



Citrus Orchard Foreman Occupational Learning

Work Scenario Guide

A5: Fruit Quality Monitoring and Improvement

Qualification:	110667 – Occupational Certificate: Orchard and Vineyard Foreman
Work Scenario:	A5: Fruit Quality Monitoring and Improvement
Learning Area:	A: Take part in the business management of the farming operation
Scenario Description:	To ensure the business is successful, the farm must produce high-quality fruit consistently. To ensure this, you must continuously monitor the quality of your fruit, and, if necessary, take actions to improve it, all while ensuring that the food is safe for customers.

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Alignment Information

Qualification

The content of this learner guide is aligned to the following occupational qualification:

SAQA QUAL ID	Qualification Title			
110667	Occupational Certificate: Orchard and Vineyard Foreman			
Originator				
Development Quality Partner – AgriSETA				
Primary Or Delegated Quality Assurance Functionary			NQF Sub-Framework	
-			OQSF - Occupational Qualifications Sub-Framework	
QUALIFICATION TYPE		FIELD		SUBFIELD
Occupational Certificate		Field 01 - Agriculture and Nature Conservation		Primary Agriculture
Abet Band	Minimum Credits	Pre-2009 NQF Level	NQF Level	Qual Class
Undefined	147	Not Applicable	NQF Level 04	Regular-ELOAC

Modules

The content of this learner guide is aligned to the following modules of the occupational qualification above.

Module Code	Module Title	Level	Credits
Knowledge Modules			
611202-001-00-KM-01	Plant Structure and Physiology	4	5
611202-001-00-KM-02	Vineyard or Orchard Establishment	3	2
611202-001-00-KM-03	Vineyard or Orchard Manipulation Processes	3	8
611202-001-00-KM-04	Harvesting	3	4
611202-001-00-KM-05	Basic Principles of Plant Nutrition	4	4
611202-001-00-KM-06	Crop Protection	3	3
611202-001-00-KM-07	Assets in Horticultural Production	3	2
611202-001-00-KM-08	Farm Business Management and Farming Process Management	4	8
611202-001-00-KM-09	Human Resource Management and Processes	4	8
611202-001-00-KM-10	Overseeing Farming Resource Utilisation	4	8
Practical Skill Modules			
611202-001-00-PM-01	Organise, Allocate and Monitor Availability and Productive Use of Resources	4	5
611202-001-00-PM-2a	Set Team and Individual Performance Goals to Enhancing Team Performance	4	10
611202-001-00-PM-2b	Control Vineyard or Orchard Practices	4	10

611202-001-00-PM-03	Supply Accurate Daily Orchard or Vineyard and Production Information	4	10
Work Experience Modules			
611202-001-00-WM-01	Vineyard or Orchard Resource Optimisation	4	20
611202-001-00-WM-02	Skilled and Motivated Work Team Output	4	20
611202-001-00-WM-03	Daily Orchard or Vineyard and Production Information Availability	4	20

Learning Outcomes

The content of this learner guide is aligned to the following learning outcomes of the modules above.

Knowledge Topics	
Outcome Code	Module Title
KM-05-KT07	Food Safety
IAC0703	The actions that ensure traceability are outlined
IAC0704	The need to prevent spraying of chemicals when they are not applicable is explained
IAC0705	Withholding periods are defined and the need for them is motivated
KM-09-KT03	Overseeing horticultural farming operations
IAC0310	The operations are planned and executed in compliance with quality standards
KM-10-KT04	Food Safety
IAC0401	The factors impacting of food safety are listed and explained
IAC0402	The control mechanisms for ensuring food safety are outlined and described
IAC0403	The regulations and impact factors around food safety management is discussed
IAC0404	The elements of food safety such as traceability, MRLs, decay management and contamination control (personal health and hygiene, etc.) are explained
IAC0405	The concept and principles of food safety are defined and outlined
IAC0406	Food safety hazards are identified along with the appropriate counter action
IAC0407	Food safety systems are listed and their applications described
IAC0408	Hygienic work principles and practices are described in the context where they are to be applied
IAC0409	Food safety standards and accreditation are discussed and explained
IAC0410	Regulatory requirements are listed
IAC0411	Customer requirements are discussed in terms of regulatory requirements and food safety management
IAC0412	A basic understanding of dispute procedures is demonstrated
KM-10-KT05	Quality management
IAC0501	Principles of product quality are discussed
IAC0502	The concept of quality control is discussed
IAC0503	The role and importance of quality testing is argued
IAC0507	The importance of accurate analysis of test results is emphasized
Practical Skills	
PM-01-PS01	Perform a practical exercise to compile a production plan for an orchard or vineyard for a full growth cycle based on case study information
PA0106	Identify the control mechanisms to ensure output and quality targets are met.

AK0104	Controlling and maintaining quality standards
PM-01-PS02	Determine agricultural input to support the production activities of the orchard related to the production stages of the crop
AK0204	Controlling and maintaining quality standards
PM-01-PS03	Organise and allocate equipment and agri-chemicals to the work team to perform vineyard or orchard practices
AK0304	Controlling and maintaining quality standards
PM-01-PS05	Determine crop quality
IAC0501	The unit standards and plant requirements are correctly identified taking into account the production and growth stage of the crop
IAC0502	Visually observe and identify deviations from the quality standard for the vineyard or orchard
IAC0503	Recommendations to address deviations are accurate and in support of the plant requirements and unit quality targets
PA0501	Determine the standards to be checked for the specific production stage of the crop
PA0502	Assess the quality of the orchard and crop against standards by visual inspection and observation through all production and growth stages of the plant/ crop
PA0503	Identify problems and deviations and recommend solutions / actions to support the production and quality targets of the Vineyard or orchard based on the requirements of the specific crop
PM-2b-PS01	Conduct a practical exercise to control and evaluate the agricultural practices in a vineyard or orchard based on case study information
IAC0105	The production practices are correctly inspected and assessed for compliance with legislation and quality and quantity standards
PA0106	Practically evaluate Vineyard or orchard practices for compliance to quality and quantity standards
PA0107	Practically compare the quality and quantity of the practices of different teams and individuals to determine compliance with (farm, operation and cultivar) standards and identify actions to support the individual/team who do not meet the set standards

Chapter 1

Fruit Quality Monitoring

learning outcomes

The content of this chapter is aimed at helping you to:

- Understand and explain the quality supervision process.

1. Fruit Quality

For you to be a successful farmer, you need to sell fruit that people want. Selling high quality fruit is the best way to do this. High quality fruit can be sold for better prices, exported more widely, and enhances your farm's reputation. Quality is not just about meeting standards, it is about surpassing them, to produce fruit that stands out in a very competitive market.

As you know, export is generally the only market which is truly profitable for most growers, and these markets often have high requirements for the quality of your fruit, both in terms of what regulators require and customers want. The customer in the supermarket here or overseas is looking for fruit that is visually appealing, tasty, fresh, and the buyers and importers want consistent fruit that is pest and disease-free with a long shelf life.

Meeting all these different requirements can be difficult, but it is worth the effort and expense, so that you can build a loyal customer base and good relationships with importers, ensuring that you have repeat business for years to come. Not only do quality fruits fetch higher prices, leading to increased revenue for the farm, but they will also save you money, by reducing costs associated with rejected consignments, or a low pack-out percentage.

Further, as we mentioned, consistently producing high-quality fruit helps build a strong reputation and brand. Once your farm is famous for producing good fruit consistently, you will attract better business opportunities, including contracts with premium retailers and exporters. You will also have to spend less on marketing eventually, as your fruit will have its own reputation.

2. Fruit Quality Monitoring

This talk of the importance of quality is all well and good, but it raises a question. How do we make sure our fruit is high quality, and, if it isn't, how do we get it to be? The best way to know for sure that your fruit is high quality is to monitor that quality continuously, and quality can be improved in a few different ways. We discuss both these aspects later in this module.

3. Visual Inspections

Monitoring fruit quality in the orchards is usually done through visual inspections, but some fruit can be sent for more advanced tests like the maturity indexing described in chapter 2. These regular visual inspections of fruits help you to detect quality issues early. Usually, these will involve having trained workers check for signs of diseases, pests, and physical damage from either. They can also note down the fruits size and colour to keep track of its general development.

Visual inspections should be conducted regularly through the various stages of fruit development in your orchards. Consistent, organised, thorough inspections ensure that any

problems are identified and addressed quickly and effectively. It is very important that you train workers to recognize the early signs of quality issues, and have a good system for reporting on these inspections.

4. Laboratory Testing

Laboratory testing is not usually done regularly, but can provide detailed information about internal fruit quality factors such as sugar content, and acidity. These are usually performed as part of maturity indexing (see chapter 2), but can also be performed when there is a certain quality issue with the fruit that you are unable to figure out. In these cases, you can send fruit samples to external laboratories to get detailed reports of their condition and quality, which may help you narrow down the problem.

5. Improving Fruit Quality

If you do discover that your fruit isn't the quality it should be, there are a few different actions you can take. We won't discuss any of these in detail here because they are discussed in far greater detail in other modules, but some of the basic quality improvement actions could include:

- Soil improvement
- Water quality improvement
- Pest and disease control
- Improved harvesting techniques
- Improved post-harvest handling

It may also be that your workers require more training if they are the cause of the poor quality. Regularly training your workers on the importance of good practices and high quality is essential to running a good operation. This includes educating them on proper handling, pest control, and harvesting techniques. This training is not 'one-and-done' either, workers need to have their training constantly refreshed to ensure that quality never slips.

Further, new research is constantly being done by industry bodies such as the CRI, and it is vital that you stay up to date with the latest research and development, since this may change what your practices should be to maximise fruit quality. Continuously educating and developing yourself and the workers is the best way to ensure that you are doing the right thing for your fruit at all times. This includes attending workshops, seminars, and reading relevant publications. New technology, new chemicals, new techniques, and new information are constantly coming out, and it is the duty of a good farm manager or foreman to be aware of these things.

summary

Chapter 1 – Fruit Quality Monitoring

- High quality fruit can be sold for better prices and exported more widely.
- Meeting all quality requirements can be difficult, but it is worth the effort and expense, as it can increase revenue and cut costs.
- Consistently producing high-quality fruit helps build a strong reputation and brand.
- The best way to know for sure that your fruit is high quality is to monitor that quality continuously.

- Monitoring fruit quality in the orchards is usually done through visual inspections, which involve having trained workers check for signs of diseases, pests, and physical damage.
- Visual inspections should be conducted regularly through the various stages of fruit development in your orchards.
- Laboratory testing is not usually done regularly, but can provide detailed information about internal fruit quality factors.
- Regularly training your workers on the importance of good practices and high quality are essential to running a good operation.

assessment activities

- ✓ **Activity P1:** Complete this activity to test your knowledge of fruit quality monitoring.

Chapter 2

Maturity Indexing

learning outcomes

The content of this chapter is aimed at helping you to:

- Perform maturity indexing.

1. Maturity Indexing

Maturity indexing is a particular type of quality measurement that is used to predict the optimum picking time for citrus fruit. The gathered information, together with yield and fruit size estimates, are used to plan for harvesting and are sent to the packhouse to assist with their planning. To be able to estimate when the fruit in a certain orchard or block will be ready for harvesting, we measure and plot over a period of time the maturity parameters of a sample of fruit taken from that block.

Maturity indexing also gives a general indication of how the fruit is developing internally relative to other factors, such as the colour and size development. Equally importantly, it allows one to assess if fruit quality and timing will meet market requirements.

2. Maturity Parameters

Maturity parameters refer to the factors measured in maturity indexing. They can be either internal or external.

External maturity parameters are factors such as fruit size, colour and firmness. These factors can be measured without having to pick or cut open the fruit. Colour is the most important external quality factor. Citrus fruit develop colour when it gets cold in autumn and winter. The difference between day and night temperatures plays the biggest role in colour development, but various methods have been developed to enhance colour development. Standard colour plates are available for every cultivar against which the colour of the fruit can be assessed in various stages of maturity.

Internal maturity parameters are the juice percentage, Brix (total soluble solids or sugar content) the acidity, and the Brix to acid ratio. Internal quality norms for different varieties are set at different levels by the market the fruit is destined for.

3. Sampling Procedures

Sampling means taking a representative portion of a whole for analysis. Always remember the first principle of sampling, which is that a sample must be representative of the bulk that is being sampled. Sampling for maturity indexing usually starts two months before harvesting of the cultivar should start, as per records of previous seasons. Fruit sampled earlier than this will in most cultivars not have sufficient juice for analysis, or the results of analysis may be so far out of specification that it will be of little use. Best practice is to sample and analyse fruit weekly, especially if the information is being used to adjust production practices to manipulate internal quality of the fruit.

Although a fruit sample must be taken randomly, it is important to focus on fruit that will most likely be exported. Large fruit with a coarse skin high in the canopy and small, pale fruit lower down inside the canopy are for example not fruit that one would include in a

sample. Divide the orchards into sample blocks, according to cultivar and rootstock combination, tree age and condition, soil type and aspect. Mark ten representative trees per block and use these as index trees throughout the season.

Select two fruit per index tree which are representative of fruit on the tree. If there will be more than one pick due to for instance colour differentiation, subdivide the sample accordingly. In certain orange cultivars there is a great deviation in internal quality between large and small fruit, and it would be better in these situations to take a large and small fruit size sample. The fruit sample is placed in a bag and the orchard details, and the date of sample is written on the bag or on a slip that is placed in the bag.

4. Recording Maturity Indexing Information

In the laboratory, the details of each sample are noted, including the producer, orchard number, and fruit size and colour. The fruit is then weighed, cut, its juice is extracted, and the juice percentage, Brix, and acidity are measured. The ratio of Brix to acidity is calculated from this information. The results of the laboratory tests are recorded in a table and can be plotted on a graph along with other information, such as fruit colour.

Notes on the general fruit condition, referring to factors that may have a bearing on fruit maturity such as granulation, puffiness and fruit splitting, are also made. If orchard practices need to be changed to manipulate fruit development, the maturity indexing graph is a key factor in making these decisions. Projections are also made for the packing operation.

summary

Chapter 2 – Maturity Indexing

- Maturity indexing is a particular type of quality measurement that is used to predict the optimum picking time for citrus fruit.
- Maturity indexing information, together with yield and fruit size estimates, are used to plan for harvesting and packing.
- Maturity parameters refer to the factors measured in maturity indexing. They can be either internal or external.
- External maturity parameters are factors such as fruit size, colour and firmness.
- Internal maturity parameters are the juice percentage, Brix (total soluble solids or sugar content) the acidity, and the Brix to acid ratio.
- Sampling means taking a representative portion of a whole for analysis.
- Sampling for maturity indexing usually starts two months before harvesting of the cultivar should start, as per records of previous seasons.
- Although a fruit sample must be taken randomly, it is important to focus on fruit that will most likely be exported.

assessment activities

- ✓ **Activity P2:** Complete this activity to test your knowledge of maturity indexing.
- ✓ **Activity F1:** Complete this activity to test your knowledge of the entire module.