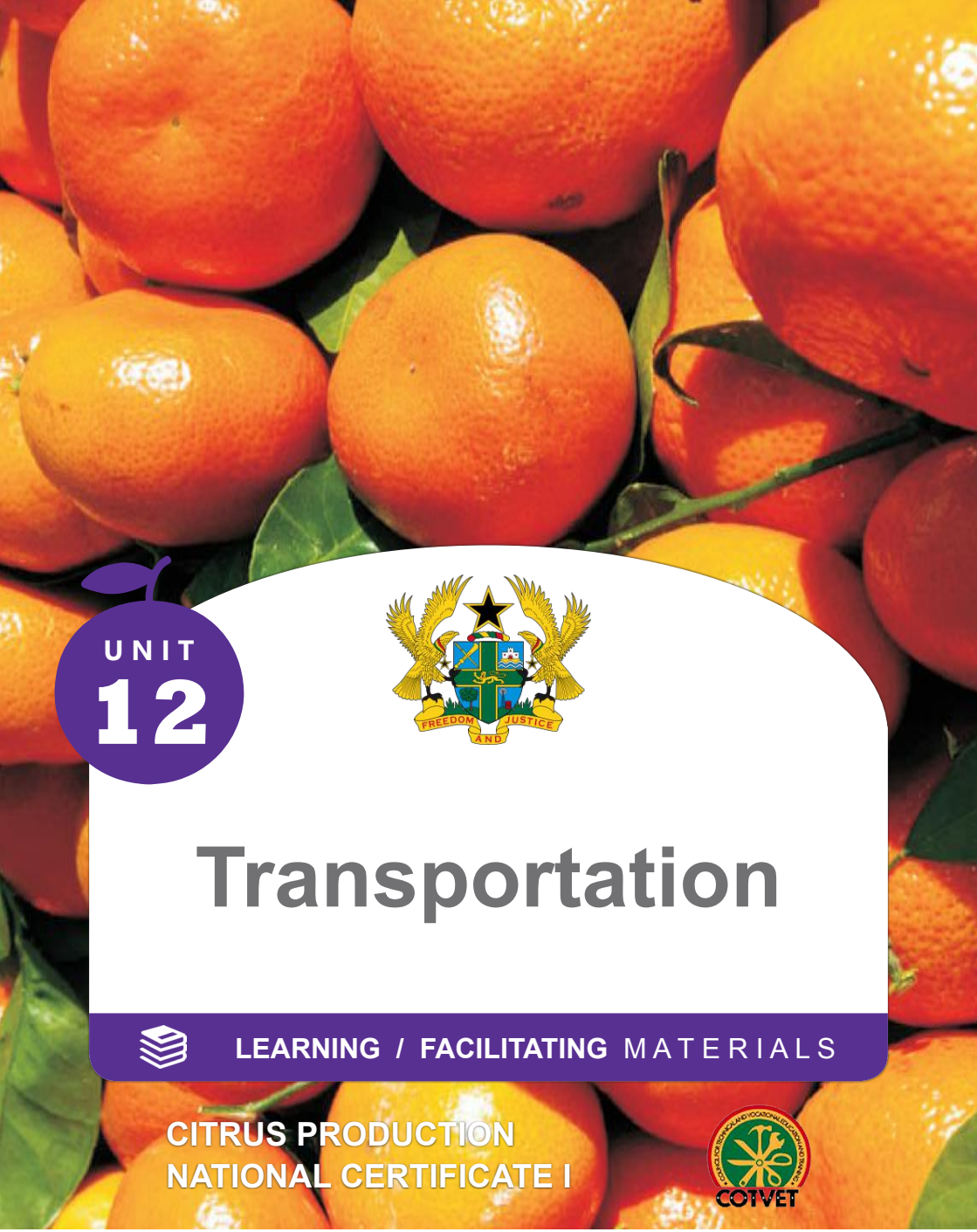

UNIT 12

Transportation

LEARNING / FACILITATING MATERIALS

CITRUS PRODUCTION
NATIONAL CERTIFICATE I

COTVET

CAADP

NEPAD
TRANSFORMING AFRICA

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by:
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Introduction

Citrus fruits after harvest are conveyed from the farm site to the pack house, processing unit or markets. The act of conveying from one location to the other is termed as transportation. This unit will help the learner to understand the entire recommended process of transporting citrus fruits from one location to a designated destination while maintaining the quality and value.

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

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LEARNING OUTCOME **1**

Demonstrate understanding of fruits transportation.

In this LO, you will learn to identify the appropriate methods of transportation, demonstrate the appropriate methods of loading and off-loading, explain and apply the appropriate standards for transporting.

PC (a) Identify appropriate methods of transportation

Harvested citrus fruits may be transported within cities, towns and between countries. There are several means by which this can be done, for example;

- air
- sea
- land (rail, truck)

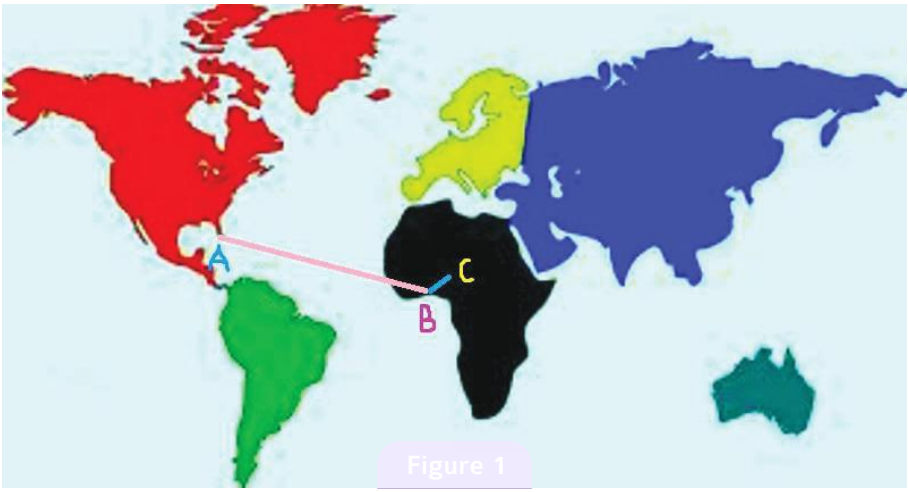

Figure 1

PC (b) Demonstrate the appropriate methods of loading and off-loading citrus fruits

Appropriate methods of loading and off-loading citrus fruits

Citrus fruits are mainly loaded in cartons (plastic containers), boxes and fruit crates made of corrugated board or wood. In some cases they are loaded into a loose truck and then transported to a nearby local market. Plastic containers have an advantage over the wooden boxes and sacks because they give protection to the fruit and easy to clean and stack.

Loading of citrus fruits

In order to avoid mechanical damage to fruits, containers that provide adequate protection to the fruit must be used and well stacked while fruits are transported. The loading of citrus fruits into containers can be done manually or mechanically (the use of machines).

Manual loading

Manual loading

During loading, pulp temperature measurements must be performed continually. The pulp temperature must be between 4°C and 25 - 30°C as storage life and appearance are impaired outside this range (fruits must be transported in the morning and late evening). Fruits punctured for pulp temperature measurement must be discarded as they would rapidly spoil and infect the other fruits.

Note: citrus fruits must not be packed to the brim so that the next box will not have direct contact with fruits beneath.

a. Procedure for loading citrus fruits from the farm

i. Identify suitable vehicle
ii. Discuss terms and timing with vehicle/transport owners
iii. Gather harvested citrus fruits in appropriate boxes to the roadside
iv. Determine appropriate time of loading
v. Invite vehicle owner to fruits assembly point
vi. Load filled boxes into vehicle
vii. Transport gently to pack house.

b. Procedure for loading citrus fruits from the pack house

i. Identify type of vehicle (container) preferably one with closed/constant internal temperature, e.g. refrigerated container.
ii. Clean and disinfect container (vehicle)
iii. Decide on method of packing depending on size of container
iv. Identify labour required

v. Pack/arrange boxes gently ensuring they do not topple off during transportation.
vi. Decide on transportation and take off time from pack house to destination.

C. Procedure for off-loading citrus fruits

i. Examine the off-loading space
ii. Clean and disinfect off-loading point
iii. Direct vehicle to off-loading point
iv. Off-load fruits onto conveyor belt or through manual means

PC (c) Explain and apply the appropriate standards for transporting

Appropriate standards for transporting citrus fruits

- Citrus fruits are mostly packed in 15kg and 17kg cartons which are palletized at production point and transported long distances to port by means of road or rail.
- Pack/arrange boxes gently ensuring they do not sit or topple on fruits during transportation.
- Stacked crates should not exceed 1.8m during road transportation. In ships, citrus are stacked in cartons to a height not exceeding 2.1m due to the height limitations.
- Citrus fruits must be maintained at a temperature between 4°C and 25 - 30°C for the period of transportation.

During transportation between pack house and cold store the load is subjected to immense shifting and forward pressure when hard breaking is applied. This creates an environment for the load to become unstable and shift on the load bed. In some cases the load collapses resulting in irreparable damage to the product.

Green citrus fruits require higher transport temperatures than yellow coloured citrus fruits. The higher the acid contents of the fruit the greater its cold sensitivity.

Self-assessment

PC (a)

1. Using the table below, list the appropriate means of transporting citrus fruits to the following destinations:

DESTINATION	APPROPRIATE MEANS OF TRANSPORT
Central region to Ashanti region	
Ghana to USA	
Ghana to Cote D'ivoire	

Note: Use the keys below to support your answer

KEY

PC (b)

1. State and explain two (2) methods of loading and transporting citrus fruits from farm to pack house and pack house to the factory/market centres.

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LEARNING OUTCOME **2**

Demonstrate knowledge in container management.

In this LO, you will learn about the importance of container management, inspecting, cleaning and disinfecting the container, explain the importance of tracking and regulating temperature and track and regulate temperature.

PC (a) Explain the importance of container management.

Management of containers in transporting citrus fruits involve controlled atmosphere technologies which allow operators to lower the respiratory rate. Citrus fruits require particular temperature, humidity or moisture and ventilation conditions (enough air circulation).

Citrus fruits containers

The addition of fresh air is extremely important as citrus fruits can start to ferment within few hours due to anaerobic respiration (resulting in total loss of fruits). If ventilation is inadequate, storage damage may occur taking the form of a bitter flavour and peel scab. In damp weather (rain), the cargo or containers must be protected from moisture as otherwise there is a risk of premature spoilage.

Refrigeration container

Depending upon the variety, all citrus fruits are highly cold-sensitive. Grapefruits, lemons and limes are more susceptible to chilling damage than sweet oranges and mandarins. Late ripening varieties are more temperature-sensitive than early varieties. While oranges can withstand temperatures of 5°C, more temperature-sensitive types should never be transported below 10°C when using a refrigerated container

In container management, temperature must be between 4°C and 25 - 30°C as storage life and appearance are impaired outside this range. Fruits spoiled outside the required temperature measurement must be discarded as they would rapidly spoil and infect the other fruits.

PC (b) Inspect, clean and disinfect the container

In order to maintain the fruit quality and shelf life during transportation, it is necessary to maintain proper container hygiene by inspecting, cleaning and disinfecting.

Procedures for inspecting, cleaning and disinfecting the container:

I. Clean and remove previous debris of fruits
ii. Check for unusual cracks in the container
iii. Disinfect the container to prevent disease causing organisms

PC (C) Explain the importance of tracking and regulating temperature.

Citrus fruits require a particular temperature (between 4°C and 25 - 30°C depending upon variety), humidity (85 - 90%) and ventilation conditions during transportation. Where controlled atmosphere transport is used, storage duration may be extended. A written cooling order must be complied during the entire transport chain to keep track of temperature.

Importance of tracking and regulating temperature

1. To delay maturity and decay
2. Prevents dehydration
3. So that fruit can be shipped with a higher degree of quality
4. It also helps to maintain taste, nutritional value and appearance

NOTE: Excessively rapid warming of refrigerated fruit results in condensation and spoilage.

Self-assessment

PC (a)

1. State two (2) benefits of managing containers in transporting citrus fruits.

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PC (b)

1. State one activity each that can be performed during container management under each of the following

INSPECTING	CLEANING	DISINFECTING

PC (c)

1. State and explain any two importance of maintaining cold chain in citrus transportation.

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LEARNING OUTCOME **3**

Demonstrate understanding in conveying harvested fruits to the port or market centre.

In this LO, you will learn about the importance of correct timing of transportation, determine the proper procedure for loading, packing and stacking the boxes in pallet, identify types of containers for land, sea and air travel, determine the right arrangements of pallet in container, prepare invoice and waybill and explain the importance of maintaining the cold chain.

PC (a) Explain the importance of the correct timing of transportation.

Importance of timely transportation of citrus fruits.

Citrus fruits must be conveyed early in the morning and late in the evening. This is purposely to avoid sunburn. But the ideal time for transporting citrus if not using a refrigerated system is late in the evening where temperature is not expected to increase.

The following are some importance of correct timing for transporting citrus fruits:

i. reduction in rotting and decay
ii. to meet market demand
iii. maintaining shelf life
iv. preservation of fruits quality

PC (b) Explain the correct procedure for loading, packing and stacking the boxes on pallet.

Correct procedure for loading, packing and stacking the boxes in pallet:

Citrus fruits are mainly loaded in cartons, plastic crates, boxes and fruit crates made of corrugated board or wood. In some cases they are loaded into a loose truck and then transported to a nearby local market. Plastic containers have an advantage over the wooden boxes and sacks because they give protection to the fruit and easy to clean and stack.

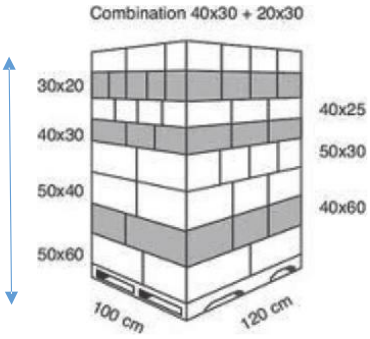
Packing on a pallet

Packing in a container

Packing or stacking depends on fruit characteristics, protection requirements and transportation mode. But generally, procedures involved in packing and stacking boxes of citrus fruits on pallets includes;

i. identifying packing materials
ii. packing fruits into boxes (fruits should not be overloaded in each box)
iii. stacking boxes containing fruits on pallets horizontally or vertically.
iv. leaving space between boxes as they are stacked.
v. limiting height of stacked boxes due to height limitations

Below shows packing of citrus in a horizontal and vertical way on a pallet.



Horizontal packing

Vertical packing

PC (c) Identify types of containers for land, sea and air travel

Types of containers for transporting citrus fruits by land, sea and air

Packaging containers are used to protect citrus fruits during transportation either by land (rail or road), air or sea.

The most common type of packaging containers is made from corrugated cardboard. It is a specialized form of paperboard made from a mixture of adhesive and paper. It is available in single, double or triples wall strength.

Corrugated box from cardboard

Corrugated plastic is significantly stronger and more durable than corrugated cardboard. Packaging containers made from this material last longer, require less replacement and reduce waste disposal costs. It is lighter in weight than corrugated cardboard as well. This weight reduction leads to significant cost savings when shipping products and pressure on beneath containers carrying citrus fruits. Aluminum containers have a comparative advantage over the others when transportation is done by air due to its light weight.

However, for hygienic purposes the cardboard boxes are preferable since its cleaning and re- cleaning could lead to infections. The cardboard boxes though disposed of could be recycled.

Types of containers for land, sea and air transport

Different methods of transporting citrus fruits require different containers. Below are some examples of containers required for the various transportation methods;

- Sea: Plastic, card boxes and wooden containers
- Air: Aluminium foils and card boxes
- Land: Plastic, card boxes and wooden containers

PC (d) Determine the right arrangements of pallets in containers

Arrangement of pallets in containers

While there are some variations in the design of pallets in a container, most are simple square boxes that are constructed with notched bottoms and lids. The notches are spaced to accommodate the spacing of planks on pallet surfaces. This makes it possible to place containers full of citrus onto a pallet in a way that slides the notches securely between the plank spacing.

As a result, the container is less likely to shift or slide while the pallet is in transit (a feature that helps to minimize the possibility of damage to any item stored in the container).

The notches on the lid of a pallet container are arranged so that other containers can be stacked on the unit, with the notches interlocking for maximum stability for rows and stacks on each individual pallet.

Typical arrangement of pallets in containers

Note: Spaces between stacks or crates or pallets must be filled to prevent tipping or slippage.

PC (e) Prepare invoice and waybill

Preparation of invoice and waybill

An invoice is a bill sent by a provider of a product or service to the purchaser. Invoice is an essential legal document prepared by a vendor or service provider and given to the customer or client to serve as a record of goods or services sold to the customer or client. The vendor or service provider needs to retain a copy as a record of their sales. The customer or client needs to retain a copy as a record of their purchase or expense.

The essential features of an invoice include:

- Date
- Invoice number
- Name and address (customer and supplier)
- Consignee (name and address)
- Description of items purchased (weight, quantity)
- Terms of payment.
- Signature (customer and supplier)
- Vehicle number/ drivers name

How to write an invoice and what to include on it

Basically, an invoice can be divided into 3 main parts: The Header, Body and Footer.

1. Invoice Header

- **Letter head:** business name, address, telephone & email and web address (if available).
- In some countries, the invoice must also include business registration number, Tax Identification Number (TIN) and Value Added Tax (VAT).
- The word "**Invoice**" clearly written towards the top of the page.
- **An invoice number.** This running serial number that must be maintained. Each invoice should have a unique identification number.
- **An invoice date (date of purchase or sale of produce)**
- **Payment terms (payment on or before delivery or after delivery)**
- "**Our Ref**" or "**Our Reference**". Enter quotation number if issued with one prior to the invoice.
- "**Your Ref**" or "Customer Ref" (Purchase order or Work Order by customer)

2. Invoice Body

- **A description of the goods** being supplied, quantity, unit of measure, price per unit and total amount for individual items. In the case of services, **a brief scope of work** and amount for individual items will be required.

3. Invoice Footer

- **Total Amount** of all individual items.
- If applicable, a **tax amount and total after tax.**
- **Payment instructions** if necessary. Tell recipients how to make out their cheque payment. If you expect payments by wire transfer, you should provide your bank account number and details here. Confirm if part payment is acceptable and validity of the offer.
- **Other comments** (delivery instructions, goods return policy, overdue payment policy etc.)

Sample of an invoice

Logo

Your Company Name

Street Address
City, ST ZIP Code
Phone Number, Web Address, etc.

INVOICE

DATE: August 20, 2006
INVOICE #I INV1048

Bill To: C1003
Test Customer Two
88 WILLIAM Square
Sydney 12345
Australia

Ship To:

P. O. #	Sales Rep. Name	Ship Date	Ship Via	Terms	Due Date
	Sales1	8/20/2006	UPS	No: 60	

Description	Quantity	Unit Price	Line Total
Very long product description that occupies more than 1 line - infact, it occupies 2 lines	1	199.99	199.99
One line product description	2	420.00	840.00

SUBTOTAL		1,039.99
PST	6.5%	67.60
GST	3.20%	33.28
SHIPPING & HANDLING		-
TOTAL		**1,140.87**
PAID		-
TOTAL DUE		**1,140.87**

THANK YOU FOR YOUR BUSINESS!

Sample of an invoice

COMPANY MAME

COMPANY NAME
Street Address
Address 2
City, ST ZIP Code
Phone: (123) 456 78 99

INVOICE
Invoice #:
Invoice Date:

Billing Address		**Billing Address**	
Company:		Company:	
Name:		Name:	
Address		Address	
City/State/Zip		City/State/Zip	

Shipping Method:

Qty	**Product Description**	**Price per item**	**Amount**
		Subtotal:	
		Tax:	
		Shipping:	
		Grand Total:	

Notes:

Make all checks payable to [Your Company Name]
Payment is due within 30 days
If you have any questions concerning this invoice, contact [Name, phone number, e-mail]

Thank you for your business!

PC (f) Explain the importance of maintaining the cold chain

Cold chain is the process of maintaining temperature in which citrus fruits are transported in order not to affect the fruits.

Importance of the cold chain includes;

1. maintaining nutritional value of the fruits
2. slowing the rate of citrus fruits spoilage
3. increasing citrus fruits shelf life
4. maintaining fruits quality

Self-assessment

PC (a) & (b)

1. In groups of three (3), discuss the reasons why citrus fruits must be transported at the right time.

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PC (c)

1. Explain why aluminium containers are preferred when transporting citrus fruits by air.

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