

UNIT

9



# Harvesting Citrus Fruits



LEARNING / FACILITATING MATERIALS

CITRUS PRODUCTION  
NATIONAL CERTIFICATE I



CAADP



NEPAD  
TRANSFORMING AFRICA



implemented by

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für Internationale  
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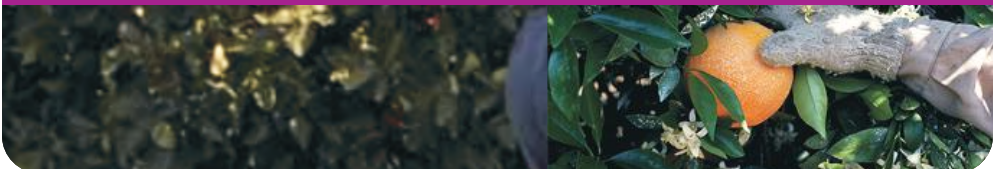




## Introduction

Citrus fruits are harvested when matured or ripe. Harvesting is the process of collecting fruits that are matured from the fields. Harvesting at the wrong time will lead to undesirable consequence such as fruit rot and post-harvest losses. This unit will help the learner to understand the necessary techniques and methods used for harvesting citrus fruits so as to gain high value for the product.

This learning material covers all the Learning Outcomes for harvesting in citrus for the **Certificate I programme**.



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## Demonstrate knowledge of harvesting.

In this LO, you will learn about the methods of harvesting, the importance of harvesting fruits at the right maturity and at the right time of the day and demonstrate proper handling of harvested fruits.

### PC (a) Describe methods of harvesting/plucking.

Harvesting is the removal of mature fruits from the plant. The harvest marks the end of the growing season or the growing cycle for a particular crop. In citrus unlike other fruits, once you pick the fruit, it does not increase in sweetness or ripen.

Citrus trees bear fruits in about three to five years from planting propagated seedlings and can be harvested after five to six months from flowering depending on the species, cultural management, and the environment.

For some varieties, fruit should be harvested when it has developed full colour and most importantly full flavour. For other varieties such as Valencia, oranges may be greenish in appearance but still be fully ripe.

#### Methods of harvesting

There are two methods of harvesting citrus fruits, namely:

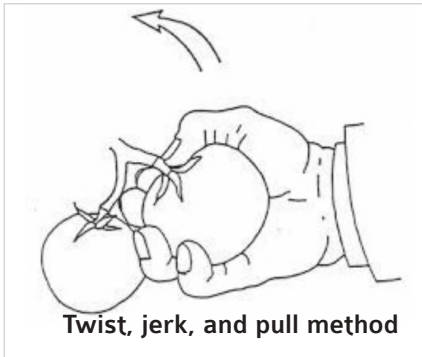
- Manual method
- Mechanical method

#### Manual method

For manual method, fruits are harvested by cutting them off with pruning shears, clippers or by pulling the fruit stalk from the tree.

The manual method includes hand picking, (where harvesting of citrus fruits is done by pulling or clipping from the stem). The general rule is "twist, jerk, and pull". This procedure is highly recommended for tight-skinned citrus like the Late Valencia. This method is used when the fruit is within a reachable height.

However, the method is not recommended for harvesting tangerines as the skin around the (stem end) will pull away from the fruit. The fruit will then be open for infection and will deteriorate rapidly. To prevent damage, clip the fruit off by cutting the stem just above the button. Lemons to be stored should also be clipped off in the same manner. Also the use of simple tools such as the clippers and ladder can be classified under the manual method of harvesting citrus fruits.



Also the use of simple tools such as the clippers and ladder can be classified under the manual method of harvesting citrus fruits.

The ladder is used to scaffold the one doing the cutting to a height where he or she can cut or detach the fruit from the tree. In place of the ladder other machines (power ladders) can be used to achieve same results. Power ladders are used to harvest fruit that cannot be reached from ground level. The clipper's blades are designed and shaped in such a way that they will fit into the calyx of the fruit, cutting the stem off as close to the calyx as possible.

### **Mechanical method**

This involves the use of heavy machines or it's an automated form of harvesting citrus fruits. Mechanical harvesting of citrus fruits can be broadly classified as contact machines and mass- removal machines. The contact machines consist of the positioning mechanism and the picking hand or arm.

The mass removal machine operates by applying force or shaking the trunk to remove fruits. Both methods come with a catch frame system which is incorporated to catch the fruit. However mechanical harvesters cannot harvest selectively.

Figure A shows a mass removal machine used for harvesting citrus.



**Figure A**

## **PC (b) Explain the importance of harvesting fruits at the right maturity.**

Harvesting/plucking at the right maturity and time of day

Unlike other fruits, citrus does not exhibit further ripening after harvest so picking at the right stage of maturity is most important. Every variety of citrus has a slightly different time to mature. But generally after fertilization it takes;

- Grapefruit - 11 months
- Lemon - 8 months
- Sweet orange - 9- 15 months to mature. (Valencia oranges take 12 to 15 months to mature)

In Ghana, maturity time for harvesting the

- Mediterranean and Red Blood is from October to December
- Late Valencia is March or September

Oranges develop their sweetness over time on the tree, so taste test some each week before you decide to harvest. Depending on the variety, oranges will stay fresh on the tree for two to six months. Overripe oranges will turn soft and then fall from the tree.



To accurately predict when fruit should reach optimum maturity, maturity parameters are monitored weekly.

The following table shows the right maturity time for the various types of citrus produced in Ghana.

<b>Maturity time</b>	<b>Type of citrus</b>
Mid-season (Oct.-January)	Sweet orange
Late maturity (March-April)	
(May-June) and (Sept.-Oct.)	Grapefruit
	Lemons
	Lime
	Tangerine

## **PC (c) Explain the importance of harvesting at the right time of the day**

### **Time for Harvesting Fruits**

The picking/harvesting time is also known as the NPP (Normal Picking Period). This is an indication of the daylight hours available during each of the normal harvesting months.

As picking cannot take place early in the morning when fruit might be wet from overnight dew, the best time to harvest is from 8 a.m. to 3 p.m. During this period, the dew has already dried up and the fruits have already lost their turgor.

Turgid fruits are easily bruised, resulting to olleocellosis (brown spot on the rind/peel with slight bruises). This is a direct injury to the oil cells of the fruits in its rind. The physiological disorder appears as brown patches on the rind, greatly lowering the fruit quality.

## **PC (d) Demonstrate proper handling of harvested fruits**

### **Post-harvest handling.**

This involves the proper handling of harvested citrus fruits and it includes;

- Careful packing of the sorted fruits in plastic crates.
- Avoid using large and deep containers because it cause losses due to compression injury. Appropriate container size is also important for repeated



- manual handling operations during transport.
- Avoid rough handling particularly during loading and unloading to prevent fruit injury.



## Self-assessment

### PC (a)

1. Compare the use of manual and mechanical methods of harvesting citrus fruits. Support your findings with two advantages and disadvantages each of using any of the above methods.

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### PC (b)

1. Complete the table below.

TYPE OF FRUIT	VARIETY	MATURITY RANGE
Sweet orange		
Lemon		
Tangerine		

### PC (c)

1. State two (2) reasons why you will harvest citrus fruits late mornings and late afternoons.

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### Pc (d)

2. State two (2) reasons why it is necessary to properly handle citrus fruits after harvesting?

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## Demonstrate understanding of pre-harvest preparation.

In this LO, you will learn to identify tools and equipment for harvesting citrus fruits, identify the stages of fruit maturity, demonstrate methods of checking the brix level of fruits and prepare gathering shed for receiving fruits.

### PC (a) Identify appropriate tools and equipment for harvesting citrus fruits

#### Tools & Equipment for Harvesting Citrus Fruits

When harvesting citrus you need to use the correct harvesting tools for the job to ensure your fruit leaves the farm in the best possible condition. These tools can be grouped or classified into two; Cutting and conveying tools. Commonly used cutting tools for harvesting citrus fruit are secateurs or knives, hand held or pole mounted picking shears.

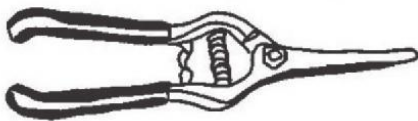
For some types of citrus, a glove is also used while harvesting, worn on the hand that touches the fruit.

Steel clippers are used to cut the stem of the fruit as close to the calyx as possible without injuring the fruit.

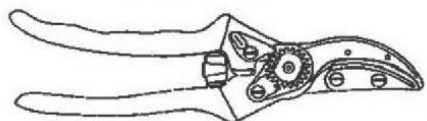
Picking bags have a single strap and are slung over the shoulder of the picker, with fruit placed into the bag as it is picked, after which the bag is taken to a general collection point where it is emptied into bulk bins or picking trailers.

Ladders are used during harvesting only when needed to reach fruit in the top of trees. See below, some basic tools used for harvesting citrus fruits

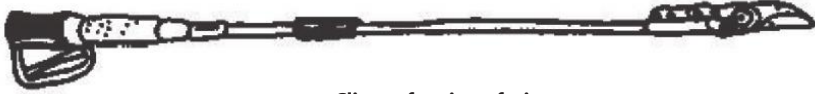
Thin curved blade for grapes and fruits:



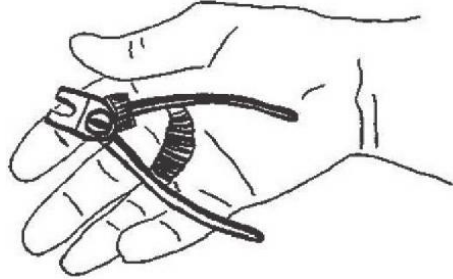
Cut and hold hand shears:



### Pole mounted cut and hold picking shears:



### Clipper for citrus fruits:



### Citrus Clipper

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The clipper's blades are designed and shaped in such a way that they will fit into the calyx of the fruit, cutting the stem off as close to the calyx as possible. The shorter the remaining stem, the less damage to other fruit during the harvesting & packing process.

### Lemon Clipper

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The citrus clipper also has a rounded tip to ensure the skin of the fruit is not carelessly damaged during harvesting.



## PC (b) Identify the stages of fruit maturity

### Stages of Fruit Maturity

Fruit maturity refers to when fruit is ready to be picked and eaten. A mature fruit is one that has completed its growth phase. This will also ensure that it completes its ripening phase and reaches optimal quality for consumption, because a fruit cannot ripen until it reaches maturity.



It is important not to confuse the terms 'ripe' and 'mature'. They are usually used synonymously, but they actually mean different things.

Ripening is the term used to describe the changes that occur within the fruit from the time it reaches maturity to the beginning of decay. These changes usually involve starch converting to sugar, a decrease in acids and a softening and change in the fruit's colour.

Citrus fruits pass from immaturity to maturity to over-maturity while still on the tree. Once they are separated from the tree, they will not increase in sweetness or continue to ripen, meaning that the internal quality of the fruit will not change further. The only change that may happen after being picked is that they will eventually start to decay hence it is very important to pick citrus only once the internal quality factors meet market requirements.

## PC (c) Demonstrate methods of checking the brix level of fruits.

### Brix level in citrus fruits

Brix (total soluble solids): Is a measure of the total soluble solids in the juice. These soluble solids are primarily sugar, sucrose, fructose and glucose. Citric acid and minerals in the juice also contribute to the soluble solids. Brix is reported as "degrees Brix" and is equivalent to percentage. For example, a juice which is 12 degrees Brix has 12% total soluble solids.

## Methods and instruments for checking brix level of citrus fruits

Brix level of citrus fruits can be tested using any of the following instruments

- Hydrometer
- Refractometer
- The titration method.

However, at this level the use of hydrometer and refractometer will be considered.

### HYDROMETER:

The brix content (mostly soluble sugar) is determined using a hydrometer to measure the specific gravity, which is converted to degrees brix using the tables

with specific gravity and their corresponding sugar content (using interpolation if necessary) to give the brix level.

### REFRACTOMETER:

Procedure:

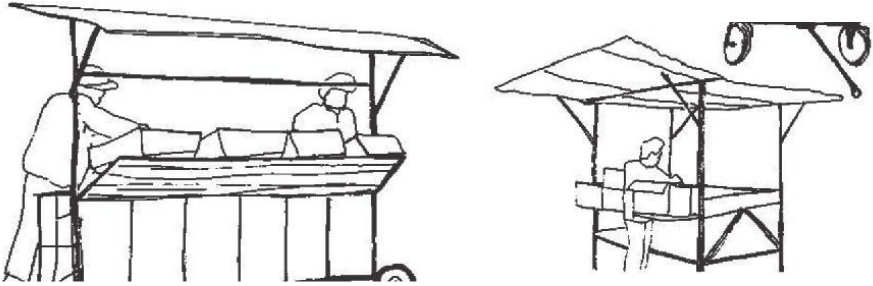
1. Ensure the refractometer prism surface is clean and dry.
2. Place a small amount of fresh juice (a couple of drops is sufficient) onto the prism of the refractometer.
3. Look through the eyepiece while pointing the prism in the direction of good light (not directly at the sun).
4. Focus and take the reading of where the base of the blue colour sits on the scale and record the % percentage sugar ( $^{\circ}$ Brix).



## PC (d) Prepare gathering shed for receiving fruits

### Gathering shed

After harvesting, citrus fruits must be collected and grouped at a particular place for other activities such as sorting, grading and transportation. To avoid sun burn which affects the shelf life and quality of harvested fruits, construct a well-ventilated temporary structure to house the



### Examples of gathering sheds



**Note:** any material can be used in preparing a gathering shed as long as it serves its purpose.

### Basic procedure for preparing citrus fruit shed

- i. Identify a suitable site
- ii. Identify suitable tools and equipment
- iii. Clear the site
- iv. Select materials for construction (wood, metals, leather)
- v. Determine size of shed
- vi. Construct shed
- vii. Provide other furniture

Note: observe safety in constructing the shed



## Self-assessment

### PC (a)

1a. Sketch and label the major parts of the following harvesting tools

i. Clipper

ii. Pole picking shears

1b. State one use each of the tools sketched (in Q1a) above

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**PC (b)**

1. Discuss whether or not colour can be used as an indicator for citrus fruit majority

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**PC (c)**

Perform the following activities:

1. Using the refractometer, demonstrate how to check the brix level of citrus fruit. Discuss your findings with your classmates.

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2. Taste the citrus fruits individually and assess the sweetness level.

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3. In groups of four, discuss and compare the results of Q2 with the recorded Brix levels in Q1.

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Figure A shows a mass removal machine used for harvesting citrus.



## Demonstrate understanding of plucking citrus.

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In this LO, you will learn to identify appropriate period for plucking, demonstrate the various methods of gathering fruits and apply safety measures in harvesting fruits

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### PC (a) Identify the appropriate period for plucking

#### Plucking

Plucking is a form of harvesting which refers to the actual physical removal of the fruits from the tree (usually by hand).

Learners may refer to unit 8 (harvesting) LO 1 for more information.

#### Procedure for plucking citrus fruits

- i. Decide the maturity of fruit
- ii. Identify necessary materials and tools for plucking
- iii. Plan the time suitable for plucking
- iv. Prepare a gathering shed
- v. Determine the quantity of labour required
- vi. Carry out the act of plucking
- vii. Assemble fruits

### PC (b) Demonstrate the various methods of gathering fruits.

#### Gathering of Citrus Fruits

Citrus fruits can be gathered using two main methods; Manual gathering  
Mechanical gathering

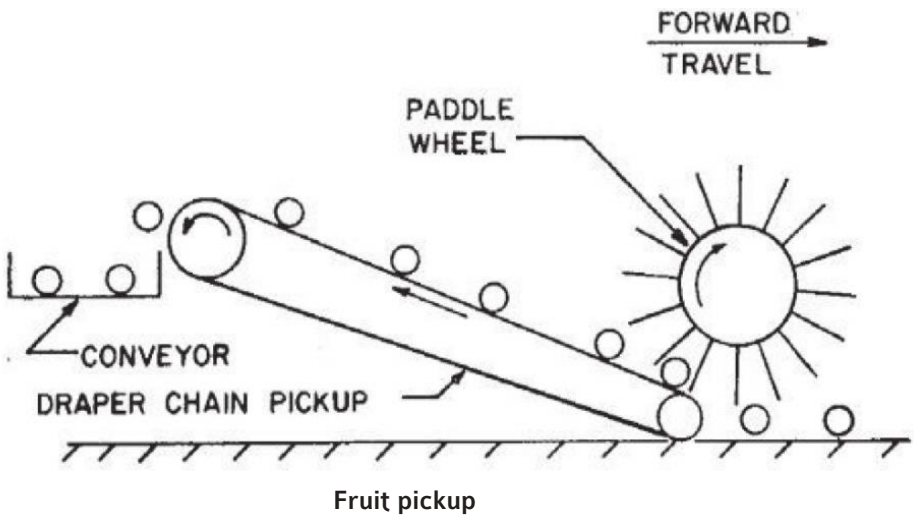
Manual gathering involves the personal conveying of fruits from various points to a gathering point. The use of carrying sacks, crates and other manual conveying equipment is key here. In manual gathering care must be taken so as not to damage or injure the fruits



Manual gathering of harvested citrus fruits

Mechanical gathering involves the use of machines to gather harvested citrus fruits to a point of collection. Some mechanical gathering methods are;

- Raking machines
- Fruit pickup machine



## PC (c) Apply safety measures in harvesting fruits

### Safety measures to be observed when harvesting

Safety can be grouped into three when harvesting citrus fruits. The table below shows some recommended safety measures

PERSONAL	TOOLS	OTHERS
<ul style="list-style-type: none"><li>• Wear protective clothing: long sleeves, trousers, sturdy shoes, gloves, goggles.</li><li>• Apply insect repellents if available to keep nuisance pests away</li></ul>	<ul style="list-style-type: none"><li>• Wash, clean, oil tools and equipment used in harvesting.</li><li>• Repair any tool or equipment malfunctioning</li><li>• Use the right tool for the right work</li></ul>	<ul style="list-style-type: none"><li>• Train other workers or people on how to safely use tools, equipment and also techniques involved in harvesting.</li></ul>



## Self-assessment

### PC (a)

- 1a. State and explain the appropriate period for gathering citrus fruits.

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### PC (b)

- 1a. Visit a nearby farm where fruit are being gathered and participate in the gathering activity.

- 1b. Prepare reports and share with your classmates

