



RQF LEVEL 5



FOPCP503

FOOD PROCESSING

Coffee Cherries Processing

TRAINER'S MANUAL

October, 2024



COFFEE CHERRIES PROCESSING

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Original published version: October 2024

ACKNOWLEDGEMENTS

The publisher would like to thank the following for their assistance in the elaboration of this training manual:

Rwanda TVET Board (RTB) extends its appreciation to all parties who contributed to the development of the trainer's and trainee's manuals for the TVET Certificate V in Food Processing, specifically for the module "**FOPCP503: Coffee Cherries Processing.**"

We extend our gratitude to KOICA Rwanda for its contribution to the development of these training manuals and for its ongoing support of the TVET system in Rwanda

We extend our gratitude to the TQUM Project for its financial and technical support in the development of these training manuals.

We would also like to acknowledge the valuable contributions of all TVET trainers and industry practitioners in the development of this training manual.

The management of Rwanda TVET Board extends its appreciation to both its staff and the staff of the TQUM Project for their efforts in coordinating these activities.

This training manual was developed:

Under Rwanda TVET Board (RTB) guiding policies and directives



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ACRONYMS

°C: Degree Celcius

°F: Degree Fahrenheit

AGR: Agriculture

CBC: Competence Based Curriculum

CCP: Critical Control Point

FOP: Food Processing

KOICA: Korean International Cooperation Agency

PPE: Personal Protective Equipment

RQF: Rwanda Qualification Framework

RTB: Rwanda TVET Board

SOP: Standard Operating Procedure

TQUM Project: TVET Quality Management Project

TVET: Technical and Vocational Education and Training

Hrs: Hours

pH : Potential of Hydrogen

%: Percentage

ml: milter

mm: millimeter

QR: Quick Response Cod

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled "**Coffee Cherries Processing.**" trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labor market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer trainees opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that trainees review the key reading and the points to remember section.

MODULE CODE AND TITLE: FOPCP503 COFFEE CHERRIES PROCESSING

Learning Outcome 1: Receive coffee cherries

Learning Outcome 2: Process coffee cherries into parchment coffee

Learning Outcome 3: Process parchment coffee into green coffee

Learning Outcome 4: Grind roasted coffee

Learning Outcome 1: Receive Coffee Cherries



Indicative contents

1.1. Introduction to coffee processing.

1.2. Selecting of tools and equipment used in coffee processing.

1.3. Arranging the workplace.

1.4. Checking quality of coffee cherries

Key Competencies for Learning Outcome 1: Receive Coffee Cherries

Knowledge	Skills	Attitudes
• Explanation of key terms used in coffee cherries processing • Identification of coffee benefits. • Description of coffee processing methods • Description of tools and equipment used in coffee cherries processing • Description of cleaning products • Description of quality characteristics of coffee cherries.	• Selecting and adjusting tools and equipment used in coffee cherries processing • Cleaning the workplace • Checking cleanliness of the workplace • Arranging the workplace • Selecting coffee cherries • Sorting coffee cherries • Floating coffee cherries	• Being responsible while selecting tools and equipment • Being carefully while adjusting tools and equipment • Being attentive when using cleaning products • Being carefully while checking quality of coffee cherries



Duration: 10 hrs

Learning outcome 1 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Explain correctly the key terms and processing methods as used in coffee cherries processing.
2. Identify effectively the health and economic benefits of coffee for human
3. Describe appropriately tools and equipment used in coffee cherries processing according to their uses.
4. Explain correctly coffee cherries selection criteria based on reception parameters
5. Select and adjust properly tools and equipment used in coffee cherries processing according to their functionality
6. Prepare properly the workplace according to the safety measures and processing line
7. Sort correctly coffee cherries according to sorting parameters
8. Check correctly the quality of coffee cherries according to the quality parameters



Resources

Equipment	Tools	Materials
• Washing tanks • Floating tanks • Fermentation tanks • Conveyor belts • Grading channel • Pulping machine • Colour sorters • Mucilage remover • Coffee dryer • Personal protective equipment	• Basins • Timer • Analytical balances • Moisture meter • Hygrometer • Thermometer • Brushes • Buckets • Mopes • Kettles • Bowls • Hot water glass	• Packaging material • Coffee cherries • Serviettes • Water • Cupping form • Black plastic net • Plastic sheeting • Ropes • Cupping form

• Sorting tables • Weighing balances • Coffee hulling machine • Cyclone • Fan • Destoner • Grading machine • Coffee roaster • Coffee grinder • Water sprayers • Cupping table • Packaging machine • Sealing machine • Labelling machine	• Coffee testing spoons • Plastic cups • Color checker • Magnets • Coffee cupping tray.	
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Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail manuals/guides, video related to floating and cleaning and avail photos related to tools and equipment used in coffee cherries processing.
- Avail tools and equipment for coffee cherries processing
- Avail not expired cleaning agents.
- Avail ripen coffee cherries
- Have classroom and workshop.



Indicative content 1.1: Introduction to coffee processing.



Duration: 2 hrs



Theoretical Activity 1.1.1: Introduction to coffee cherries processing.



Notes to the trainer:

- Trainer may use small groups to explain the key terms, coffee processing methods and identification of coffee benefits.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions

- i. What do you understand by the following terms:
 - a) Coffee cherries
 - b) Parchment coffee
 - c) Green coffee
 - d) Roasting profile
 - e) Cupping
- ii. What do you understand by different method of coffee cherries processing?
- iii. What could be the benefits of coffee?

Step 2: Ask trainees to write the findings on papers, flip chart, blackboard or white boards

Step 3: Facilitate trainees to present their findings

Step 4: Provide expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 1.1.1 in trainee manual



Points to Remember

- Coffee cherry or coffee berry is a small, round stone fruit produced by the coffee plant.
- There are three methods of coffee cherries processing: dry method, semi-dry method and wet method
- Parchment Coffee: is dried but unhulled coffee beans. Describes wet-processed coffee shipped with the dried parchment skin still adhering to the bean.
- Drinking coffee reduces the risk of heart attack and also helps to lose weight.



Indicative content 1.2: Selecting tools and equipment used in coffee processing



Duration: 2 hrs



Theoretical Activity 1.2.1: Description of tools and equipment used in coffee cherries processing



Notes to the trainer:

- Trainer may use small groups to describe tools and equipment used in coffee cherries processing
- Avail some drawings, pictures showing tools and equipment for coffee cherries processing to be used as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- What are tools and equipment which may be used in coffee cherries processing?
- Based on list of tools and equipment provided, what can be the use of each tool and equipment?
- What could be the safety precautions of tools and equipment used in coffee cherries processing?

Step 2: Ask trainees to write the findings on papers, flip chart, blackboard or white boards

Step 3: Facilitate trainees to present their findings

Step 4: Provide expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 1.2.1 in trainee manual



Points to Remember

- Common equipment used in coffee cherries processing include pulper, fermentation tank, washing channel, hulling machine, roaster, and grinder.
- Common tools used in coffee cherries processing include moisture meter, hygrometer, and thermometer.



Practical Activity 1.2.2: Selection and adjustment of tools and equipment used in coffee cherries processing



Notes to the trainer

The trainer may:

- Demonstrate how to select and adjust tools and equipment for coffee cherries processing.
- Avail tools and equipment required for coffee cherries processing.
- Avail procedures for adjustments



Key steps:

While delivering this activity, pass through the following steps:

Step.1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to select the right tools and equipment to be used in coffee cherries processing.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to select and adjust tools and equipment for coffee cherries processing. While demonstrating, explain clearly the procedures for selecting and adjusting tools and equipment.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether tools and equipment are properly selected and adjusted and provide feedback on each trainee's work

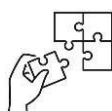
Step 6: Ask trainees to read key reading 1.2.2 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 1.2



Points to Remember

- Wear PPE before selecting and using tools and equipment for coffee cherries processing.
- The selection criteria of tools and equipment used in coffee cherries processing include; working condition of tool and equipment, availability of tool or equipment, cost, efficiency and durability.
- Unplug electrical equipment when not in use.
- Beware to follow manufacturer's instructions when adjusting tool or equipment



Application of learning 1.2.

In school's coffee processing workshop, request each trainee to select and adjust tools and equipment for coffee cherries processing into parchment coffee and ground coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tools and equipment are appropriately selected	1.1 Cleaning tools and equipment are selected		
		1.2 Coffee cherries processing tools and equipment are selected		
2	Tools and equipment are properly adjusted	2.1 Tools are adjusted		
		2.2 Equipment are adjusted		



Indicative content 1.3: Arranging the workplace



Duration: 2 hrs



Theoretical Activity 1.3.1: Description of cleaning products



Notes to the trainer:

- Trainer may use small group to describe cleaning products used in coffee cherries processing.
- A trainer may avail some drawings, pictures related to cleaning product be used as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- i. What do you think could be the cleaning products to use in coffee cherries processing workplace?
- ii. What could be the direction of use and safety precautions of using cleaning agent in coffee cherries processing workplace cleaning?

Step 2: Ask trainees to write the findings on papers, flip chart, blackboard or white boards

Step 3: Facilitate trainees to present their findings

Step 4: Provide expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 1.3.1 in trainee manual



Points to Remember

- Common cleaning products used in coffee cherries processing may include food-grade sanitizers (Chlorine-based sanitizers, Acid-based sanitizers, Hydrogen peroxide) and Mild detergents.



Practical Activity 1.3.2: Arranging the work place



Notes to the trainer

The trainer may:

- Avail a disorganized coffee processing workshop.
- Avail cleaning agents, tools and equipment
- Use pictures/drawing showing the process flow chart of a coffee cherries processing workplace.
- Demonstrate how to clean and arrange the workshop for coffee cherries processing.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to clean and arrange the workshop.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to clean and arrange the workshop for coffee cherries processing. While demonstrating, explain clearly the procedures of cleaning and arranging the workshop for coffee cherries processing.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether workshop is properly cleaned and arranged and provide feedback on each trainee's work

Step 6: Ask trainees to read key reading 1.3.2 in trainee manual

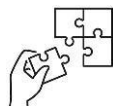
Step 7: Ask trainees to perform the task provided in application of learning 1.3



Points to Remember

- Before arranging the workplace for coffee cherries processing, bear in mind the flow chart of coffee cherries processing into parchment and ground coffee.

- When diluting cleaning products, it is highly recommended to respect the dosage
- While preparing cleaning products, never mix bleach and ammonia as this can produce highly toxic chloramine gas, which can cause serious health problems.
- Cleaning methods are wet and dry cleaning
- Cleaning effectiveness should be well checked in order to avoid contamination of the product.



Application of learning 1.3.

In coffee processing workshop, request each trainee to clean and arrange the workplace.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Workplace is properly cleaned	1.1 Cleaning products are selected		
		1.2 Cleaning tools and equipment are selected		
		1.3 Cleaning products are prepared		
		1.4 Cleanliness is checked		
2	Workplace is well arranged	2.1 Process flow chart is respected		
3	Activity report is well done	3.1 Activity report is available		
		3.2 Key competencies gained are described		
		3.3 Recommendations are mentioned		



Indicative content 1.4: Checking quality of coffee cherries



Duration: 2 hrs



Theoretical Activity 1.4.1: Description of coffee cherries reception activities



Notes to the trainer:

- Trainer may use small group to describe coffee cherries reception.
- A trainer may avail some drawings, pictures related to coffee cherries reception to be used as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- i. What do you understand by manual sorting of coffee cherries?
- ii. What do you understand by weighing and recording of coffee cherries after reception?

Step 2: Ask trainees to write the findings on papers, flip chart, blackboard or white boards

Step 3: Facilitate trainees to present their findings

Step 4: Provide expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 1.4.1 in trainee manual



Points to Remember

- For good coffee cherries reception, remember sorting criteria
- Remember to weigh coffee cherries and to record all information



Practical Activity 1.4.2: Selecting coffee cherries



Notes to the trainer

The trainer may:

- Avail a coffee processing workshop.

- Avail ripen coffee cherries
- Use pictures/drawing showing the coffee cherries reception.
- Demonstrate how to select coffee cherries.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to select coffee cherries.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to select coffee cherries. While demonstrating, explain clearly the selection criteria of coffee cherries.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether coffee cherries are properly selected and provide feedback on each trainee's work

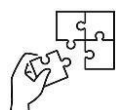
Step 6: Ask trainees to read key reading 1.4.2 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 1.4



Points to Remember

- Coffee cherries Selection criteria are: Coffee varieties, Coffee cherries maturation parameters and coffee cherries defects.
- The coffee cherries that are mature to be processed are of bright red color.
- Biologically defected beans cause quality deterioration of coffee mainly flavour that why they are all removed during sorting.



Application of learning 1.4.

In coffee processing workshop, request each trainee to select coffee cherries, weigh and record coffee cherries and then perform manual sorting.

Checklist:

SN	Criteria	Indicators	Yes	No
		1.1 Selecting is applied		

1	Selection of coffee cherries is done	1.2 Immature coffee cherries are removed		
		1.3 Damaged coffee cherries are removed		
		1.4 Coffee cherries with defect are removed		
2	Weighing is done	2.1 Selected coffee cherries is weighed		
3	Recording is done	3.1 All information are recorded and kept		



Indicative content 1.5: Floating coffee cherries



Duration: 2 hrs



Practical Activity 1.5.1: Floating coffee cherries



Notes to the trainer

The trainer may:

- Avail a coffee processing workshop.
- Avail ripen coffee cherries
- Use video showing the coffee cherries floatation.
- Demonstrate how to float coffee cherries.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to float coffee cherries to be processed.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to float coffee cherries. While demonstrating, explain clearly the floatation process of coffee cherries.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether coffee cherries are properly floated and provide feedback on each trainee's work

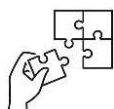
Step 6: Ask trainees to read key reading 1.5.1 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 1.5



Points to Remember

- Floating of coffee cherries should be well done in order to remove all unwanted materials and process the good cherries
- Sorting parameters are: Maturity levels and defects



Application of learning 1.5.

In coffee processing workshop, request each trainee to sort coffee cherries by floatation

Checklist:

SN	Criteria	Indicators	Yes	No
1	Floatation is well done	1.1 Defected coffee cherries are removed		
		1.2 Only well ripen mature coffee cherries are remained		
		1.3 All unwanted materials are removed		
2	Activity report is well done	2.1 Activity report is availed		
		2.2 Key competencies gained are described		



Learning outcome 1 end assessment

Written assessment

1. Answer by **True** when the statement is correct or **False** when the statement is incorrect.

- i. Coffee cherries are the fruit of the coffee tree and contain two seeds enclosed by pulp and an outer skin.

Answer: True

- ii. Parchment coffee refers to fully hulled coffee beans that are ready for roasting.

Answer: False

- iii. Green coffee refers to coffee beans that have been roasted and are ready for brewing.

Answer: False

- iv. Coffee fermentation is a step that helps develop flavors and aromas in coffee by breaking down sugars in the coffee cherry.

Answer: True

- v. A roast profile includes parameters such as total roast time and brewing temperature.

Answer: False

- vi. Cupping is a method used to evaluate the sensory attributes of coffee.

Answer: True

- vii. Drinking coffee can lead to higher blood pressure if consumed excessively.

Answer: True

- viii. The coffee industry does not significantly impact local economies or employment opportunities.

Answer: False

2. From the table below, match the following tools and equipment with their functions by writing the letter with the corresponding digit in the provided space.

Answer	function	Tool/equipment
1=C	1) It is an instrument used for measuring the relative humidity	A. Moisture meter
2=E	2) It is a machine used for grinding roasted coffee beans in order to get coffee powder	B. Smout peeler polisher

3=A	3) It is used for measuring moisture content of coffee beans during drying	C. Hygrometer
4=B	4) There are used for polishing coffee beans	D. Roaster
5=F	5) Is used during fermentation process in order to remove the mucilage layer from coffee beans	E. Grinder
6=D	6) It is used for roasting green coffee beans.	F. Fermentation tank

3. Fill in the blank space with the following words related to cleaning products used in processing coffee cherries into parchment coffee and ground coffee (**acidic cleaner, water, alkaline cleaner, neutral cleaner, and degreaser**).
- is a fundamental cleaning agent used for rinsing equipment and surfaces. It helps remove food particles, grease, and other contaminants.
 - contain strong bases like sodium hydroxide or potassium hydroxide. Bleach (pH 12) and ammonia (pH 11) are common alkaline cleaning agents.
 - have a dissolving action on grease and similar dirt. The solvent-containing degreaser may have an alkaline washing agent added to a solvent to promote further degreasing.
 - agents are mainly used for removal of inorganic deposits like scaling. The active ingredients are normally strong mineral acids and chelants.
 -agents are pH-neutral and based on non-ionic surfactants that disperse different types of dirt.

Answer:

- Water**
 - Alkaline cleaner**
 - Degreaser**
 - Acidic cleaner**
 - Neutral cleaner**
4. The following steps are for coffee cherries processing into parchment and ground coffee, rearrange them in a logical sequence.

Reception of coffee cherries, Fermentation, Weighing and recording coffee cherries, Sorting coffee cherries or cherries separation, Polishing, Pulping, Washing, Packaging and storing, Cooling, Hulling, Roasting, Grading and Sorting and Grinding

Answer:

- Reception of coffee cherries
- Weighing and recording coffee cherries
- Sorting coffee cherries or cherries separation
- Pulping
- Fermentation
- Washing
- Drying
- Hulling
- Polishing
- Grading and Sorting
- Roasting
- Cooling
- Grinding
- Packaging and storing

5. Read the statements below and circle the correct answer

- a. The following are purposes of floating coffee cherries except
- i. Ensuring proper fermentation of coffee cherries
 - ii. Sorting of coffee cherries by their density
 - iii. Removing broken coffee cherries

Answer: i. Ensuring proper fermentation of coffee cherries

- b. To perform floating of coffee cherriesis the most suitable.
- i. Hot water
 - ii. Warm water
 - iii. Cold water
 - iv. Reused water

Answer: iii. Cold water

Practical assessment

Your school have a food processing unit that process coffee cherries into parchment and ground coffee. The coffee produced is used for breakfast of teaching staff. Recently, there have been complaints from teaching staff over the past two consecutive months regarding the flavour and tastes of the

served coffee that might be due to poor sorting of coffee cherries or contamination during process.

You are requested to go in school coffee processing workshop to perform the following tasks:

Task:

1. To select tools and equipment
2. To arrange the work place
3. To select coffee cherries.

All necessary materials, tools and equipment are available in the workshop.

The task should be completed in 4 hours

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tools and equipment are appropriately selected	1.1 Cleaning tools and equipment are selected		
		1.2 Coffee cherries processing tools and equipment are selected		
2	Tools and equipment are properly adjusted	2.1 Balance is adjusted		
		2.2 Disc pulper is adjusted		
		2.3 Moisture meter is adjusted		
		2.4 Roaster is adjusted		
		2.5 Grinder is adjusted		
		2.6 vacuum sealer is adjusted		
3	Workplace is properly cleaned	3.1 Cleaning products are selected		
		3.2 Cleaning tools and equipment are selected		
		3.3 Cleaning products are prepared		
		3.4 Workplace is cleaned		
		3.5 Cleanliness is checked		
4		4.1 Processing flow chart is respected		

	Workplace is appropriately arranged	4.2. SOPs is respected		
5.	Floatation is properly done	5.1. Defected coffee cherries are removed		
		5.2. Well ripen mature coffee cherries are remained		
		5.3. All unwanted materials are removed		

END



Further information to the trainer

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Learning Outcome 2: Process Coffee Cherries into Parchment coffee



Indicative contents
2.1 Pulping of coffee cherries
2.2 Fermenting the parchment coffee
2.3 Checking quality of parchment coffee
2.4. Drying of parchment coffee

Key Competencies for Learning Outcome 2: Process coffee cherries into parchment coffee

Knowledge	Skills	Attitudes
• Description of coffee cherries pulping • Description of coffee beans fermentation • Explanation of coffee fermentation methods • Identification of factors that affect coffee fermentation • Description of washing parchment coffee • Description of parchment coffee grades • Explanation of coffee drying methods	• Pulping of coffee cherries • Fermenting coffee beans • Washing fermented coffee beans • Grading coffee beans • Sorting coffee beans • Drying coffee beans • Checking quality of parchment coffee	• Being carefully in pulping coffee cherries • Being responsible while washing fermented coffee beans • Being carefully when grading coffee beans • Being attentive when drying coffee beans • Being attentive when checking quality of parchment coffee



Duration: 15 hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Pulp properly coffee cherries according to coffee beans quality
2. Describe appropriately coffee beans fermentation process as performed during coffee cherries processing.
3. Ferment appropriately coffee beans according to fermentation conditions.
4. Wash properly fermented coffee beans based on quality requirement
5. Grade appropriately coffee beans according to quality requirement
6. Dry properly coffee beans according the quality requirement
7. Check correctly the quality of parchment coffee based on quality parameters.



Resources

Equipment	Tools	Materials
• Washing tanks • Floating tanks • Fermentation tanks • Conveyor belts • Grading channel • Pulping machine • Mucilage remover • Coffee dryer • Weighing balance • Personal protective equipment • Sorting tables • Water sprayers.	• Basins • Timer • Moisture meter • Hygrometer • Thermometer • Brushes • Buckets • Mopes • Squeegees.	• Sacks • Ropes • Coffee cherries • Black plastic net • Plastic sheeting

**Advance Preparation:**

Before delivering this learning outcome, you are recommended to:

- Avail manuals/guides, video related to pulping, washing and grading and avail photos related to fermentation, sorting and drying of coffee beans.
- Avail tools and equipment for coffee cherries processing
- Avail ripen coffee cherries
- Have classroom and workshop.



Indicative content 2.1: Pulping of coffee cherries



Duration: 3 hrs



Practical Activity 2.1.1: Coffee cherries pulping



Notes to the trainer

The trainer may:

- Avail pulper machine to be used in pulping coffee cherries.
- Avail enough clean water
- Use video related to pulping coffee cherries.
- Demonstrate how to pulp coffee cherries.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to pulp coffee cherries.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to pulp coffee cherries. While demonstrating, explain clearly the process of pulping coffee cherries.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether coffee cherries are well pulped and provide feedback on each trainee's work

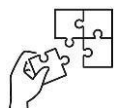
Step 6: Ask trainees to read key reading 2.1.1 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 2.1



Points to Remember

- While pulping don't forget to add water in order to avoid crushing of coffee beans.



Application of learning 2.1.

In coffee processing workshop, request each trainee to pulp coffee cherries.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Coffee cherries are properly pulped	1.1 Water is used		
		1.2 Pulper is used		
		1.3 Skin and coffee beans are separated		



Indicative content 2.2: Fermenting the parchment coffee



Duration: 4 hrs



Theoretical Activity 2.2.1: Description of parchment coffee fermentation



Notes to the trainer:

Trainer may use small group to describe parchment coffee fermentation.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- i. What could be the purpose of fermenting parchment coffee?
- ii. What could be the factors that affect parchment coffee fermentation?

Step 2: Ask trainees to write the findings on papers, flip chart, blackboard or white boards

Step 3: Facilitate trainees to present their findings

Step 4: Provide expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 2.2.1 in trainee manual



Points to Remember

- Factors that affect coffee fermentation are: Temperature, pH level, Oxygen level and Microbial Activity



Practical Activity 2.2.2: Fermenting parchment coffee



Notes to the trainer

The trainer may:

- Avail fermentation tank and plastic sheeting
- Avail clean water
- Use pictures related to fermentation of parchment coffee.

- Demonstrate how to ferment parchment coffee.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to ferment coffee beans.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to ferment parchment coffee. While demonstrating, explain clearly the process of fermenting parchment coffee.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether coffee parchment are well fermented and provide feedback on each trainee's work

Step 6: Ask trainees to read key reading 2.2.2 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 2.2



Points to Remember

- While fermenting parchment coffee use clean water
- After fermentation check if all mucilage is removed from parchment coffee by hand feeling
- Fermentation time should be well monitored because over fermentation and under fermentation can affect the quality of coffee.



Practical Activity 2.2.3: Wash fermented parchment coffee.



Notes to the trainer

The trainer may:

- Avail washing channel tank
- Avail enough clean water

- Use video related to washing of parchment coffee.
- Demonstrate how to wash parchment coffee.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to wash parchment coffee.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to wash coffee beans. While demonstrating, explain clearly the process of washing parchment coffee.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether parchment coffee are well fermented and provide feedback on each trainee's work

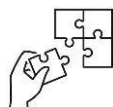
Step 6: Ask trainees to read key reading 2.2.3 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 2.2



Points to Remember

- While washing parchment coffee use enough clean water
- Washing process is repeated until obtaining clear water.
- Whether by hand in water channels or using mechanical equipment, the beans are agitated or scrubbed to fully remove the sticky mucilage layer that may still cling to them after fermentation.



Application of learning 2.2.

In coffee processing workshop, request each trainee to ferment and wash parchment coffee.

Checklist

SN	Criteria	Indicators	Yes	No
1	Parchment coffee are properly fermented	1.1 Fermentation methods are applied.		
		1.2 Fermentation time is respected.		
		1.3 Water temperature is respected		
		1.4 Relative humidity is respected		
2	Parchment coffee are properly washed	2.1.All mucilage residues are removed		
		2.2.Enough clean water is used		
		2.3. Waste water is managed		



Indicative content 2.3: Checking quality of parchment coffee



Duration: 4 hrs



Practical Activity 2.3.1: Grading parchment coffee



Notes to the trainer

The trainer may:

- Avail grading tank
- Avail enough clean water
- Use video related to grading of parchment coffee.
- Demonstrate how to grade parchment coffee.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to grade parchment coffee.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to grade parchment coffee. While demonstrating, explain clearly the process of grading parchment coffee.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether parchment coffee are well graded and provide feedback on each trainee's work

Step 6: Ask trainees to read key reading 2.3.1 in trainee manual

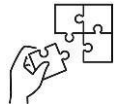
Step 7: Ask trainees to perform the task provided in application of learning 2.3



Points to Remember

- While grading parchment coffee be carefully to avoid mixing different grades

- There are 3 grades of parchment coffee: Grade A with good quality, Grade B with moderate quality and grade C with low quality.



Application of learning 2.3

In coffee processing workshop, request each trainee to grade parchment coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Parchment coffee beans are properly graded	1.1 Floating is well done		
		1.2 Grade A is obtained		
		1.3 Grade B is obtained		
		1.3 Grade C is obtained		



Indicative content 2.4: Drying of parchment coffee



Duration: 4 hrs



Practical Activity 2.4.1: Drying parchment coffee



Notes to the trainer

The trainer may:

- Avail tools and equipment to be used for drying parchment coffee.
- Use video /picture related to drying of parchment coffee.
- Demonstrate how to dry parchment coffee.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in the coffee cherries processing workshop to dry parchment coffee.

Step 2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step 3: Demonstrate how to dry parchment coffee. While demonstrating, explain clearly the process of drying parchment coffee.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether parchment coffee are well dried and provide feedback on each trainee's work

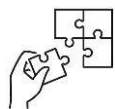
Step 6: Ask trainees to read key reading 2.4.1 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 2.4



Points to Remember

- Moisture content of parchment coffee is 12%
- Drying can be done by using dryer or sun drying.
- While drying parchment coffee don't forget to stir in order to dry evenly.



Application of learning 2.4

In coffee processing workshop, request each trainee to dry parchment coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Parchment coffee is properly dried	1.1 Drying methods are applied		
		1.2 Stirring is done		
		1.3 Moisture content is respected		
		1.4 Colour of parchment coffee is achieved		



Learning outcome 2 end assessment

Written assessment

1. Read the following statements and answer by **True** if the statement is correct and **False** if the statement is incorrect.

- i. Pulping is an important step in coffee processing that separates the parchment coffee from the fruit pulp and skin.

Answer: True.

- ii. The pulping machine removes the beans from the cherries without using water.

Answer: False (The process involves pressing the fruit in water.)

- iii. Lighter parchment coffee float to the top during the separation process in the water channels.

Answer: True.

- iv. All the pulp must be completely removed from the parchment before fermentation.

Answer: False (A significant amount of pulp may still cling to the parchment.)

- v. The classic method of removing pulp is known as machine-assisted wet processing.

Answer: False (The classic method is the ferment-and-wash method; machine-assisted wet processing is a newer technique.)

- vi. After fermentation, coffee is washed to remove mucilage residues.

Answer: True.

- vii. The washing process typically requires only one wash to remove all residues.

Answer: False (It normally takes approximately three washes.)

- viii. Wet parchment coffee at this stage contains about 57% moisture.

Answer: True.

- ix. Insufficient water during the final washing can lead to the coffee starting to dry with mucilage residues still present.

Answer: True.

- x. Proper washing of coffee increases the risk of microbial attack and mycotoxin formation.

Answer: False (Incomplete washing increases these risks.)

2. From the table below, match the following grades of parchment coffee with their descriptions by writing the letter with the corresponding digit in the provided space.

Grade	Description	Answer
Grade 1	A. Parchment coffee of lowest density and quality, composed with defect and some pulp	Grade 1=B
Grade 2	B. Parchment coffee of high density and of highest quality	Grade2=C
Grade 3	C. Parchment coffee of moderate density and quality, mixed with small amount of defect	Grade3=A

3. Circle the letter corresponding to the correct answer

i. What is the optimal moisture content for parchment coffee after drying?

- a) 5-6%
- b) 11-12%
- c) 15-20%
- d) 20-25%

Answer: b) 11-12%

ii. How long should sun drying typically take?

- a) 2-4 days
- b) 5-7 days
- c) 8-10 days
- d) 11-14 days

Answer: c) 8-10 days

iii. What is the out-turn of clean dry coffee from ripe cherry?

- a) 10-15%
- b) 15-20%
- c) 20-25%
- d) 25-30%

Answer: b) 15-20%

iv. Why should parchment coffee not be dried directly on soil?

- a) It makes them too wet
- b) It leads to earthy flavors
- c) It takes too long to dry
- d) It can cause them to crack

Answer: b) It leads to earthy flavors

v. What is a major problem when rewetting coffee during drying?

- a) It causes the beans to split
- b) It leads to mold development
- c) It enhances flavor
- d) It increases drying time

Answer: b) It leads to mold development

vi. What is the initial temperature recommended for artificial drying?

- a) 24°C
- b) 30°C
- c) 35°C
- d) 40°C

Answer: c) 35°C

vii. What color should parchment coffee have after proper drying?

- a) Dark brown
- b) Pale yellowish beige
- c) Bright green
- d) Deep red

Answer: b) Pale yellowish beige

viii. What happens if coffee is overdried?

- a) It becomes too moist
- b) It produces too many broken beans
- c) It enhances flavor
- d) It becomes more aromatic

Answer: b) It produces too many broken beans

ix. What should be checked during quality control of parchment coffee?

- a) Bean size
- b) Color of the packaging
- c) Moisture content
- d) Aroma

Answer: c) Moisture content

x. What effect does insufficient drying have on coffee beans?

- a) Improves flavor
- b) Causes them to turn dark
- c) Makes them more aromatic
- d) Leads to bland flavor and deterioration

Answer: d) Leads to bland flavor and deterioration

Practical assessment

Your school have a food processing unit that process coffee cherries into parchment and ground coffee. The coffee produced is used for breakfast of the teaching staff. Recently, there have been complaints from teaching staff over the past two consecutive months regarding the flavour and tastes of the served coffee that might be due to poor pulping of coffee cherries, fermentation, washing, grading and drying of parchment coffee.

You are requested to go in coffee processing workshop to perform the following tasks:

1. Pulp coffee cherries
2. Ferment parchment coffee
3. Wash fermented coffee
4. Grade parchment coffee
5. Dry parchment coffee

All necessary materials, tools and equipment are available in the workshop.

The task should be completed in 20 hours

Checklist:

SN	Criteria	Indicators	Yes	No
1	Coffee cherries are properly pulped	1.1 Water is used		
		1.2 Pulper is used		
		1.3 Skin and parchment coffee are separated		
		1.4 Parchment coffee are oriented in fermentation tank		
2	Parchment coffee are properly fermented	1.1 Fermentation methods are applied.		
		1.2 Fermentation time is respected.		
		1.3 Water temperature is respected		
		1.4 Relative humidity is respected		
3	Parchment coffee are properly washed	2.1.All mucilage residues are removed		
		2.2.Enough clean water is used		

		2.3. Waste water is managed		
4	Parchment coffee is properly graded.	1.1 Grade A is obtained		
		1.2 Grade B is obtained		
		1.3 Grade C is obtained		
5.	Parchment coffee are properly dried	1.1 Drying methods are applied		
		1.2 Stirring is done		
		1.3 Moisture content is respected		
		1.4 Color of parchment coffee is achieved		

END



Further information to the trainer

Banti, M., & Abraham, E. (2021). Coffee processing methods, coffee quality and related environmental issues. *Journal of Food and Nutrition Sciences*, 9(6), 144-152.

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Ghosh, P., & Venkatachalapathy, N. (2014). Processing and drying of coffee—a review. *Int. J. Eng. Res. Technol*, 3(12), 784-794.

Vincent, J. C. (1987). Green coffee processing. In *Coffee: Volume 2: Technology* (pp. 1-33). Dordrecht: Springer Netherlands.

Yeretzian, C., Jordan, A., Badoud, R., & Lindinger, W. (2002). From the green bean to the cup of coffee: investigating coffee roasting by on-line monitoring of volatiles. *European Food Research and Technology*, 214, 92-104.

Learning Outcome 3: Process Parchment Coffee into Green Coffee



Indicative contents

3.1 Dehulling parchment coffee

3.2 Sorting green coffee

3.3 Grading green coffee 0788988435

Key Competencies for Learning Outcome 3: Process parchment coffee into green coffee

Knowledge	Skills	Attitudes
• Description of dehulling process for coffee beans. • Identification of sorting criteria for green coffee • Explanation of sorting method	• De-hulling parchment coffee • Sorting green coffee • Grading green coffee	• Being careful while de-hulling parchment coffee • Being attentive while sorting green coffee • Being vigilant while grading green coffee



Duration: 15 hrs

Learning outcome 3 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe appropriately dehulling process for parchment coffee.
2. De-hull properly parchment coffee according to dehulling methods.
3. Identify appropriately sorting criteria for green coffee beans based on product requirements.
4. Explain correctly sorting methods as performed during coffee cherries processing
5. Sort properly green coffee according to sorting criteria.
6. Grade properly green coffee according to grading methods.



Resources

Equipment	Tools	Materials
• Conveyor belts • Colour sorters • Sorting tables • Weighing balances • Coffee hulling machine • Fan • Grading machine.	• Basins • Moisture meter • Hygrometer • Thermometer • Brushes • Buckets	• Sacks • Parchment coffee • Plastic sheeting.



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail manuals/guides, video related to de-hulling parchment coffee, sorting and grading green coffee.
- Avail tools and equipment for processing parchment coffee into green coffee.
- Avail parchment coffee.
- Avail organized workshop.



Indicative content 3.1: De-hulling parchment coffee



Duration: 5 hrs



Practical Activity 3.1.1: Parchment coffee de-hulling



Notes to the trainer

- Demonstrate how to de-hull parchment coffee.
- Avail tools and equipment required for parchment coffee de-hulling.
- Avail parchment coffee.



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to go in the coffee processing workshop to de-hull parchment coffee.

Step2: Explain the task and provide clear work instructions (PPE, Time allocated)

Step3: Demonstrate how to de-hull parchment coffee. While demonstrating, explain clearly the procedures for de-hulling parchment coffee.

Step3: Ask trainees to do the task individually and monitor trainees' activities.

Step4: Verify whether parchment coffee is properly de-hulled and provide feedback on each trainee's work

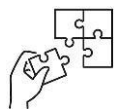
Step5: Ask trainees to read key reading 3.1.1 in trainee manual

Step6: Ask trainees to perform the task provided in application of learning 3.1



Points to Remember

- Hulling help removing the parchment layer from coffee beans.
- Polishing remove silver skin and improve appearance of green coffee beans.



Application of learning 3.1.

In school's coffee processing workshop, request each trainee to de-hull properly parchment coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Parchment coffee is properly de-hulled	1.1. Hulling machine is used		
		1.2. The parchment layer is removed		
		1.3. Green coffee is cleaned		



Indicative content 3.2: Sorting green coffee



Duration: 5 hrs



Theoretical Activity 3.2.1: Description of sorting criteria for green coffee



Notes to the trainer:

- Trainer may use small groups to describe sorting criteria for green coffee.
- A trainer may avail some videos related to green coffee sorting as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to answer the following questions:
- What do you understand by green coffee sorting?
 - What may be the purpose of green coffee sorting?
 - What are the criteria may be based on during green coffee sorting?
- Step 2:** Ask trainees to write the findings on papers, flip chart, blackboard or white boards.
- Step 3:** Facilitate trainees to present their findings to the whole class.
- Step 4:** Provide the expert view and clarify ideas.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 3.2.1 in trainee manual



Points to Remember

- Sorting help optimizing roasting because uniformity in size and density ensures that beans roast evenly and reducing the risk of under-roasted or over-roasted beans
- While sorting, remove all defected green beans because can affect the quality of coffee especially the flavor.



Practical Activity 3.2.2: Green coffee sorting



Notes to the trainer

- Demonstrate how to sort green coffee.
- Avail tools and equipment required for sorting green coffee.
- Avail green coffee.



Key steps:

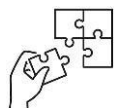
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to go in the coffee processing workshop to sort green coffee.
- Step 2:** Explain the task and provide clear work instructions (PPE, Time allocated)
- Step 3:** Demonstrate how to sort green coffee. While demonstrating, explain clearly the procedures for sorting green coffee.
- Step 4:** Ask trainees to do the task individually and monitor trainees' activities.
- Step 5:** Verify whether green coffee is properly sorted and provide feedback on each trainee's work.
- Step 6:** Ask trainees to read key reading 3.2.2 in trainee manual.
- Step 7:** Ask trainees to perform the task provided in application of learning 3.2



Points to Remember

- Sorting of green coffee is done by manual sorting or mechanical sorting method
- Green coffee sorting involves selecting beans based on size, density, color, and other factors to ensure the best possible quality before roasting.



Application of learning 3.2.

In school's coffee processing workshop, request each trainee to sort properly green coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tools, equipment and materials are appropriately selected	1.1. Sorting tools are selected		
		1.2. Sorting equipment are selected		
		1.3. Green coffee is selected		
2	Green coffee is properly sorted	2.1. Unwanted is removed		



Indicative content 3.3: Grading green coffee



Duration: 5 hrs



Practical Activity 3.3.1: Green coffee grading



Notes to the trainer

- Demonstrate how to sort green coffee.
- Avail tools and equipment required for green coffee grading.
- Avail green coffee.



Key steps:

While delivering this activity, pass through the following steps:

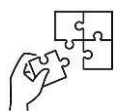
- Step 1:** Introduce the activity and ask trainees to go in the coffee processing workshop to grade green coffee.
- Step 2:** Explain the task and provide clear work instructions (PPE, Time allocated)
- Step 3:** Demonstrate how to grade green coffee. While demonstrating, explain clearly the procedures for green coffee grading.
- Step 4:** Ask trainees to do the task individually and monitor trainees' activities.
- Step 5:** Verify whether green coffee is properly graded and provide feedback on each trainee's work
- Step 6:** Ask trainees to read key reading 3.3.1 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 3.3



Points to Remember

- Grade green coffee based on specific criteria such as size, weight and defects.
- Screen size grading of green coffee This system helps ensure uniformity in the size of beans
- Defects grading of green coffee result can significantly impact the quality, flavor, and overall value of the coffee, making defect grading an essential part of the coffee quality assessment process.

- Specialty coffee grading is a systematic process that evaluates green coffee beans based on their quality, flavor, aroma, and overall characteristics.



Application of learning 3.3.

In school's coffee processing workshop, request each trainee to grade properly green coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tools, equipment and materials are appropriately selected	1.1. Grading tools are selected		
		1.2. Grading equipment are selected		
		1.3. Green coffee is selected		
2	Green coffee is properly graded	2.1.Green coffee are separated into grades		



Learning outcome 3 end assessment

Written assessment

1. Read the statements below and circle the correct answer

i. The primary purpose of coffee de-hulling is?

- a) To add flavor to the coffee beans
- b) To remove the parchment layer (endocarp) from the coffee bean
- c) To polish the coffee beans for better appearance
- d) To roast the coffee beans evenly

Answer: b) To remove the parchment layer (endocarp) from the coffee bean

ii. What is a key benefit of de-hulling coffee beans before roasting?

- a) It reduces the weight of the beans for packaging
- b) It removes any remaining silver skin from the beans
- c) It ensures even roasting of the green coffee beans
- d) It increases the bean size for better brewing

Answer: c) It ensures even roasting of the green coffee beans

iii. Which of the following is a potential drawback of coffee polishing?

- a) It makes the beans harder to roast
- b) It can alter the chemical makeup of the beans, affecting taste
- c) It leads to increased moisture in the beans
- d) It causes the beans to lose their color

Answer: b) It can alter the chemical makeup of the beans, affecting taste

iv. Which hulling method involves removing the parchment layer while the coffee is still wet?

- a) Dry hulling
- b) Wet hulling
- c) Polishing
- d) Sieving

Answer: b) Wet hulling

v. What method is commonly used for husk separation after the hulling and polishing process?

- a) Sieving
- b) Drying
- c) Roasting
- d) Packaging

Answer: a) Sieving

2. Answer by **True** if the statement is correct and **False** if the statement is incorrect

- i. Sorting green coffee beans helps to maintain consistent quality across batches by removing defective beans.
True
- ii. Beans of varying sizes and densities roast at the same rate, ensuring uniform flavor development.
False
- iii. Sorting green coffee beans enhances the flavor profile by removing defective beans that may introduce undesirable flavors.
True
- iv. Coffee that is well-sorted with minimal defects is less appealing to consumers and commands a lower price in the market.
False
- v. The presence of black beans in green coffee is usually caused by improper drying and can result in a bitter and undrinkable beverage.
True

3. Fill in the blank space with the following words (**size, five, one over sixty four**).

- a. The screen size used to measure coffee bean diameter is designated by a number, representing the hole size in increments ofof an inch.
(Answer: one over sixty four)
- b. Grading helps coffee roasters achieve more even roasting by ensuring beans of similarare grouped together, leading to a balanced flavor profile.
(Answer: size)
- c. Specialty Grade coffee, according to the Specialty Coffee Association, allows a maximum offull defects in a 300-gram sample and no primary defects.
(Answer: five)

Practical assessment

Your school have a food processing unit that process coffee cherries into parchment and ground coffee. The coffee produced is used for breakfast of the teaching staff. Recently, there have been complaints from teaching staff over the past two consecutive months regarding the flavour and tastes of the served coffee that might be due to poor sorting of coffee cherries or contamination during process.

Request the trainee to go in school coffee processing workshop to Process parchment coffee into green coffee.

All necessary materials, tools and equipment are available in the workshop.

Task:

1. De-hull parchment coffee
2. Sort green coffee
3. Grade green coffee

The task should be completed in 4 hours

Checklist:

SN	Criteria	Indicators	Yes	No
1	Parchment coffee is properly de-hulled	1.1 Parchment layer are removed		
		1.2 Polishing is well done		
2	Green coffee is properly sorted	2.1 Sorting method is applied		
		2.2 Defected green coffee are removed		
		2.3 Foreign matter are removed		
3	Green coffee is properly graded	3.1 Grading by size is done		
		3.1 Grading by defect is done		
		3.1 Grading by density is done		

END



Further information to the trainer

Banti, M., & Abraham, E. (2021). Coffee processing methods, coffee quality and related environmental issues. *Journal of Food and Nutrition Sciences*, 9(6), 144-152.

Corrêa, P. C., de Oliveira, G. H., de Oliveira, A. P., Vargas-Elías, G. A., Santos, F. L., & Baptestini, F. M. (2016). Preservation of roasted and ground coffee during storage Part 1: Moisture content

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Vincent, J. C. (1987). Green coffee processing. In *Coffee: Volume 2: Technology* (pp. 1-33). Dordrecht: Springer Netherlands.

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Learning Outcome 4: Grind Roasted Coffee



Indicative contents

1.1 Roasting green coffee

1.2 Cooling roasted coffee

1.3 Testing quality of roasted coffee

1.4 Grinding roasted coffee

1.5 Storing Roasted coffee and ground coffee

Key Competencies for Learning Outcome 4: Grind roasted coffee

Knowledge	Skills	Attitudes
• Description of roasting conditions • Description of roasted coffee categories • Identification of changes during roasting • Description of cooling conditions • Description of grinding roasted coffee • Description of roasted coffee quality parameters	• Roasting coffee • Cooling roasted coffee • Testing quality of roasted coffee • Grading roasted coffee • Grinding of roasted coffee • Storing roasted coffee	• Being carefully in coffee roasting • Being attentive in cooling • Being attentive in testing • Being carefully in grading • Having accountability in storing roasted coffee



Duration: 20 hrs

Learning outcome 4 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe appropriately the roasting conditions as respected.
2. Roast properly coffee based on roasting conditions.
3. Describe correctly roasted coffee categories according to the quality of product.
4. Identify successfully the changes during roasting respecting the quality of product.
5. Cool properly roasted coffee according to the cooling conditions.
6. Describe appropriately the cooling conditions based on cooling conditions
7. Describe correctly the quality parameters of roasted coffee according to the quality of product.
8. Test correctly the quality of roasted coffee based on quality parameters of product.
9. Grade correctly roasted coffee according to the quality of product.
10. Grind correctly roasted coffee according to grinding types
11. Store properly the roasted coffee respecting storage conditions.



Resources

Equipment	Tools	Materials
• Weighing balance • Coffee roaster • Coffee grinder • Cupping table • Packaging machine • Sealing machine • Labelling machine	• Basins • Timer • Analytical balances • Moisture meter • Hygrometer • Thermometer • Brushes • Buckets • Kettles • Cupping bowls • Hot water glass	• Packaging material • Green coffee • Serviettes • Water • Cupping form

	• Coffee testing spoons • Plastic cups • Colour checker • Magnets • Coffee cupping trays.	
 Advance Preparation: Before delivering this learning outcome, you are recommended to: • Avail manuals/guides, video related to roasting green coffee and grinding roasted coffee. • Avail tools and equipment for roasting and grinding coffee. • Avail roasted coffee. • Have classroom and workshop.		



Indicative content 4.1: Roasting green coffee



Duration: 5 hrs



Theoretical Activity 4.1.1: Description of roasting process



Notes to the trainer:

- Trainer may use small groups to describe roasting conditions, categories of roasted coffee and changes during coffee roasting.
- A trainer may avail some videos and pictures related to coffee roasting as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

- What do you understand by green coffee roasting?
- What may be the changes during coffee roasting?
- What can be the categories of roasted coffee?

Step 2: Ask trainees to write the findings on papers, flip chart, blackboard or white boards.

Step 3: Facilitate trainees to present their findings to the whole class.

Step 4: Provide the expert view and clarify ideas.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 4.1.1 in trainee manual



Points to Remember

- Roasting coffee is a crucial step in the coffee production process that transforms green coffee beans into the aromatic, flavourful product that consumers enjoy.
- The main categories of roasted coffee are typically classified into three primary roast levels: light, medium, and dark.
- While roasting coffee, respect coffee roasting conditions based on coffee roasting category



Practical Activity 4.1.2: Green coffee roasting



Notes to the trainer

- Demonstrate how to roast green coffee.
- Avail tools and equipment required for roasting green coffee.
- Avail green coffee.



Key steps:

While delivering this activity, pass through the following steps:

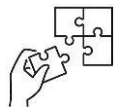
- Step 1:** Introduce the activity and ask trainees to go in the coffee processing workshop to roast green coffee.
- Step 2:** Explain the task and provide clear work instructions (PPE, Time allocated)
- Step 3:** Demonstrate how to roast green coffee. While demonstrating, explain clearly the procedures for roasting green coffee.
- Step 4:** Ask trainees to do the task individually and monitor trainees' activities.
- Step 5:** Verify whether green coffee is properly roasted and provide feedback on each trainee's work
- Step 6:** Ask trainees to read key reading 4.1.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 4.1



Points to Remember

- The main categories of roasted coffee are typically classified into three primary roast levels: light, medium, and dark.
- Manual roasting involves the hands-on approach of roasting coffee beans, often performed in small batches.
- Mechanical roasting involves using automated machines designed to roast coffee beans in larger batches.

- During the coffee roasting process, green coffee beans undergo significant physical and chemical changes that transform them into the aromatic, flavourful roasted beans.



Application of learning 4.1.

In school's coffee processing workshop, request each trainee to roast green coffee into light, medium and dark brown roast.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Green coffee is properly roasted	1.1. Roasting temperature is respected		
		1.2. Light brown color is obtained		
		1.3. Medium brown color is obtained		
		1.4. Dark brown color is obtained		
		1.5. Roasted flavor is achieved		
		1.6. Beans agitation is done		



Indicative content 4.2: Cooling roasted coffee



Duration: 3 hrs



Theoretical Activity 4.2.1: Description of cooling roasted coffee



Notes to the trainer:

- Trainer may use small groups to describe the cooling of roasted coffee.
- A trainer may avail some videos and pictures related to roasting of coffee as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

- What do you understand by cooling roasted coffee?
- What may be the purpose of cooling roasted coffee?
- What are the conditions may be based on during cooling roasted coffee?

Step 2: Ask trainees to write the findings on papers, flip chart, blackboard or white boards.

Step 3: Facilitate trainees to present their findings to the whole class.

Step 4: Provide the expert view and clarify ideas.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 4.2.1 in trainee manual



Points to Remember

- While cooling roasted coffee, air cooling method or water quenching method can be used.
- Roasted coffee should be cooled in order to avoid cracking of beans and to facilitate grinding into desired specification.



Practical Activity 4.2.2: Cooling roasted coffee



Notes to the trainer

The trainer may:

- Demonstrate how to cool roasted coffee.
- Avail tools and equipment required for cooling roasted coffee.



Key steps:

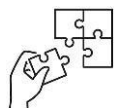
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to go in the coffee processing workshop to cool roasted coffee.
- Step 2:** Explain the task and provide clear work instructions (PPE, Time allocated)
- Step 3:** Demonstrate how to cool roasted coffee. While demonstrating, explain clearly the procedures for cooling roasted coffee.
- Step 4:** Ask trainees to do the task individually and monitor trainees' activities.
- Step 5:** Verify whether roasted coffee is properly cooled and provide feedback on each trainee's work
- Step 6:** Ask trainees to read key reading 4.2.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 4.2



Points to Remember

- Cooling methods for roasted coffee, such as **room cooling** and **fan cooling**, play essential roles in ensuring that the coffee beans are cooled efficiently and effectively.
- While cooling roasted coffee, respect cooling conditions.
- Roasted coffee should be cooled in order to avoid cracking of beans and to facilitate grinding into desired specification.



Application of learning 4.2.

In school's coffee processing workshop, request each trainee to cool properly roasted coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Roasted coffee is properly cooled	1.1. Cooling method is applied		
		1.2. Cooling time is respected		
		1.2. Cooling temperature is reached		



Indicative content 4.3: Testing quality of roasted coffee



Duration: 4 hrs



Theoretical Activity 4.3.1: Description of roasted coffee quality parameters.



Notes to the trainer:

- Trainer may use small groups to describe roasted coffee quality parameters.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to answer the following questions:
- i. What may be the roasted coffee quality parameters?
- Step 2:** Ask trainees to write the findings on papers, flip chart, blackboard or white boards.
- Step 3:** Facilitate trainees to present their findings to the whole class.
- Step 4:** Provide the expert view and clarify ideas.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 4.3.1 in trainee manual.



Points to Remember

- Brewing methods are: Decoction, Infusion and Espresso
- Brew ration: Coffee-to-Water Ratio: 15gr of ground coffee are dissolved in 225 ml of boiled water.



Practical Activity 4.3.2: Cupping of coffee.



Notes to the trainer

- Demonstrate how to perform cupping.
- Avail tools and equipment required for cupping.
- Avail roasted coffee.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to go in the coffee processing workshop to perform cupping.
- Step 2:** Explain the task and provide clear work instructions (PPE, Time allocated)
- Step 3:** Demonstrate how to perform cupping. While demonstrating, explain clearly the procedures for performing cupping.
- Step 4:** Ask trainees to do the task individually and monitor trainees' activities.
- Step 5:** Verify whether cupping is properly performed and provide feedback on each trainee's work
- Step 6:** Ask trainees to read key reading 4.3.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 4.3



Points to Remember

- Coffee flavour profiles consist of: Mild, bold, extra bold, sweetness, body, balance, crema, clean cup, uniformity and aftertaste.



Application of learning 4.3.

In school's coffee processing workshop, request each trainee to test the quality of roasted coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Roasted coffee quality is properly tested	1.1. Brewing methods are applied		
		1.2. Brewing ratio is respected		
		1.3.Extraction is optimized		
		1.3. Cupping procedure is followed		



Indicative content 4.4: Grinding roasted coffee



Duration: 4 hrs



Practical Activity 4.4.1: Performing roasted coffee grinding.



Notes to the trainer

- Demonstrate how to grind roasted coffee.
- Avail tools and equipment required for grinding roasted coffee.
- Avail roasted coffee.



Key steps:

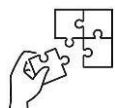
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to go in the coffee processing workshop to grind roasted coffee.
- Step 2:** Explain the task and provide clear work instructions (PPE, Time allocated)
- Step 3:** Demonstrate how to grind roasted coffee. While demonstrating, explain clearly the procedures for grinding roasted coffee.
- Step 4:** Ask trainees to do the task individually and monitor trainees' activities.
- Step 5:** Verify whether roasted coffee is properly grinded and provide feedback on each trainee's work
- Step 6:** Ask trainees to read key reading 4.4.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 4.4



Points to Remember

- Manual grinding is performed by the manual grinders which are preferred by a lot of folks who want to get more intimate with the coffee-making experience.
- Specification of coffee powder are: Fine, medium and coarse



Application of learning 4.4.

In school's coffee processing workshop, request each trainee to grind roasted coffee into fine, medium and coarse specification.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Roasted coffee is properly ground	1.1. Grinder is properly used		
		1.2. Fine coffee powder is obtained		
		1.3. Medium coffee powder is obtained		
		1.4. Coarse coffee powder is obtained		



Indicative content 4.5: Storing Roasted coffee and ground coffee



Duration: 4 hrs



Practical Activity 4.5.1: Packaging and storing roasted coffee and ground



Notes to the trainer

- Demonstrate how to pack and store roasted coffee and ground coffee.
- Avail tools and equipment required for packaging and storing roasted coffee and ground coffee.
- Avail packaging materials, packaging tools, packaging equipment, roasted coffee and ground coffee.



Key steps:

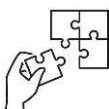
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to go in the coffee processing workshop to perform packaging and storing roasted coffee and ground coffee.
- Step 2:** Explain the task and provide clear work instructions (PPE, Time allocated)
- Step 3:** Demonstrate how to pack and store roasted coffee and ground coffee. While demonstrating, explain clearly the procedures for packaging and storing roasted coffee and ground coffee.
- Step 4:** Ask trainees to do the task individually and monitor trainees' activities.
- Step 5:** Verify whether roasted coffee and ground coffee are properly packed and stored and provide feedback on each trainee's work
- Step 6:** Ask trainees to read key reading 4.5.1 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 4.5



Points to Remember

- While selecting roasted coffee and ground coffee packaging materials, consider the key for packaging selection.
- Vacuum sealing involves removing air from the packaging before sealing it, which significantly reduces oxygen levels and extends shelf life.
- Modified atmosphere packaging involves altering the composition of gases within the packaging to extend shelf life.
- When storing roasted coffee and ground coffee, respect the storage conditions for roasted coffee and ground coffee.



Application of learning 4.5.

In school's coffee processing workshop, request each trainee to package and store properly roasted coffee and ground coffee.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Roasted and ground coffee are properly packaged	1.1. Packaging materials of roasted coffee and ground coffee are selected		
		1.2. Roasted coffee and coffee powder are packed		
		1.3. Vacuum sealing is done		
		1.4. Labelling information are indicated		
2	Roasted coffee and ground coffee are properly stored	2.1. Storage temperature is respected		
		2.2. Expiration of product is checked		
		2.2. Light is controlled		



Learning outcome 4 end assessment

Written assessment

1. Circle the correct answer

- i. At what temperature does the second crack typically occur during coffee roasting, indicating the onset of darker roasts?
- a) 350°F (177°C)
 - b) 400°F (204°C)
 - c) 450°F (232°C)
 - d) 500°F (260°C)

Answer: c) 450°F (232°C)

- ii. Which type of roast is characterized by bright, fruity, and acidic flavors, often retaining the original flavors of the coffee bean?
- a) Medium Roast
 - b) Light Roast
 - c) Dark Roast
 - d) Full City Roast

Answer: b) Light Roast

- iii. Which roast category is described as having a dark brown to nearly black color, with a glossy, oily surface and a bold, bittersweet flavor profile?
- a) Light Roast
 - b) Medium Roast
 - c) Dark Roast
 - d) Vienna Roast

Answer: c) Dark Roast

- iv. Which of the following roasting techniques involves circulating hot air around the beans to maintain even temperature and ensure consistent heat transfer?
- a) Drum Roasting
 - b) Water Cooling
 - c) Hot Air Roasting
 - d) Espresso Roasting

Answer: c) Hot Air Roasting

- v. Which of the following is a commonly used method for cooling roasted coffee beans?
- a. Air cooling with fans
 - b. Freezing the beans
 - c. Submerging in cold water
 - d. Sprinkling with ice

Answer: a. Air cooling with fans

vi. What is the primary purpose of using airtight containers for storing coffee?

- a) To prevent exposure to light
- b) To maintain a consistent temperature
- c) To minimize exposure to oxygen
- d) To enhance flavor through UV light

Answer: c) To minimize exposure to oxygen

2. Answer by **True** if the statement is correct and **False** if the statement is not correct

i. Manual roasting methods, such as stovetop roasting or using a popcorn popper, offer less control over the roasting process compared to mechanical methods.

False

ii. Mechanical roasting is commonly used for larger-scale coffee production because it offers consistency and efficiency.

True.

iii. During the coffee roasting process, the beans undergo expansion and lose moisture, resulting in a weight loss of approximately 15-20%.

True

iv. The Maillard reaction and caramelization of sugars during roasting only occur in the final stages of the roasting process.

False

v. Dark roasts have a lower perceived acidity due to the degradation of chlorogenic acids during the roasting process.

True

vi. Rapid cooling of roasted coffee beans helps retain the aromatic compounds and prevents flavor loss.

Answer: True

vii. Ground coffee should be stored in a cool and dry environment to prevent oxidation and maintain freshness.

Answer: True

viii. Modified Atmosphere Packaging (MAP) increases oxygen levels inside the packaging to extend shelf life.

Answer: False

3. Fill in the blank space with the following terms and parameters (Burr, 50, Decoction, Espresso, coarse, 15).

- i. The coffee brewing method in which finely-ground coffee is placed under pressure with nearly boiling water to create a concentrated beverage is called _____.

Answer: Espresso

- ii. When brewing coffee, the recommended coffee-to-water ratio is _____ grams of ground coffee dissolved in 225 ml of boiled water.

Answer: 15

- iii. The grind size that is better suited for filter methods and may result in under-extracted, flat-tasting coffee if too coarse is called _____.

Answer: Coarse

- iv. The type of coffee grinder that uses two revolving abrasive surfaces to produce a consistent grind is called a _____ grinder.

Answer: Burr

Practical assessment

Your school have a food processing unit that process coffee cherries into parchment and ground coffee. The coffee produced is used for breakfast of the teaching staff. Recently, there have been complaints from teaching staff over the past two consecutive months regarding the flavour and tastes of the served coffee that might be due to poor roasting, cooling, grinding and storing roasted coffee.

You are requested to go in school coffee processing workshop to perform the tasks below.

Tasks:

1. Roast green coffee
2. Cool roasted coffee
3. Test the quality of roasted coffee
4. Grind roasted coffee
5. Store roasted coffee and ground coffee.

The task should be completed in 4 hours

All necessary materials, tools and equipment are available in the workshop.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Green coffee is properly roasted	1.1. Roasting temperature is respected		
		1.2. Light brown color is obtained		
		1.3. Medium brown color is obtained		

		1.4. Dark brown color is obtained		
		1.5. Roasted flavor is achieved		
		1.6. Beans agitation is done.		
2	Roasted coffee is properly cooled Roasted coffee is properly cooled	2.1. Cooling method is applied		
		2.2. Cooling time is respected		
3	Roasted coffee quality is properly tested	3.1. Brewing methods are applied		
		3.2. Brewing ratio is respected		
		3.3 Extraction is optimized		
		3.4. Cupping procedure is followed		
4	Roasted coffee is properly ground Roasted coffee is properly ground	4.1. Grinder is properly used		
		4.2. Fine coffee powder is obtained		
		4.3. Medium coffee powder is obtained		
		4.4. Coarse coffee powder is obtained		
5.	Roasted coffee and ground coffee are properly stored	5.1. Packaging materials for roasted coffee are selected		
		5.2 Packaging materials for ground coffee are selected		
		5.3 Roasted and ground coffee are packed		
		5.4 Vacuum sealing is done		
		5.5. Labelling information are indicated		
		5.6. Storage conditions for roasted and ground coffee are respected and monitored		

END



Further information to the trainer

Banti, M., & Abraham, E. (2021). Coffee processing methods, coffee quality and related environmental issues. *Journal of Food and Nutrition Sciences*, 9(6), 144-152.

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