



Citrus Orchard Foreman Occupational Learning

Work Scenario Guide

C1: Plant Manipulation Planning

Qualification:	110667 – Occupational Certificate: Orchard and Vineyard Foreman
Work Scenario:	C1: Plant Manipulation Planning
Learning Area:	C: Oversee manipulation of citrus trees at various ages
Scenario Description:	Trees require constant care and attention. You need to continuously assess the state of the trees in your orchards, and, where necessary, plan and recommend manipulation activities.

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Occupational alignment:
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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-03-KT01	Framework development
IAC0101	The principles of developing vine plants and fruit trees are given to the growth of the crop is described
IAC0102	Free standing systems are compared to trellised systems in terms of advantages, disadvantages and applicability
IAC0103	The adaptation of the framework to the bearing ('dra wyse') of the crop is outlined
KM-03-KT02	Pruning
IAC0201	The main objective of pruning is explained
IAC0202	The main principles of pruning is discussed
IAC0203	The distinction between winter and summer pruning is discussed
IAC0204	The relevant pruning systems for specific crops or cultivars are explained
KM-03-KT03	Canopy management / foliage management
IAC0301	The main objective of canopy management is explained
IAC0302	The main principles of canopy management is discussed
IAC0303	The concept of foliage management is defined
IAC0304	The reason, process and timing of suckering are explained
IAC0305	The reason, process and timing of shoot positioning are explained
IAC0306	The reason, process and timing of lateral shoot removal are explained
IAC0307	The reason, process and timing of leaf removal are explained
KM-03-KT04	Crop control
IAC0401	The main objective of crop control is explained
IAC0402	The main principles of crop control are discussed
IAC0403	The reason, process and timing of flower and fruit thinning are explained
IAC0404	The reason, process and timing of physical, chemical and mechanical crop control practices are explained
KM-03-KT06	The reason, process and timing of thinning are explained
IAC0601	The reason, process and timing of colour improvement are explained
KM-03-KT07	Physical manipulation
IAC0701	The underlying principle of shoot positioning is discussed
IAC0702	The reason, process and timing of shoot positioning are explained

IAC0703	The underlying principle of girdling is discussed
IAC0704	The reason, process and timing of girdling are explained
Practical Skills	
PM-2a-PS04	Determine personnel requirements to meet production schedules
IAC0403	The sectional labour plan is correct
PA0401	Develop sectional (orchard) labour plans

Chapter 1

Plant Manipulation Preparation

learning outcomes

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

- Prepare for plant manipulation.

1. Plant Manipulation Preparation

Plant manipulation refers to the skilful management or treatment of plants (in our case trees) to derive a specific outcome. Trees are manipulated in various deciduous crops such as apples, pears, and grapes, to enhance the fruit size and quality.

As you know, your citrus is (usually) sold to overseas consumers through fresh fruit exports, local supermarkets, hawkers, juice manufacturers, and processors. Each of these markets has their own requirements in terms of the external and internal quality of the fruit. The highest requirements (and highest income) are from fresh fruit exports.

Overseas consumers prefer fruit that is large, well-coloured, has no blemishes, tastes sweet, and is easy to peel. If you want to sell your product at a good price, you have to provide the consumer with what they want. Unfortunately, citrus trees will not necessarily naturally produce fruit that complies with these requirements.

Plant manipulation methods contribute to producing a marketable product at an acceptable price. Plant manipulation is not a cure-all, it cannot mend diseased or neglected trees or solve cultivar selection or other problems. For plant manipulation to be effective, all other production practices should be done properly first, including nutrition, irrigation, soil management, and pest and disease management.

If any of these factors are neglected or done incorrectly, the problems that will occur as a result cannot be resolved through plant manipulation alone. The cause of the problem must be identified and rectified, and only then the correct plant manipulation technique can be selected to improve the situation.

When dealing with the various manipulation techniques, keep in mind that a citrus tree is a living organism. Circumstances change and are dependent on many internal and external factors, and plant manipulation therefore does not always have the same predictable outcomes. Knowledge of the tree and local conditions, and experience in using these techniques play a big role in being able to predict the outcome. Certain techniques, concentrations and timing also vary between cultivars, different climatic zones, and different microclimates.

As you can see, plant manipulation is a very complex process, that can take many forms. As with all complex processes, you need to plan and prepare effectively and carefully for plant manipulation. It is also important that you coordinate and allocate resources carefully. This includes ensuring that the necessary tools, equipment, and labour are available when needed, as well as coordinating with other farm activities to avoid conflicts or bottlenecks.

2. Plant Manipulation Schedules

The backbone of manipulation planning is the manipulation schedule or plan. A well-structured plan is essential for coordinating all the manipulation activities. This schedule

should outline the timing of manipulation practices, based on the growth stages of the trees and the specific conditions on the farm.

Developing a plant manipulation plan requires a good knowledge of the climatic and environmental conditions on your farm, as well as the specific cultivar you are growing. These factors need to be closely monitored to ensure they don't change and thus require a change in plans.

Changes in climate throughout the year can have a significant impact on the timing and effectiveness of plant manipulation. For example, an unusually warm winter may cause the trees to break dormancy earlier than expected, requiring changes to the pruning schedule.

To account for these variations, it is important to have a flexible plan that can be adjusted based on real-time monitoring and weather forecasts. This may involve rescheduling certain practices, adjusting the specific methods, or implementing additional practices.

Aside from the environment and climate, the specific growth stages of your citrus will largely determine the needed manipulation activities. For a reminder of the phenology of citrus trees and the associated growth stages, refer back to the plant manipulation material.

3. Plant Manipulation Methods

The plant manipulation methods used for citrus are divided into two categories, being physical and chemical manipulation. Some methods, such as fruit thinning, can be done manually or chemically, and therefore falls under both categories. The specifics of various plant manipulation methods and their timing are discussed in the material regarding plant manipulation.

4. Labour Requirements

As with most production practices, numerous workers are generally required to practice manipulation. The effectiveness of manipulation techniques depends on having a well-trained and sufficiently large workforce. These workers must be able to execute these tasks efficiently and on schedule. Part of the planning process is ensuring you have access to these workers.

The first step is assessing the necessary number of workers, which will depend on the specific manipulation practices in question, as well as other factors such as the size of your farm and the workforce available to you. To do this, you need to clearly understand the specifics of each manipulation practice.

For example, pruning is labour-intensive, that requires workers to be able to identify and remove specific branches and cut to specific heights. Thus, training your workers in proper technique is crucial to avoid damaging the trees and promoting healthy growth. Similarly, tasks like thinning and girdling require precision and care, making it important to have experienced workers who can carry out these tasks effectively.

The specific timing of plant manipulation will also depend somewhat on the availability of labour. Many of these tasks are seasonal and need to be performed within specific growth stages to work best, and it is up to you to make sure that the workers are available at that time.

Aside from the number of workers, the quality and training of the workers is very important. As with all production practices, it is well worth the money to invest in your workers. Money spent on training and developing workers will usually pay for itself, and make your workers happier when they feel that they are important to you, as well as better at their jobs.

summary

Chapter 1 – Plant Manipulation Preparation

- Plant manipulation is the skilful management or treatment of plants to derive a specific outcome and contributes to producing fruit that is acceptable to the market.
- For plant manipulation to be effective, all other production practices should be done properly first.
- A manipulation plan should outline the timing of manipulation practices, based on the growth stages of the trees and the specific conditions on the farm.
- Developing a plant manipulation plan requires a good knowledge of the climatic and environmental conditions on your farm, as well as the specific cultivar you are growing.
- There are physical and chemical plant manipulation methods.
- The effectiveness of manipulation techniques depends on having a well-trained and sufficiently large workforce.

assessment activities

- ✓ **Activity P1:** Complete this activity to test your knowledge of plant manipulation preparation.

Chapter 2

Manipulation Tools and Equipment

learning outcomes

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

- Select and use appropriate tools and equipment for a various plant manipulation methods.

1. Plant Manipulation Tools and Equipment

Since manipulation activities vary widely in both practice and complexity, there are a large number of tools that are used during manipulation of citrus. Care should always be taken to use them correctly and safely, and all workers who handle them should be well-trained in their use.

In this chapter, we will describe the various tools and equipment needed for manipulation, as procuring these tools forms a part of preparation and planning. The specific use of manipulation tools and equipment is discussed in the material regarding specific manipulation methods.

2. Pruning Shears

Pruning shears are used to cut off smaller branches of up to 20mm thick when pruning and skirting. There are two types of pruning shears, namely by-pass and anvil shears. By-pass shears are used for soft tree wood and stems, while an anvil shear gives a clean cut in hard and dead wood. Generally, you will need one pair of shears per worker, with a few spares.



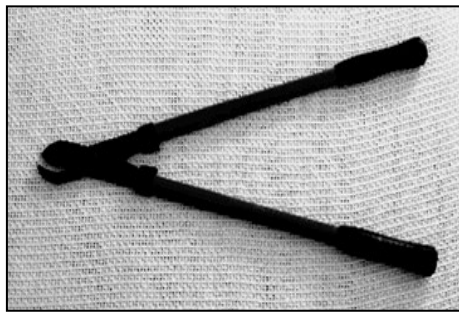
By-Pass Pruning Shears



Anvil Pruning Shears

3. Lopping Shears

Lopping shears are used to cut branches up to 30mm thick when pruning and skirting. Lopping shears have long handles for better leverage. Lopping shears are available in by-pass and anvil shears. Pneumatic pruning and lopping shears are also available, with or without telescopic handles. Generally, you will need one pair of shears per worker, with a few spares.



Lopping Shears

definition

Pneumatic Equipment

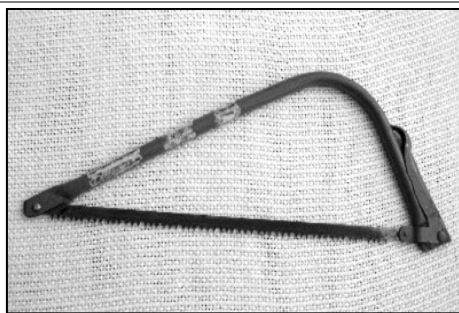
When equipment is pneumatic it means that the equipment is driven by compressed air. A flexible hose runs from an air compressor to the equipment. Less physical pressure needs to be exerted when using pneumatic equipment and work can be done faster and with less effort, because the compressed air does most of the work.

Telescopic Handles

Telescopic handles are used to extend the handle of a piece of equipment, enabling one to reach high branches. These handles are normally tubular and can slide in and out of each other, extending or shortening the handle.

4. Bow Saw

Bow saws are available in various sizes and have replaceable blades. Bow saws are used for cutting thicker branches than the lopping shear is capable of. The blade must be under tension otherwise it tends to twist, resulting in a skew cut. Generally, you will need one saw per worker or few workers depending on the practice, with a few spares.



Bow Saw

5. Pruning Saw

A pruning saw gives a quick, neat, clean cut through thicker wood when a saw is needed. It uses a pulling action for cutting. Pruning saws are available with straight, curved, or folding blades. They are more expensive than bow saws but give a better cut. Pneumatic saws are also available, with or without telescopic handles. Generally, you will need one saw per worker or few workers depending on the practice, with a few spares.



Pruning Saw

6. Wound Sealant

Wound sealant is used to seal large pruning wounds in order to prevent the wood from drying out and to prevent the possible entry of pathogens. Various makes of sealant are available, but it is important to ensure that they are not phytotoxic to citrus. The sealant is applied to the wound by means of a brush. You would generally need a can of wound sealant and a few brushes per team.

definition

Phytotoxic

Phytotoxic means poisonous to plants. Some chemicals are poisonous to certain plants while others can be poisonous under certain conditions, for example when plants are under stress.



Wood Sealant

7. Carpet /Utility Knife

A utility knife is used during girdling for making a thin cut through the bark of the tree. This is not the ideal tool to use for this purpose, but it is easily obtainable and cheaper than custom-made tools. You would generally need a knife for every worker or few workers.



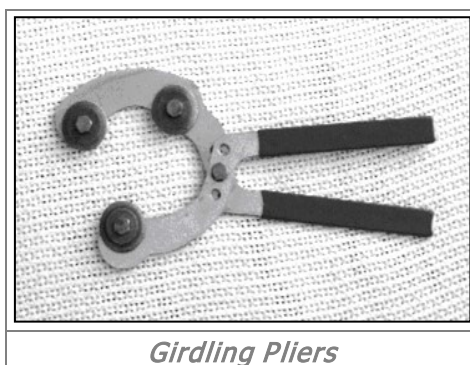
Carpet / Utility Knife

8. Girdling Saw / Knife

Custom-made girdling knives and saws are used during girdling and work better than a carpet or utility knife for making a thin cut through the bark of the tree. You would generally need a knife for every worker or few workers.

9. Girdling Pliers

Custom-made girdling pliers are large pliers-like tools with three sharp cutting wheels that cut through bark when the tool is drawn one-third of the way around a tree trunk or limb. You would generally need a pair for every team or group.



10. Skirting Stick

A skirting stick is cut to a desired length, usually 600–800mm, and used during the skirting process to measure the distance from the ground to obtain a uniform skirting height. You would generally need a skirting stick for every few workers.

11. Ladders

Various types of ladders are used to reach the high parts of the tree during pruning or other plant manipulation processes. Metal ladders are hardier and stable but are heavy to carry around. Wooden ladders may also be used, but they must not be painted. A person must never climb a tree without using a ladder, as *Phytophthora* can be spread in this way. One ladder should be issued per team or few workers.

definition

Phytophthora

Phytophthora is a disease that causes root rot and collar rot in citrus trees, as well as brown rot of fruit. It is a fungal disease which can be carried in both soil and water.

12. Mechanical Hedgers and Toppers

Mechanical hedgers and toppers are large, expensive, specialised pieces of equipment, designed and built for being mounted on a tractor and pruning many trees in a short time. They remove parts of the outside canopy and cut trees uniformly and some can also be used to skirt trees.

A hedger can cut vertically or at an adjustable angle, with the cutting angle normally 15° off vertical. A topper cuts off the tops of the trees horizontally or up to a 45° off the horizontal angle. Due to the high purchase cost, they are used mainly on large farms. Usually only one hedger or topper is used at a time, except in very large farms.

13. Mulching Equipment

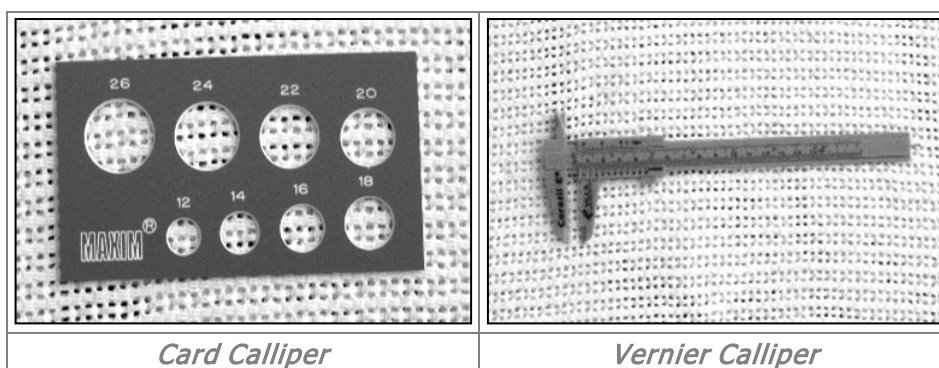
A mulcher is a tractor drawn machine that chops up the foliage left in the rows after pruning. After processing, the chippings and shredded foliage is left in the rows as mulch. Usually only one mulcher is used at a time, except in very large farms.

14. Fruit Count Frame

A fruit count frame is used to count the number of fruitlets on a tree to determine whether hand thinning is required. It is made from electrical conduit tubing, metal rods or wooden dowels that can be dismantled for easy transport. Different sizes are used for mandarins and oranges. The amount of frames issued will vary based on practices in question.

15. Fruit Measuring Callipers

There are various kinds of fruit measuring callipers. They are used to measure fruit size to assist in the decision of when to use a chemical plant manipulation method. The two types illustrated below measure smaller fruit. Other callipers are available to measure larger fruit. Generally, every worker should have a calliper.



16. Protective Clothing and Safety Equipment

Suitable gloves, such as welding gloves, must be worn at all times during plant manipulation processes to protect the hands. Safety goggles must be worn during all sawing, hedging and topping operations, and while sterilising equipment. It is preferable to wear suitable clothing such as overalls and strong footwear as other clothing can easily be torn. Wear long sleeves to protect the arms from scratches. Every worker must have proper protective clothing and safety equipment.

summary

Chapter 2 – Manipulation Tools & Equipment

- Care should always be taken to use manipulation tools correctly and safely, and all workers who handle them should be well-trained in their use.
- Pruning shears are used to cut off smaller branches.
- Lopping shears are used to cut branches up to 30mm thick.
- Bow saws are used for cutting thicker branches than the lopping shear is capable of.
- A pruning saw gives a quick, neat, clean cut through thicker wood when a saw is needed.
- Wound sealant is used to seal large pruning wounds in order to prevent the wood from drying out and to prevent the possible entry of pathogens.

- A utility knife is used during girdling for making a thin cut through the bark of the tree.
- Girdling knives and saws are used during girdling to make thin cuts through the bark.
- Girdling pliers are large pliers-like tools with three sharp cutting wheels that cut through bark when the tool is drawn one-third of the way around a tree trunk or limb.
- A skirting stick is used during the skirting process to measure the distance from the ground to obtain a uniform skirting height.
- Various types of ladders are used to reach the high parts of the tree during pruning or other plant manipulation processes.
- Mechanical hedgers and toppers are mounted on tractors and remove parts of the outside canopy and cut trees uniformly.
- A mulcher is a tractor drawn machine that chops up the foliage left in the rows after pruning.
- A fruit count frame is used to count the number of fruitlets on a tree to determine whether hand thinning is required.
- Fruit measuring callipers are used to measure fruit size to assist in the decision of when to use a chemical plant manipulation method.
- Suitable gloves and safety goggles must be worn at all times during plant manipulation processes.

assessment activities

- ✓ **Activity P2:** Complete this activity to test your knowledge of plant manipulation tools and equipment.
- ✓ **Activity F1:** Complete this activity to test your knowledge of the entire module.