practices whereby providing the environment for the application of quality practices and thus strengthen agricultural practices in general. 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

It is assumed that a learner attempting this unit standard will show competence against the following unit standards or equivalent:

- NQF 3: Apply of crop protection and animal health products effectively and responsibly.
- NQF 3: Explain store inputs categories, labelling and storage methods.
- NQF 3: Monitor and supervise a food safety and quality management system in the agricultural supply chain.

UNIT STANDARD RANGE

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

N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Manage a traceability system demonstrating operational efficiency in the agricultural supply chain.

OUTCOME RANGE

Traceability system includes but is not limited to a system that allows for problems to be traced back to the points of origin, both pre-harvest and post-harvest.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

The purpose of a traceability system is explained.

ASSESSMENT CRITERION RANGE

In relation to the local agricultural market and international agri-trade.

ASSESSMENT CRITERION 2

Practices, which will support operational efficiency of a traceability system are identified.

ASSESSMENT CRITERION 3

The record keeping which supports a traceability system is explained.

ASSESSMENT CRITERION 4

Evidence of traceability records provided.

SPECIFIC OUTCOME 2

Implement a record system on the farm.

OUTCOME RANGE

A record system includes but is not limited to a manual and electronic system that allows for a paper or electronic trail of activities and management systems on the farm.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

Evidence of good record keeping practices is provided.

ASSESSMENT CRITERION RANGE

Records include but are not limited to production, agrochemicals/ pests and diseases/ fertiliser/ irrigation/ application of chemicals, worker welfare/ safety/ security and training, soil management, soil history.

ASSESSMENT CRITERION 2

Relevant documentation of the different activities of the agricultural enterprise is managed is described and supplied.

ASSESSMENT CRITERION 3

The flow of information is controlled and accessed to ensure effective distribution of information.

ASSESSMENT CRITERION 4

The role of this process and how it complements the traceability process is discussed.

SPECIFIC OUTCOME 3

Manage and maintain good agricultural practices (GAP) associated with good manufacturing practices (GMP), good health practices (GHP), good social practices (GSP) and good environmental practices (GEP).

OUTCOME RANGE

Management and maintenance includes but is not limited to ensuring that the activities of one regulatory process compliments the other.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

Concepts of good manufacturing practices in the agricultural food chain are described.

ASSESSMENT CRITERION 2

The complimentary nature of these regulatory processes and how it impacts on the management of the agricultural enterprise are described.

ASSESSMENT CRITERION 3

The management and maintenance of above processes are explained.

ASSESSMENT CRITERION 4

The flow of the process to achieve the goals is illustrated.

SPECIFIC OUTCOME 4

Take decisions on reported non-conformances in respect of food safety, production, environmental, and social practices and implement corrective action in the agricultural environment.

OUTCOME RANGE

Taking decisions and implementing corrective action includes but is not limited to addressing the problems encountered in order to assist with the implementation of corrective processes in order to achieve the set goals.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

Examples of non-conformances and the effect thereof on quality of the product are described.

ASSESSMENT CRITERION 2

The role of traceability and record keeping system in the identification of non-conformances are described.

ASSESSMENT CRITERION 3

The effect of non-conformances is identified and explained.

ASSESSMENT CRITERION RANGE

- Non-conformances relate to but are not limited to chemical, microbiological and physical contamination.

- Management systems include but are not limited to production, Fertiliser/agrochemical/irrigation, product handling, hygiene and safety, quality, waste and pollution, social and welfare, environment, record keeping.

ASSESSMENT CRITERION 4

Different types of corrective action are described and implemented.

SPECIFIC OUTCOME 5

Conduct internal audits according to the specifications of the trade/market in the agricultural environment.

OUTCOME RANGE

Internal audits include but is not limited to implementing checks and balances that assist the GMP to ensure good agricultural practices in keeping with the rights of the workers and the environment.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

The purpose, importance and effect of an internal audit are explained.

ASSESSMENT CRITERION 2

The procedure of an internal audit is explained.

ASSESSMENT CRITERION RANGE

Within the standard operation procedures of the enterprise.

ASSESSMENT CRITERION 3

An internal audit is performed.

ASSESSMENT CRITERION 4

The management of such a process is explained and how the results assist with improving certain aspects of the agricultural enterprise.

SPECIFIC OUTCOME 6

Maintain standard operational procedures with regard to agro-chemicals, food safety, quality, and production practices, as well as environmental and social awareness within the agricultural supply chain.

OUTCOME RANGE

Standard operational procedures include but are not limited to food safety, quality, production practices, environmental, and social awareness within the agricultural supply chain.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

Standard operation procedures of the enterprise are explained.

ASSESSMENT CRITERION RANGE

Related to food safety, quality, production practices, environmental and social awareness within the agricultural supply chain.

ASSESSMENT CRITERION 2

The management of the different aspects of the agricultural enterprise with respect to traceability and regulatory procedures are described.

ASSESSMENT CRITERION 3

The impact of non-conformance to the basic regulatory processes on the trade of the product is explained and discussed.

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:

- Principles of regulatory and legal aspects with reference to the specific agricultural enterprise.
- A basic understanding of food-borne illnesses.
- A basic knowledge of the Impact of food safety and quality in trade.
- A thorough understanding of contamination risks and preventative measures.
- Contamination risks.
- Contamination preventative measures.
- A basic understanding of risk factors related to food safety.
- Be familiar with the principles of food safety and quality.
- Basic principles of environmental and conservation management.
- Basic principles of waste and pollution management.
- Basic principles of natural resource management.
- Local legislation such as Occupational Health and Safety, Health and Welfare,
- A basic understanding of procedures of internal audits, traceability, and management skills.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Problem solving relates to all specific outcomes.

UNIT STANDARD CCFO WORKING

Teamwork relates to all specific outcomes.

UNIT STANDARD CCFO ORGANIZING

Self-organisation and management relates to all specific outcomes.

UNIT STANDARD CCFO COLLECTING

Interpreting information relates to all specific outcomes.

UNIT STANDARD CCFO COMMUNICATING

Communication relates to all specific outcomes.

UNIT STANDARD CCFO SCIENCE

Use science and technology relates to all specific outcomes.

UNIT STANDARD CCFO DEMONSTRATING

Inter-relatedness of systems relates to all specific outcomes.

UNIT STANDARD CCFO CONTRIBUTING

Self-development relates to all specific outcomes.

UNIT STANDARD ASSESSOR CRITERIA

N/A

UNIT STANDARD NOTES

N/A

QUALIFICATIONS UTILISING THIS UNIT STANDARD:

	ID	QUALIFICATION TITLE	LEVEL	STATUS	END DATE
Core	48979	National Certificate: Animal Production	Level 4	Registered	2007-10-13
Core	49009	National Certificate: Plant Production	Level 4	Registered	2007-10-13