Learner Guide
Primary Agriculture

Harvesting agricultural crops

My name: ..................................................
Company: ..............................................
Commodity: ...................... Date: ............

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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: Harvest agricultural crops
US No: 116204
NQF Level: 1
Credits: 5

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

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

<table>
<thead>
<tr>
<th>Title</th>
<th>ID Number</th>
<th>NQF Level</th>
<th>Credits</th>
<th>Mark</th>
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</thead>
<tbody>
<tr>
<td>National Certificate in Animal Production</td>
<td>48970</td>
<td>1</td>
<td>120</td>
<td>☐</td>
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<tr>
<td>National Certificate in Mixed Farming Systems</td>
<td>48971</td>
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<tr>
<td>National Certificate in Plant Production</td>
<td>48972</td>
<td>1</td>
<td>120</td>
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</tbody>
</table>

Please mark the learning program you are enrolled in:

Your facilitator should explain the above concepts to you.

You will also be handed a Learner Workbook. This Learner Workbook should be used in conjunction with this Learner Guide. The Learner Workbook contains the activities that you will be expected to do during the course of your study. Please keep the activities that you have completed as part of your Portfolio of Evidence, which will be required during your final assessment.

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.

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?

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SAQA Unit Standards
What will I be able to do?

♦ Harvest crops as advised making use of basic harvesting tools.
♦ Have gained specific knowledge and skills in harvesting techniques and will be able to operate in a plant production environment implementing sustainable and economically viable production principles.

Learning Outcomes

♦ Use appropriate tools / equipment for pre-determined harvesting method
♦ Carry out sampling for maturity indexing according to pre-determined requirements.
♦ Harvest crops following specific prescribed procedures.
♦ Adhere to personal health, hygiene and safety during harvesting.
♦ Dispose of waste.
♦ Care for and maintain equipment used during harvesting under close supervision

What do I need to know?

♦ NQF 1: Demonstrate a basic understanding of the structure and function of a plant in relation to its environment.
♦ NQF 1: Demonstrate an understanding of the basic concept of sustainable farming systems
Session 1  Harvesting and Harvesting Equipment

After completing this session, you should be able to:

SO 1: Use appropriate tools / equipment for pre-determined harvesting method.
SO 6: Care for and maintain equipment used during harvesting under close supervision.

In this session we explore the following concepts:

- The tools used for specific harvesting processes.
- The safe use of the harvesting tools.
- The basic safety precautions to be adhered to while handling harvesting tools.
- Cleaning and safe storage of harvesting tools.
- The reasons for cleaning, sterilization and storage of harvesting equipment.
- How you would clean and maintain the equipment used in the specific enterprise is demonstrated.
- How you would store the equipment is described.
- The procedure followed should you find defaults in the equipment is described.

1.1 Introduction to Harvesting

The nutritional value, freshness, and flavour of fresh produce (includes all fruit and vegetables marketed fresh) will depend on the stage of maturity and the time of day at when they are harvested. If the harvested produce is overly mature they will be stringy and coarse. Produce picked too soon may be too tender and will lack substance and flavour.
In general the sequence of events from harvest is:

HARVEST (e.g. by hand, or specialized shears)
\(\downarrow\)
Place into picking bag or crate
\(\downarrow\)
TRANSPORT (e.g. in a bin)
\(\downarrow\)
PACKINGHOUSE
\(\downarrow\)
dump (e.g. bin tipper)
\(\downarrow\)
cull (e.g. discard damaged produce and debris)
\(\downarrow\)
treat (e.g. wax)
\(\downarrow\)
sort (e.g. colour grade)
\(\downarrow\)
size (e.g. weight grade)
\(\downarrow\)
pack (e.g. cell-pack fibreboard cartons)
\(\downarrow\)
palletise (e.g. wooden pallets)
\(\downarrow\)
cool (e.g. pressure cool)
\(\downarrow\)
store (e.g. cold room)
\(\downarrow\)
TRANSPORT (e.g. refrigerated sea container)
\(\downarrow\)
WHOLESALE (e.g. regional market)
\(\downarrow\)
TRANSPORT (e.g. green-grocers flat top truck)
\(\downarrow\)
RETAIL (e.g. fresh produce stall)
\(\downarrow\)
CONSUMER

What the diagram shows is that there are many steps in the process before the produce gets to the end user. It is therefore critical that all possible steps be taken not to cause injury or stress to fruit during harvest.

The time for harvesting varies with climate, the particular season, the variety, and the crop involved. For instance, tomatoes can be left on the vine until fully ripened or taken off when partially ripened. Other crops such as winter squash and watermelon are not ready until after they are fully developed. Export citrus is often harvested fully matured, but green. These are then later put through a ripening process.
Crops may be harvested at different stages of fruit maturity depending on the produce and factors such as:

- The market destination.
- The purpose of the produce i.e. is it to be used as fresh or processed produce.
- The time it takes for the produce to reach the consumer.
  - If the produce is aimed at the local market the fruit may be harvested when ripe or are about to ripen.
  - If the produce is destined for the export market the fruit can be harvested when fruit is mature, but not ripe yet.
- The external appearance of the produce is less important when the fruit is meant for processing. There remains quality standards such as:
  - Water, sugar and acid content of the fruit.

For vegetables, seed packages give an indication of "days to maturity". This indication can also be found in seed catalogues. Because the ripening of a crop is largely dependent on environmental conditions the time indication of “days to maturity” should only be used as a guide.

The best way of determining the readiness of the crop for harvest is to check the garden frequently for ripe produce during close to the expected harvest time.

When harvesting, avoid bruising or damaging the vegetables as this will lead to decay of the produce.

Vegetables continue to carry on life processes even after harvesting. It is thus important that we retard these processes in mature products. With the exception of ripening storage of vegetables does not improve the quality of the produce. A vegetable must possess high quality characteristics and be cultivated properly for it to be acceptable.

It is not easy to determine the point at which specific crops reach their peak quality. It is essential that one keeps accurate and complete records of the varieties that you use, when they were planted etc. This will help you gauge the ideal time of harvest.

Some crops are more easily damaged during harvesting than others. However bruises and cuts must be avoided during handling with all crops. All produce showing decay or rot must be removed and disposed of.

Washing certain vegetables in cold running water immediately after harvesting removes soil, dust or other contaminants and helps lower the temperature. By adding a suitable sanitizer, microbial contaminants may be removed.

When storing vegetables the following requirements need to be considered.
- **Temperature**

  The conversion of sugar to starch is critical in products such as sweet corn and peas. It is necessary to cool these products immediately after harvest to minimize this conversion. If possible, harvest vegetables early in the morning or right before you intend to use them.

- **Moisture**

  Proper humidity varies with different commodities. In general however leafy vegetables need a high humidity (95 %) whereas onions should be stored in a drier atmosphere (65 to 70.5 relative humidity).

- **Ventilation**

  Wilting and tissue breakdown are minimized if the storage area is well ventilated.

  In preparation for harvesting, an assessment is done of the tools and equipment required. This is done taking into account the size of the farm, the crop and/or cultivar, the period during which the harvesting must be completed, and the capacity of storing facilities, where if applicable.

  Once this information has been gather a decision can be made as to the number and size of picking teams, which in turn determines the equipment requirements.

  In the case of mechanical harvesting such assessments will determine when a harvester should be booked, if the farmer does not own a harvester, and the number of harvesters that may be required. In addition the numbers of back-up equipment such as tractors and trailers used for transporting harvested goods can be decided upon.

### 1.2 Harvesting Methods

The crop type and expected harvest volume will determine the harvesting method that is to be used. Certain crops are harvested by hand, while others are harvested either manually or mechanically. Hand harvesting usually provides a better quality product than mechanical harvesting. Harvesting by hand is however more time consuming and expensive than mechanical harvesting and is not always practical or economical feasible.

The harvesting method to be used is also affected by the area (size of the field) to be harvested. A farmer might easily be able to harvest half a hectare of maize by hand, but it is not possible hundreds or even thousands of hectares are to be harvested.

In addition the market may often dictate the harvesting method. If for example tomatoes are to be sold on the fresh produce market, harvesting will be by hand in order to ensure that the crop is not damaged. If, however, the fruits are destined to be processed a certain degree of damage can be tolerated at harvest.
Crops that are exported as fresh produce, including most of the tree fruit and vegetables, are traditionally harvested by hand. The quality of fruit and vegetables play an important role in their marketing and thus the amount of damage should be minimised. Physical damage also leads to shortened produce shelve life.

Crops such as tobacco, and cotton are examples of industrial crops, which are harvested by hand. In the case of tobacco this is because the leaves mature from the bottom of the plant up. The time lapse between ripening of the bottom to the top leaves is such that the plant cannot be harvested at once.

Hand picked cotton is of a higher quality than machine picked cotton, because hand picked cotton can be picked sooner and cleaner than with a harvester.

Grain (wheat and maize), oil (sunflower and canola) and protein (soybean and groundnut) crops are seldom harvested by hand. These crops are harvested using specialized combine harvesters.

There are instances where a combination of hand and machine picking is practised. An example is where onions or potatoes are lifted out of the soil using machines. The bulbs or tubers are then picked up and sorted by hand.

1.3 Harvesting Equipment

Harvesting equipment may include a wide range of different instruments and containers.

Ladders are used especially in tree crops to reach fruit high in the tree. The ladders should be kept clean and in good condition, ensuring that pickers do not fall and injure themselves.

Picking bags are used especially in orchard, as they are easier to handle that crates or baskets. The bag is slung across the shoulder and fruit placed carefully into the bag after being picked. The bags must be kept clean and not be thrown on the ground or walked on. This will ensure that no sand and grit gets into the bag, which can damage the produce.

Where bins are used the same principals apply. The crates must be keep clean and should not be sat on.

The bins into which produce is placed must be handle with care so-as they do not break or splinter. Splinters in the bins will perforate the harvested produce.

Picking knives and shears. In crops such as lettuce and cabbage, harvesting knives are usually used. The knife is placed between the first and second leaves and a single clean cut removed the head from the stem. The knives must be sharp at all times; otherwise it will not give a clean cut. The knife must be kept clean at all times. In between cutting, the knife must be dipped in a sanitising solution. This will ensure that potential post-harvest diseases are carried from one head to the next.
In the case of fruit harvesting, fruit are harvested either by hand or some form of harvesting sears or cutter. These are used to cut the fruit stem from the branch. In this way you ensure that the fruit stem is not torn from the fruit. If the fruit tears, it will enable entry of disease and lead to rotting of the fruit. It is important that the fruit stem is not left too long as it could puncture the accompanying fruit in the bags on bins.

All equipment must be cleaned and stored in a designated storage area for the harvesting equipment. The equipment must be kept dry and should not be kept on a dirty floor. Harvesting equipment must not be stored in close vicinity to pesticides, pesticide application equipment or fertilisers. The equipment could become contaminated and thereby contaminate the harvested produce.

All tools and equipment used in the harvesting process must be properly cleaned and sterilized before and after use as well as at regular intervals during harvesting. Workers must also wear clean and suitable protective clothing.

**Pruning shear**

The most common tools used for harvesting fruit are steel pruning shears. They are used to cut the stem of the fruit as close to the button, or calyx, as possible without injuring the shoulder of the fruit. Some vegetable fruits, like tomatoes, can easily be picked by a simple twist of the hand, while pruning shears are used on others like peppers.

In some crops, specialised shears and snips are used for harvesting. Pruning shears fit comfortably into the palm of the hand, have a rounded point and curved blade to avoid damaging the fruit. A spring keeps the blade in an open position and ensures fast recovery for efficient picking.

In preparation for harvesting, all pruning shears must be checked to ensure that the spring action is working well, and that the blades are sharp and closely aligned. This should also be checked on a regular basis during picking. Pruning shears must also be cleaned and sterilised and prior to harvesting and regularly during picking.
### Picking containers

A number of receptacles are used to collect picked fruit, but the most common is a picking bag. Picking bags are generally made from canvas or polyvinyl. They have a single strap and are slung over the shoulder of the picker. As the picker picks the fruit, it is placed inside the bag until it is full. It is then taken to a general collection point in the orchard where the bags are emptied into bulk bins or picking trailers.

A number of different bag designs, are available and used in various industries.

In preparation for harvesting, all picking bags and containers must be checked for holes and/or tears. The containers must be cleaned before harvesting is initiated. When cotton is hand picked, the cotton is placed in picking bags before being emptied into metal baskets. Unlike for tree crops the bags are non-woven bags (material or polyvinyl) as the strands of these bags contaminate the cotton fibre. Cotton picking bags most often used are empty plastic fertilizer bags. Because these bags are not porous and the cotton will still contain moisture, picked cotton should not be left in these bags overnight as the cotton may rot.

Fruits and vegetables, which damage easily, are picked into picking crates taken to the cold rooms or packing sheds as soon as possible. These crates are usually made from durable plastic and are well ventilated. They are also designed to be stacked.

Clean, dry and sterilized crates should be used to prevent disease contamination. Crates, which are damaged in such a way that bruising or puncturing of the crops could occur should be discarded.
Harvesting Knives

Knives are used in harvesting leafy crops such as cabbage heads, Swiss chard leaves and lettuce. A good quality knife with a strong blade should be supplied to the harvesters. The blade should be sharp enough to facilitate easy cutting. A blunt knife will not only reduce the harvest speed, but can cause unnecessary damage to the produce. Knives should be regularly cleaned and disinfected whilst harvesting to prevent the spread of post harvest decay organisms.

Ladders

Ladders are used during harvesting of tree crops depending on the height of trees. Ladders are placed alongside trees, or rested against the canopy in the case of larger trees.

Ladders vary from home-made, single-sided, two-legged ladders made from locally grown wood to factory-manufactured, two- or three-legged ladders generally made from aluminium or wood.

In preparation for harvesting, ladders must be checked for sharp edges, splinters, loose components and dirt to ensure fruit is not damaged when the ladders are placed alongside the trees or against the canopy. The ladders should also be checked for defects that may compromise the safety of the harvesters.

Mechanical harvesters

Field crops such as grains, vegetables produced for industrial purposes, potatoes, onions, oil crops, protein crops and cotton are harvested mechanically. The different types of harvesters are specially designed to for a specific crop or group of crops.

Wheat, maize, sunflower and soybean can be harvested with combine harvesters. These types of harvesters harvest the whole plant. This usually involves fast moving rollers and or blades.

The harvester then removes kernels from the ears or the seeds from the heads or pods in a process known as threshing. It is a complex mechanical action that results in clean seed being dropped into a storage compartment. The remaining plant residue is released (stalks, straw, pods, leaves, etc.) back onto the field. As soon as the storage compartment is full, it is offloaded into bulk trailers and transported to silos where it is stored.
Servicing the harvesters should be done before the start of the season to prevent hold-ups due to breakage during the harvesting process. During harvesting, any blockages must be dealt with as soon as it occurs, as permanent damage may result. The harvesters should be cleaned at the end of each day to prevent any hold-ups the following day. While cleaning one can also easily pickup any problems such as broken blades or other damaged parts etc.

Cotton harvesters have rotating comb-like spindles, which comb the cotton out of the open cotton bolls. At the back of the harvester, metal baskets, are attached into which the cotton is blown. When a basket is full, it is emptied into another basket in which it is then transported to the gin. Harvesters should be serviced before the start of the season.

Onions, potatoes and groundnuts grow below the soil surface. Commercially these crops are harvested by lifting the bulbs, tubers or pods from the soil before. Once lifting has been completed the crop is picked up by hand, sorted and packed. Lifting is done using specialized implements containing a blade, which is attached to the back of a tractor. The “blade” is then inserted into the soil at one end of a row and drawn just below the soil surface (at a depth of ± 15 – 20 cm).

The next step can be manual or mechanical. In both cases it involves the pulling of the plants from the soil and removing the tubers etc. from the plant. Potato tubers can be placed in bulk trailers or bulk bins on trailers and transported to the pack.
in the case of onions the bulbs are first left on the field for at least a week to cure before the dry leaves are cut (with sharp knives) from the bulbs and the bulbs placed in onion bags, ready for the market. Peanut plants are also left on the field for a week or two in heaps or in windrows to cure. Then only will the plants will be threshed and the pods placed in woven material bags or bulk trailers and transported to where the peanuts will be processed.

**Garden fork**

In the case of smaller production areas, where mechanical harvesters cannot be used, a fork can be used instead for lifting produce. The fork is inserted into the soil at an angle, close to the crop plant and then the plant and soil are lifted. Take care not to push one of the fork teeth into a tuber, bulb etc.

**Bulk Bins and Picking Trailers**

Fruit are transported from orchards in bulk picking trailers with a capacity of 2t to 3t or in wooden or plastic bulk bins with a capacity of 350 kg. In small operations, crates with a capacity of 15 kg to 20 kg capacity are used.
Bulk bins are normally supplied by pack houses, or rented from an equipment supplier. In preparation for harvesting, bulk bins are checked for sharp edges and splinters to avoid damage to fruit. They are also cleaned and sterilised to prevent contamination and decay. The supplier of the bulk bins normally does this.

All moving parts of picking trailers must be serviced before the harvest starts. Also check the tyres to make sure they are in good order. If trailers have to be used on national roads, they must be roadworthy. The fruit carrying area of the bin must be checked for dirt, sharp edges, latch functioning, etc.

The metal baskets in which the cotton-picking bags are emptied and in which the cotton can be stored, should be dry and clean before the seed cotton is placed therein. Because it is made from metal, any rust should be removed and treated.

**Cleaning, sterilizing and maintaining harvest tools and equipment**

Cleaning of harvesting tools refers to both removal of dirt and plant material becomes adhered as well as to the removal of microscopic particles including disease organisms.

The harvested produce must not come into contact with post-harvest decaying organisms, as it will reduce the shelf life and quality of produce.
Removal of dirt, plant material etc. from tools and equipment prolongs the lifespan of the tools.

Please complete Activity 1 in your learner workbook

My Notes …

<table>
<thead>
<tr>
<th>Concept</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
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<tr>
<td>SO 1 – AC 1-4, SO 6 – AC 1-4</td>
<td>Use appropriate tools / equipment for pre-determined harvesting method.</td>
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<tr>
<td></td>
<td>What tools to use for which harvesting process as advised are explained.</td>
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<tr>
<td></td>
<td>The safe use of the harvesting tools as advised is demonstrated.</td>
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<tr>
<td></td>
<td>The basic safety precautions to be adhered to while handling the harvesting tools are described.</td>
<td></td>
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<tr>
<td></td>
<td>How the tools are cleaned and safely stored are demonstrated.</td>
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<td></td>
<td>Care for and maintain equipment used during harvesting under close supervision.</td>
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<tr>
<td></td>
<td>Why it is important that equipment is cleaned, sterilized and stored as prescribed is explained.</td>
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<td></td>
<td>How you would clean and maintain the equipment used in the specific enterprise is demonstrated.</td>
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<td></td>
<td>The procedure followed should you find defaults in the equipment is described.</td>
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Session 2  
Sampling for maturity Indexing

After completing this session, you should be able to:  
SO 2: Carry out sampling for maturity indexing according to pre-determined requirements.

In this session we explore the following concepts:  
♦ How to harvest a sample.  
♦ Sample handling.  
♦ Basic sample processing.  
♦ The need for pre harvest samples.

2.1 Harvest Timing

In some cases fruit need to be tested for parameters such as sugar contents or acidity etc. prior to harvest. In order to generate accurate analyses results however, one needs to take a sample of fruit or produce that represents the status of the fruit of the field or orchard. To this end the samples to be taken must be taken randomly from the field. To do this, divide the field into equal parts or sampling units. If a tree crop is involved each tree could be viewed as a sampling unit. Number the sampling units starting from one. Then using a random number generator (on a calculator) or random number tables, select 5 sampling units that to be sampled. Once selected go to those specific sampling units and sample the area. In the case of tree crop divide the tree into 4 quadrants. Pick a fruit from each quadrant representing and from each of the lower middle and upper part of each quadrant. Also sample from the outer reaches of the branches and the inner (closer to the stem).

Maturity Indexing and Sampling

Maturity Indexing is, the process of monitoring the physiological development of fruit as it ripens. Taking of a few individual fruits from some trees in the orchard of the same cultivar. These fruits then represent all the fruits in that orchard and specific cultivar.
Before a crop can be harvested, it must be determined whether the crop is ready to be harvested. To this end maturity indexing is done for a crop.

Ready for harvesting does not necessarily mean that the fruit is mature or ripe. Different crops are harvested at different stages of development. Baby vegetables for example are harvested at a young stage mostly before the crop is mature. In vegetables such as carrots, beetroot and lettuce the size requirement for the crop may determine when it will be harvested.

Fruit crops and fruit bearing vegetables can be divided into two groups with regards to harvest. In the one group the fruit is harvested at a fairly green stage because full ripening will only occur post harvest. This often helps to prolong the shelf life of the produce. Examples of these crops include avocados, mangoes, bananas and tomatoes. Other fruit crops such as grapes, litchi’s and strawberries will not further ripen or improve quality after harvesting. This means these types of crops must be harvested when mature.

Maturity indexing information is used to plan harvesting, by determining whether fruit should be picked earlier or later than the historically recorded picking dates, and adjust orchard practices where needed.

![Maturity Indexing of Tomatoes](image)
Maturity indexing also provides information on how the internal physiological development of the fruit is progressing relative to other physiological factors, such as the colour and size. Equally importantly it allows the manager to assess how the fruit timing, or readiness for picking, and quality relates to the specific requirements and opportunities in the market.

The basic parameters that are assessed and monitored during maturity indexing are internal quality parameters and fruit colour, as defined by colour plates (Available from the different growers’ associations retailers and exporters).

There are four stages of ripening for tomatoes, pale green, early light red, light red (shoulders of fruit not full red yet) and a full red colour. Despite the outside colour, the flesh is already ripe and harvesting at any of these stages will produce an acceptable product. Some consumers prefer pale green to early light red fruits if they go camping for long periods of time, as the fruits will turn full red over time and the chances of rotting will be minimal. However, a housewife who is preparing a meal for her family would prefer a light red to full red coloured tomato.

Maturity indexing is a common practise in tree crops like citrus and mango and prescribed norms are available. In vegetable crops like tomatoes, colour changes can be used to classify maturity, but no fixed norms have been developed.

Many fruit are harvested when a desired colouring has developed. The colour development is used as an indication of internal ripeness.

In grain and other field crops, maturity is usually determined by the moisture content of the produce. For each of these crops there are set norms in terms of moisture content. Table 2.1 provides some of the norms as to the relation between moisture and harvest ability. When the crop is too dry, conditions in the silos can become instable and explosions may occur. If the moisture content is too high, problems with rotting and mould develop.

The moisture content norms at harvest for certain field crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Moisture content (%)</th>
</tr>
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<tbody>
<tr>
<td>Maize kernels</td>
<td>± 13%</td>
</tr>
<tr>
<td>Sunflower seeds</td>
<td>10 to 13%</td>
</tr>
<tr>
<td>Seed Cotton</td>
<td>±12% (for machine harvest)</td>
</tr>
<tr>
<td>Soybean pods</td>
<td>10 to 13%</td>
</tr>
<tr>
<td>Groundnut seeds</td>
<td>± 10%</td>
</tr>
</tbody>
</table>

**Sampling techniques**

In order to conduct maturity indexing, the crops must be sampled and then a specific test is performed on the sample.

**Fruit sampling – example citrus and tomatoes**

Sampling for maturity indexing are generally initiated two months before the historically initiation of the harvesting period of a cultivar.
It is important that the correct fruit is sampled on a plant. The first principle of sampling is that the sample must be representative of the bulk of the medium that is being sampled. A sample is not a piece or a section of a whole, but rather the whole reduced to a manageable volume.

Although a fruit sample must be taken randomly, the focus should be on fruit that represent the development stage of the bulk of the crop. The focus should also be on the fruit that is likely to be harvested in the earlier part of the season, referred to as the first pick. Unusually large or small fruit would not be included in the sample.

The sample is placed in a bag and the details of the field / orchard, the date of sampling is written on a label and sealed. Do not write on the outside of the bag, as the writing will wipe off.

**Sampling Field crops**

Using maize as an example the following applies for sampling field crops. The maize kernel goes through a number of developmental stages before maturing. One of these is the soft and hard dough stage. Pressing the kernel with a fingernail identifies the soft dough stage. If it releases a white milky substance the kernel is at the soft dough stage. This is the ideal stage for harvesting of green cob corn. If the same test is preformed and the kernel is still soft, but no milk flows from it, the hard dough stages has been reached, and at this stage the cobs are no longer suitable for cob corn. After this stage the kernels keep on losing moisture and become harder and harder. Physiological ripeness is reached when a black abscission layer develops between the ear and the individual kernel. At this stage the kernels can easily be removed from the cob by simply rubbing two ears over each other. The kernels will however still be too wet and harvesting cannot commence.

![Place where black abscission layer will develop.](image)

The abscission layer forming around individual maize kernels (left). On the right is an immature ear on which the arrow indicates the place where the black layer will develop.
In order to determine if the correct moisture content has been reached the following steps can be followed.

- Walk in a zigzag fashion through the maize field and pick ears from different plants spread out over the whole field.
- One should harvest enough ears to generate 5 kg of seed.
- Do not pick ears from the outside rows, as these plants are not representative of the field - Remove the leaves and thresh them.
- Place the seeds in a container and mix the seed of the different plants thoroughly.
- Now take a representative sample by taking hands-full of seeds from different places and at different depths out of the container. The sample should be at least 1 kg in mass.
- If there are no instruments available on the farm to determine the moisture content, the sample can be taken to a co-op, which handle grain crops.
- Determine the moisture content.
- If the moisture content is 15% or above, wait at least another week and repeat the procedure. Repeat this until the desired moisture content of 13 % or less has been reached.

Similar procedures can be followed for other grain crops. Talk to farmers in the area to learn from them how it should be done.

**Analysis of Fruit Samples**

The procedures set out in this section are applicable to citrus fruits. Similar tests are also conducted on tomatoes for the tomato processing industries where the brix, acidity and juice percentage is measured. Most other vegetable fruits and leafy vegetables will not be analysed chemically, while grain, oil etc. crops will only be monitored for moisture content. In the laboratory, details relating to the 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 following parameters are measured:

- Juice percentage;
- Brix, which relates to the total soluble solids or sugar content; and
- Acidity.

The ratio of Brix to acidity is a further parameter used by the industry to determine acceptability of taste for different markets.
The norms for different varieties are set at different levels. In the case of lemons, the only deciding factor for export is juice percentage, as neither Brix nor acidity levels are generally used for table fruit. In the case of niche cultivars, higher standards, meaning higher Brix and ratios, have been set to place the fruit in a particular marketing bracket. That standard has to be maintained to assure the producer of the potentially higher return from that market.

Recording Maturity Indexing Information

Once the internal quality results are received from the laboratory, the data is assessed relative to the management plan on the farm.

The maturity indexing information is stored in a file and presented as a graph to develop a picture of how the fruit is maturing. If orchard practices need to be changed to manipulate fruit development, maturity indexing is a key factor in guiding this.

<table>
<thead>
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<td>How to harvest a sample.</td>
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<td>Sample handling</td>
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<td>Basic sample processing</td>
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<td>The need for pre harvest samples</td>
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</table>
After completing this session, you should be able to:

SO 3: Harvest crops following specific prescribed procedures.

In this session we explore the following concepts:

- Crop harvesting in cropping industries.
- Post harvest crop handling.
- Basic harvesting procedures.

3.1 Harvesting Processes

Before harvesting can commence, a number of decisions must be taken and preparations must be made.

The harvesting process can be divided into sections. If for instance a reasonable percentage of the fruit in a certain orchard will not be fit for export because of external damage, a decision must be taken to pick the fruit that is more likely to be fit for export separately. Note that pickers who are entrusted with pre-selection in the orchard / field must be well trained and closely monitored to ensure that export fruit is not picked by mistake.

Based on the maturity indexing data and the crop estimate, a decision has to be taken on when picking will start, and on the picking period.

A decision can also now be taken on the number of pickers and picking teams that will be required. The necessary workers are recruited and trained, if necessary prior to the harvest.

In preparation for harvesting, a general inspection of the equipment is required to ensure that maintenance has been adequately seen to. Pruning shears, picking bags, ladders, bins or trailers, and tractors are inspected to ensure that they are in the proper working condition. All equipment that may come into contact with fruit must also be cleaned and sterilised to limit waste and decay.
Mechanical harvesters are very expensive and harvesting is often contracted out. It is therefore essential for a farmer to book the harvesters well in advance to prevent yield and quality losses due to too late harvesting. Contractors usually prefer to harvest all the fields in a particular production area before moving on to the next production area and will seldom return to an area in the same season. Therefore the planting time of the crops should also be seen as part of the harvest preparation, because if you plant earlier or later than the other farmers in the area, your crops development will not be in synchronization with the rest of the fields in the area and that can lead problems come harvest time. If a farmer, however, has his/her own harvesters, the latter is not of importance. As with contract harvesting, make sure to enquire and plan for contract labour, transport of the produce to markets, gins, silos etc., if it has to be contracted out.

### 3.2 Harvesting Methods

#### Fruit picking methods
- Snap picking; and
- Clipping

Snap picking is a method whereby fruit is twisted off sharply by hand without using an implement. Clipping makes use of specifically designed pruning shears that are used to cut the stem of the fruit. Clipping is generally recommended in most situations, but there are cases where snap picking, which is faster, is appropriate.

In the case of clipping, purpose-built pruning shears are used to cut the stem as close to the button, or calyx, as possible without injuring the shoulder of the fruit. Long stems of between 1mm and 4mm, which result from inefficient cutting, are a frequent problem in harvesting and can lead to injuries to fruit when they are put into the picking bags, trailers or bins. Injuries of this nature can cause the fruit to decay at a later stage. If fruit is handled roughly or if the shoulders are cut by inexperienced pickers or pickers who are not taking enough time, it also increases the risk of fruit decay.

Snap picking is not recommended for produce such as export citrus fruit for a number of reasons. The calyx buttons are pulled out easily, oleocellosis develops because of the pressure on fruit as it is pulled and twisted, and stems are sometimes not cleanly broken off. It is however appropriate in certain situations, such as when a team is sent in to select and pick non-export fruit.

Snap picking is often done in tomatoes and other vegetable fruit crops, while the use of clipping is often done to improve the quality of the produce less bruising and other physical damage associated with snap picking occurs.

#### Harvesting of leafy vegetables

In most cases the cabbage and lettuce heads are cut from the root at the base of the head and as close as possible to the soil surface, using a knife. Where individual leaves are harvested such as Swiss chard (spinach) or lettuce, the fingers are placed close to the base of the petioles and while firmly keeping hold of the petiole the leaf
will be removed from the plant in the same way as the snap pick procedure followed in tree fruit. This may, however, cause tearing of the petiole tissue and knifes could also be used for a cleaner cut.

### Harvesting of grain and seed crops

If small areas are to be harvested, maize ears can be harvested with the snap picking explained in session 3.1, while pruning shears can be used cut the heads of the sunflower stem. The ears can then be taken to the shed where the ear leaves have to be removed to gain access to the kernels. By simply rubbing the hand palm firmly over the ear, the kernels can be removed. An alternative is to rub two ears together. When soybeans are harvested it would be easier to cut the stem with pruning shears or any other sharp tool close to the soil surface, taking the stems to the shed and manually removing the pods from the stem there. The seeds can be removed by pressing hard on the sides of the pods to force it open.

### 3.3 Guidelines to Harvesting Crops

The section below summarises harvesting guidelines for selected crops.

#### Citrus

Once picking starts, a few basics guidelines should be adhered to, as set out below.

- Picking bags are suspended from the side of the pickers and not in front of them. This prevents damage to the fruit as the picker leans against a ladder or pushes into branches in the canopy.
- Pickers must walk with full picking bags and not run, as running will bounce and chafe the fruit, leading to the development of oleocellosis.
- When picking bags are emptied they should be placed close to or on existing fruit lying in the bulk bins or picking trailers before being emptied. This will also limit injury.
- Once a bag has been emptied, it must be opened and shaken to remove loose twigs, leaves and sand that might have collected during the picking process.
- Fruit that were dropped during the picking process must not be picked up off the ground and put with export fruit. Similarly, fruit lying on the ground and in contact with the soil should not be picked up and mixed with export fruit.

When varieties that are susceptible to oleocellosis are harvested, filling of bulk bins and trailers should be limited. The extent of the limitation will depend on the specific condition, but it would generally never be approximately 50% of the volume of the bin/trailer. As an added precaution, rubber or cardboard sheeting can be used to line bins providing protection.
Soft fruits such as tomatoes

Ensure that clear instructions are given on which colour fruits should be harvested and which should be left for the next picking. Follow the site procedures where they are available. Provide examples of some poor quality fruits and what should be done if such fruit are encountered. These fruits bruise easily and should not be thrown into the picking crates from a distance.

Ears, heads and pods - dry

As these are already dry, care should be taken to prevent the seeds from falling out of the head or pod before it reaches the threshing area. At this stage some diseases could have attacked the ears, heads or pods. The pickers should know how to identify these and should separate diseased pods and cobs.

Vegetable Crops

Vegetables should be harvested during the cool part of the morning and should be stored as soon as possible. If the produce is destined for the market, ensure that the storage conditions are correct for the produce. If they are destined for processing, they should be cooled and stored under refrigeration to preserve flavour and quality. You need to ensure that you know the basic harvest practice for each crop you are dealing with. What follows are some examples of harvest practices for different crops.

♦ **Beans** – green - Start harvesting before seeds develop in the pod – when the green pods are about the diameter of a pencil. To determine harvest readiness bend them in the middle, if they snap easily, they can be harvested.

♦ **Beetroot** - Harvest when they are about 5 to 8 cm in diameter. If the market is for smaller beets they can be harvested at about 2 – 3 cm diameter. The leaves should be about 10 – 15 cm long. The beet tops can also be eaten as greens.

♦ **Broccoli** - Harvest the dark green compact clusters or heads when they are about 15 cm in diameter. The buds must be tight and should be harvested before any yellow flower develops. As you harvest the heads, smaller side shoots will develop providing an almost continuous harvest.

♦ **Cabbage** - Harvest cabbage when the heads feel hard and solid. If left to late the heads will crack and split. Cut the heads from the stem just below the point of attachment to the stem. Ensure that you use a clean, sharp suitable knife. Always clean the knife using a dip mixture of suitable sanitizer in water. One can harvest the sprouts that develop as a later crop.

♦ **Cucumbers** - Harvest when the fruits are deep green and before a yellow colour develops. The cucumber fruit should be 5 – 8 cm long for sweet pickles; 13 – 16 cm for dill pickles, and 16 – 20 cm for slicing pickles. Harvest 4 to 5 times per week to encourage continuous production. Mature cucumbers left on the vine will stop the production of the entire plant.

♦ **Lettuce** - For non-heading types harvest the older, outer leaves from leaf lettuce when they are approximately 12 cm long. For heading types harvest when the heads are moderately firm but well before seed stalks form.
Onions - Harvest when the tops fall over and begin to turn yellow. Dig out the onions and place them to dry out in the open sun for a few days. The onions are sufficiently dry when skin is toughened. Remove the dried soil by brushing the onions lightly. Cut the stem, leaving 4 to 5 cm and store in a net bag in a cool, dry place.

**Tree crops - general**

- Do not shake the branches of the trees to make the fruits fall down as this will lead to bruising.
- Use ladders where possible.
- When harvesting for processing, a harvesting stick can be used where fruit are too high to reach but allow the fruits drop onto a soft surface, such as a net.
- When mango and avocados are to be exported or transported for extended periods, leave a portion of the stalk on the fruit.
- Do not throw fruits out during harvest.
- When harvesting heavy banana bunches use two people per bunch.
- Harvest in the early morning or late afternoon.
- Do the first grading according to market destination during harvest.
Ensure that the latex from mango, banana and paw paw does not come into contact with the skin of the fruit. If this happens wash the fruit in clean water.

Take care of your eyes, if harvested fruits contain latex juice.

Place your fruits on a well-aerated surface or in containers that are not made of rough surfaces.

Handle the fruit as little as possible.

Pack the fruits as soon as possible into the final transport box or container.

Export fruit may have to be cooled.

The basic principals or orchard hygiene are:-

- In order to avoid mould infections and rind damage a number of standard orchard hygiene practices could also be implemented.
- Prune trees of dead branches twigs.
- Prune the trees to allow light and air movement through trees.
- Harvest cultivars that are susceptible to splitting early.
- Never place fallen fruit into bins together with fresh fruit.

3.4 The harvesting checklist

The list provided below is a checklist of items that should be kept in mind before harvest commences.

- Harvesting equipment.
  - Maintain ladders, bins, picking bags and crates in good condition.
  - Wash and clean all equipment used for picking fruit.

- Harvest and the weather.
  - When harvesting during colder conditions the harvest should be during the warmer parts of the day to reduce the risk of skin damage in some fruit.
  - During hot conditions wilted fruit should not be picked and the orchard should be, irrigated before harvest.

- Handle fruit with care.
  - Wear gloves.
  - Have short fingernails.
  - Empty bags carefully.
  - Do not drop fruit.
  - Do not overfill bags or bins.
- Ensure farm road surfaces are smooth.
- Use minimum trailer tyre pressures to cushion the ride.
- Drive slowly to the packing shed.

Protect fruit from the sun.
- Keep harvested out of the sun.
- Erect shelters if necessary.
- Transport full bins directly to the packing facility.
- Bulk dip or spray a suitable post-harvest fungicide onto fruit within 24 hours of harvest where appropriate.

Please complete Activity 3 in your learner workbook.

My Notes ...

<table>
<thead>
<tr>
<th>Concept (SO 3-AC 1-4)</th>
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<tr>
<td>Harvest crops following specific prescribed procedures.</td>
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<tr>
<td>How the crops will be harvested for the specific enterprise as advised, is described.</td>
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<tr>
<td>How harvested crops will be handled before being transported to the processing or packing plant is described.</td>
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<tr>
<td>Illustrate How to harvest the crop as advised, is described.</td>
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<tr>
<td>The following of certain harvesting procedures are explained.</td>
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</table>
Session 4

Harvesting Safety and Hygiene

After completing this session, you should be able to:
SO 4: Adhere to personal health, hygiene and safety during harvesting.

In this session we explore the following concepts:
♦ Safety equipment used during harvest.
♦ The reasons for following hygiene procedures during harvest.
♦ Importance of reporting and treating accident.

4.1 Safety wear appropriate to harvesting crops and/or handling the harvested crop

■ Working with machinery

Operators should not touch any machine unless he/she is trained to conduct maintenance on the machinery. When machinery is involved, it is best to wear overalls, protective gloves and closed end shoes (not barefoot or sandals). All parts of the body, except the face is covered, reducing the risk of injury due to stray rocks or even plant debris during the harvest process.

Wear protective eyewear. Fine dust, soil and plant particles are always present during mechanical harvesting of dry products such as maize and soybean, and can cause severe eye damage. Due to the dust and fine particles surrounding the harvester at work, dust masks should be used to prevent these from being inhaled. Do not wear loose clothes that may be caught in moving parts of machinery.

■ Safety during hand harvesting

Wear overalls and closed shoes. Although no machinery is involved, grass leaf blades can cut exposed skin. Some crops such as tomato contain chemicals that may irritate the skin. Unprotected feet may be injured if harvesting bins are dropped on
the foot. If pruning shears, knives or other tools with blades are used during the harvesting process, wear protective gloves.

- **Post Harvest**

When machinery is involved, it is best to wear overalls, protective gloves and closed shoes. Post harvest treatment of the produce may involve the use of chemicals. In such situations ensure that the correct Personal Protective Equipment is used.

- **Personal hygiene and health**

To prevent contamination of produce with human related diseases, all labourers should practice strict personal hygiene and should know that their health may affect the safety of the end user.

Important rules to adhere to are listed below:

- Wash hands under running water and with soap after each visit to the bathroom.
- Wear a hair net if you are involved in packing and further processing of the produce.
- Wear a mask over the mouth and nose if you have to handle fruits and vegetables.
- In the case of a severe cold or other disease, inform your employer or group leader so that the correct health procedures can be followed.
- If you have or if you suspect you have some other contagious disease, inform your employer or group leader so that the appropriate measures can be followed. This may involve you being used in aspects of the harvest process which will not place you in direct contact of the produce etc. Remember your problem might be curable, but if you do not inform or trust your employer or group leader with this information, you could suffer unnecessarily.
- When you have open wounds on your body, cover it with clothes or bandages. Replace bandages at least once a day and make sure you are treating the condition correctly. If the wound is on the hands, use gloves when the produce has to be handled. Also inform your employer or group leader of this situation, to ensure the right health procedures are followed.
- In case of an accident during the harvesting or post harvesting of the crop, call the person(s) responsible for first aid to the scene of the accident, and then inform the group leader and employer immediately.
- If a fellow worker is not adhering to the rules set out by the employer, report it to the group leader or employer promptly. Rules are usually set to protect all role players in the harvesting process, this includes you, and a person not following these rules are not only endangering him/herself, but you also. Therefore, love yourself and report any potential problems promptly.
**Safety and the use of loaders and fork lifts**

The safe and efficient operation of any equipment, including loaders, is the sole and direct responsibility of the operator. Experience and skill in this type of task can only be gained through training and supervision.

It is important that a safety inspection program is followed. Such inspections allow for the detection of unsafe equipment and unsafe conditions early. In this way counter measures can be set up before someone is injured. However accidents do occur and should someone be injured the injury must be reported immediately so that the injury can be properly treated and produce is not contaminated. This also allows for an injury record to be evident over time. Such records will highlight potential problem areas that can be eliminated from the harvesting procedures.

General safety inspections should be conducted daily before the equipment is being used. So checkpoints for equipment such as tractors and forklifts are:

- Check water, fuel, fan belts, etc.
- Once engine is running, check hand and/or air brakes, this ensures that brakes will hold while loading.
- Inspect hydraulic lines for kinks, cracks, and general wear and tear.
- Inspect the frame for hairline cracks, or fatigue in the metal. Cracks in the metal may cause the equipment to break either completely or parts coming off.
- Pickers must be at a safe distance from the equipment when loading or unloading bins.
- Operators must be aware of the location of the harvesters at all times. Drivers and operators must be on the look out for harvesters on ladders while driving through an orchard.
- Operators must look out for overhead power lines during loading and unloading of fruit.
- Always discuss unsafe acts seen during the day with the supervisors so that preventative measures can be developed and implemented.

Please complete Activity 4 in your learner workbook

My Notes ...

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### Concept (SO 4-AC 1-4)

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<tr>
<td>The types of safety clothes or equipment used during harvesting are described.</td>
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<tr>
<td>Why it is necessary to follow certain basic hygiene procedures during harvesting are explained.</td>
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<tr>
<td>The importance of revealing minor accidents that result in cuts or minor wounds to management and have it taken care of is discussed.</td>
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### My Notes ...

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Session 5 Waste Disposal

After completing this session, you should be able to:

SO 5: Dispose of waste.

In this session we explore the following concepts:

♦ Categorisation of Waste.
♦ Importance of following waste disposal procedures.
♦ Waste collection.

5.1 Handling Waste

Often much of the harvested produce is lost. This is because fresh produce tends to go into a steady decay almost immediately after harvesting. Although post harvest treatments will preserve the produce to some extent, there is always some extent of post harvest wastage. The amount of waste that is generated should be minimized.

To minimize such damage, care must be taken to ensure that fruit is not damaged in any way. Losses associated with wastage extend beyond the physical loss the produce itself. Such wastage leads to reduced income, they contribute to environmental pollution. Most fresh produce farms will however have an area set aside where harvest wastage is either stored and later used as animal feed, or is composted. Such areas must be at a distance from both the fields and the processing areas.

Waste produced during the harvest process

Waste in this sense is a plant residue left on the field after harvesting. Examples include:

♦ The stubble, cobs and leaves of a maize plant.
♦ The stem leaves and discarded fruit of tomatoes and other fruit crops.
♦ The stem and wrapper leaves of a cabbage crop.

Such materials are normally degradable and seldom cause environmental problems. However crops diseases and pests maybe harbored in such material, and should therefore be allowed to completely decompose before the new crop is introduced.
After harvesting various non-degrading or slow degradable waste are generated. These include:

- Damaged plastic bags in which produce were to be packed, plastic bags, which contained the packing material.
- Cardboard boxes in which packing materials were delivered.
- Broken/damaged picking containers.
- Un-repairable harvest tools and equipment

### Dealing with waste produced during harvesting

Firstly, waste in this case does not necessarily have a negative connotation. The waste or rather plant residue produced during harvesting are the plant parts (leaves, stems, cobs, heads etc.) that do not contribute to the yield of the crop. These are often left on the field after harvesting. The following processes can be followed to deal with such waste:

- The plant residue can be left on the field where it can be used as:
  - Animal feed. Cattle etc. can be allowed onto the field after harvesting and utilize the plant material in producing milk and meat.
  - Mulch. The plant residue can be chopped into smaller particles with a disc implement pulled by a tractor. The plant residue then acts as a mulch to protect the soil against water and wind erosion.

- The plant residue can be incorporated into the soil during primary cultivation and in this way replace some of the nutrient which were extracted out of the soil during the growth of the crop.

- The residue of some crops like soybean, peanut and wheat can be baled and removed from the field. This is again used to feed animals.

- Maize residue can be put through a hammer-mill to reduce the particle size. This chopped rest are stored in bags and can be used as is, or mixed with molasses etc. to be fed to animals.

- Where diseases are problematic or no there is no other use for the rest, it can be burn to get rid of it in an easy and quick way.

- The residue, especially if it is still green and moist, can be used in the making of compost, which can be used as an alternative to inorganic fertilizers.

- Discarded vegetables and fruits can also be used in the making of compost. Do not use diseased material for this.

- Discarded vegetables and fruits can be used as animal feed.

- Diseased material should be discarded of in a safe way by burning or burying it in a pit, far away from the crop fields.

Most of the plant residue can therefore be used successfully in other farming enterprises, contributing to the overall success of the farm.
The non-degradable waste requires extra care. A few examples of process that can be followed to deal with such waste are provided below.

- Recycling of plastics, cardboard, glass etc.
- If recycling is not an option, discard waste in a safe way. Away from animals and where children play, ideally making use of purpose build waste disposal areas.
- Discard of the waste by putting it in a pit and covering it with soil as soon as the pit is full. Keep record of where such a pit was dug to prevent later problems when the pit is opened up by accident.

Some of the waste can be use in alternative ways. Cardboard boxes can for example be used to store gloves, picking bags etc.

**Waste management planning and record holding**

Plant residue can be accommodated in different safe and useful ways on the farm. It remains advisable that a waste management plan includes the processes for dealing with such waste. All harvesting personnel must know the areas for composting or dealing with the biological material.

Keeping records of waste management remains important, as it provides an account of the type of waste being produced and what it can be used for. Especially where the plant residue is used as animal feed. This helps for planning fodder flow of an enterprise. The same principal can be applied for compost. Knowing the type of residue that may be available and when it could become available makes scheduling the composting and compost use possible.

Keeping records of recyclable materials allows one to determine the extent of waste that is produced. This in turn adds in the planning for numbers of waste bins that may be required per waste type, and the scheduling of waste removal.
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<td>Importance of following waste disposal procedures.</td>
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<td>Waste collection.</td>
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## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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<tbody>
<tr>
<td>Combine harvester</td>
<td>A farm machine which firstly cuts and then threshes (separating grain from the hulls) grain.</td>
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<tr>
<td>Fresh produce</td>
<td>Perishable produce like fresh fruit and vegetables</td>
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<tr>
<td>Fungal spores</td>
<td>Reproductive and survival bodies of Fungi.</td>
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<tr>
<td>Gin</td>
<td>Process whereby the cotton fibre is removed from the cotton seed.</td>
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<tr>
<td>Industrial crop</td>
<td>A crop where the produce has to go through a factory process before it can be used. Exp. wheat kernels have to be milled to make flour before we can bake bread. Also seed cotton has to be ginned to get the fibre which is used in making of yarn and material.</td>
</tr>
<tr>
<td>Microscopic</td>
<td>Things so small, it can only be seen with the aid of a microscope.</td>
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<tr>
<td>Physical damage</td>
<td>Damage caused to fruits by harvesting equipment, when it is dropped from distance to the ground or thrown into a basket or simply touched very hard.</td>
</tr>
<tr>
<td>Produce</td>
<td>Any part of the plant which can be harvested and marketed Exp. maize grain, tomato fruit, spinach leaves, seed cotton etc.</td>
</tr>
<tr>
<td>Propagation material</td>
<td>Plant propagation material such as Seed, tubers, seedlings, rootstocks, etc. used in establishing the crop.</td>
</tr>
<tr>
<td>Shelve life</td>
<td>How long produce can last (remain fresh) before it loses quality</td>
</tr>
<tr>
<td>Silo</td>
<td>Structure in which grain is stored</td>
</tr>
</tbody>
</table>
Bibliography

### Books:

- SWANEVELDER, C.J., 1998 Groundnuts - always tops. ARC - Grain Crops Institute

### World Wide Web:

- [www.nda.agric.za](http://www.nda.agric.za) - crop production manuals for various crops.

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**Terms & Conditions**

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**No user is allowed to sell this material whatsoever.**
Acknowledgements

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

- **Developer:**
  Mr R Meinhardt

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY
REGISTERED UNIT STANDARD:

Harvest agricultural crops

<table>
<thead>
<tr>
<th>SAQA US ID</th>
<th>UNIT STANDARD TITLE</th>
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<td>116201</td>
<td>Harvest agricultural crops</td>
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<tr>
<th>SGB NAME</th>
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<td>SGB Primary Agriculture</td>
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<tr>
<td>Field 01 - Agriculture and Nature Conservation</td>
<td>Primary Agriculture</td>
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<td>2007-10-13</td>
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PURPOSE OF THE UNIT STANDARD

A learner achieving this unit standard will be able to harvest crops as advised making use of basic harvesting tools.

Learners will gain specific knowledge and skills in harvesting techniques and will be able to operate in a plant production environment implementing sustainable and economically viable production principles.

They will be capacitated to gain access to the mainstream agricultural sector, in plant production, impacting directly on the sustainability of the sub-sector. The improvement in production technology will also have a direct impact on the improvement of agricultural productivity of the sector.

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 1: Demonstrate a basic understanding of the structure and function of a plant in relation to its environment.
- NQF 1: Demonstrate an understanding of the basic concept of sustainable farming systems.

UNIT STANDARD RANGE

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

SPECIFIC OUTCOME 1
Use appropriate tools / equipment for pre-determined harvesting method.

OUTCOME RANGE
Harvesting methods according to specific production context include, but are not limited to harvesting by hand, machine harvesting, and the use of certain equipment as advised.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
What tools to use for which harvesting process as advised are explained.

ASSESSMENT CRITERION RANGE
Tools, according to specific production context include, but are not limited to hands, trays, crates, picking bags, shears, ladders, etc.

ASSESSMENT CRITERION 2
The safe use of the harvesting tools as advised is demonstrated.

ASSESSMENT CRITERION 3
The basic safety precautions to be adhered to while handling the harvesting tools are described.

ASSESSMENT CRITERION 4
How the tools are cleaned and safely stored are demonstrated.

SPECIFIC OUTCOME 2
Carry out sampling for maturity indexing according to pre-determined requirements.

OUTCOME RANGE
Sampling may include, but is not limited to sampling by hand, etc.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
How to harvest the sample as advised is explained.

ASSESSMENT CRITERION 2
How the sample would be handled for testing is described.

ASSESSMENT CRITERION 3
The basic processing of the sample is discussed.
ASSESSMENT CRITERION 4
Why it is important to sample correctly is explained.

SPECIFIC OUTCOME 3
Harvest crops following specific prescribed procedures.

OUTCOME RANGE
Prescribed procedures include, but are not limited to quality specifications, maturity specifications, etc.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
How the crops will be harvested for the specific enterprise as advised, is described.

ASSESSMENT CRITERION 2
How harvested crops will be handled before being transported to the processing or packing plant is described.

ASSESSMENT CRITERION 3
Illustrate How to harvest the crop as advised, is described.

ASSESSMENT CRITERION 4
The following of certain harvesting procedures are explained.

SPECIFIC OUTCOME 4
Adhere to personal health, hygiene and safety during harvesting.

OUTCOME RANGE
Personal health, hygiene and safety include but are not limited to covering minor cuts and wounds, washing hands, covering hair and the removal of jewellery etc.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
The types of safety clothes or equipment used during harvesting are described.

ASSESSMENT CRITERION 2
Why it is necessary to follow certain basic hygiene procedures during harvesting are explained.

ASSESSMENT CRITERION 3
The importance of revealing minor accidents that result in cuts or minor wounds to management and have it taken care of is discussed.

SPECIFIC OUTCOME 5
Dispose of waste.

OUTCOME RANGE
Waste includes, but is not limited to any bio-degradable or non bio-degradable materials that are not accepted as the primary product. Bio-degradable materials include parts of plants, fruit, flowers, etc. Non bio-degradable materials include, but are not limited to plastics, glass, metals, etc.
ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
How waste is categorized is explained.

ASSESSMENT CRITERION 2
The importance of disposing of waste as prescribed is explained.

ASSESSMENT CRITERION 3
Demonstrate and describe How waste is collected as prescribed is demonstrated and described.

ASSESSMENT CRITERION 4
How waste is loaded and/or deposited according to procedures is described.

SPECIFIC OUTCOME 6
Care for and maintain equipment used during harvesting under close supervision.

OUTCOME RANGE
Care and maintaining of equipment include but are not limited to the oiling, sharpening, cleaning, sterilizing and storage of equipment as prescribed. Equipment include, but are not limited to hand tools, power tools, machinery, etc.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
Why it is important that equipment is cleaned, sterilized and stored as prescribed is explained.

ASSESSMENT CRITERION 2
How you would clean and maintain the equipment used in the specific enterprise is demonstrated.

ASSESSMENT CRITERION 3
How you would store the equipment is described.

ASSESSMENT CRITERION 4
The procedure followed should you find defaults in the equipment is described.

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.