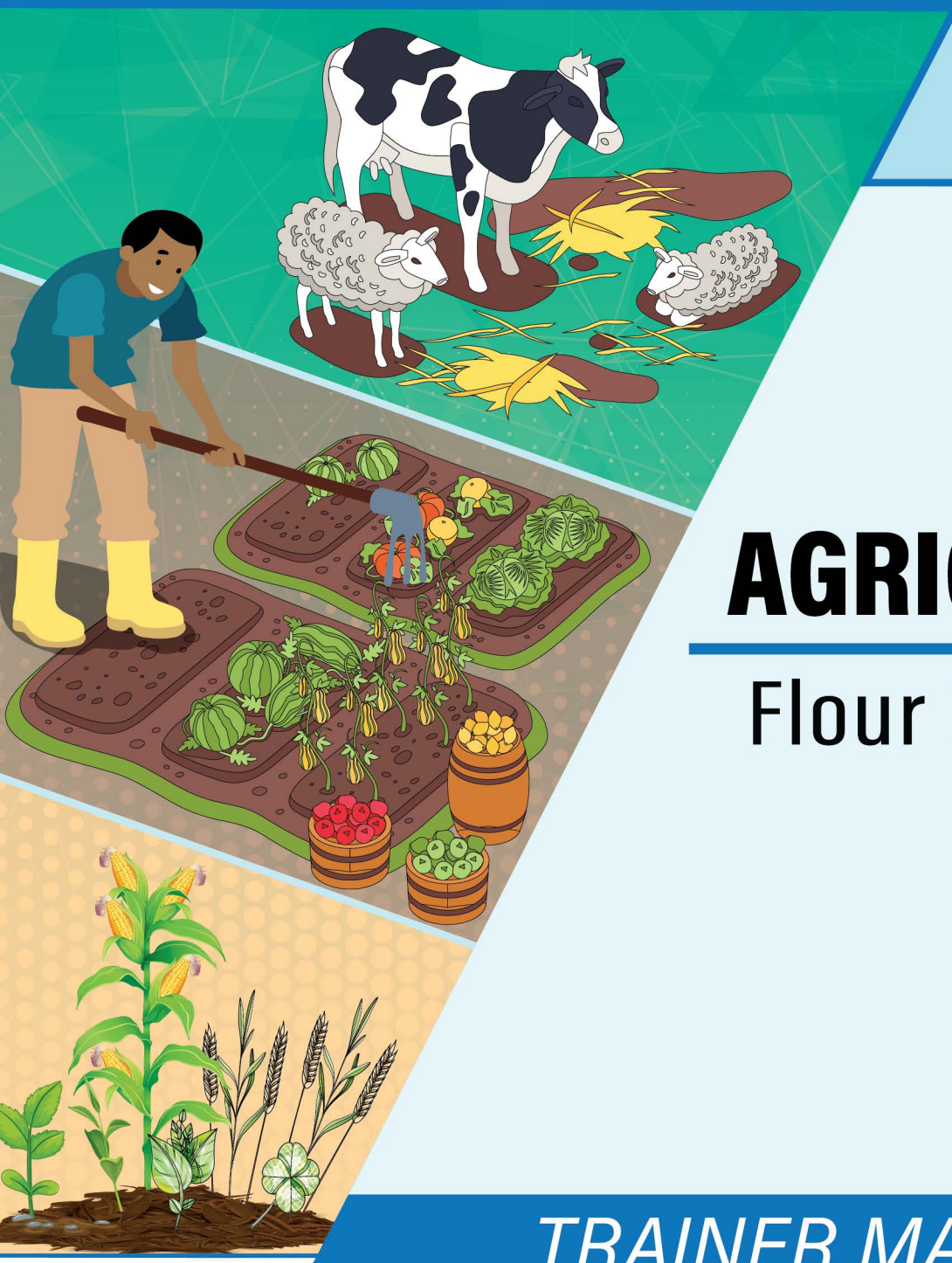
RWANDA POLYTECHNIC

TVET LEVEL II



AGRICULTURE

Flour Processing

TRAINER MANUAL

RWANDA POLYTECHNIC

Approved by: Workforce Development Authority

USAID FROM THE AMERICAN PEOPLE

EDC Education Development Center

2020

Acknowledgements

Rwanda Polytechnic (RP) would like to officially recognize all parties who contributed actively to the preparation of the Trainer and Trainee manuals of this module. We wish to extend our thanks to various organizations such as Workforce Development Authority (WDA), EDC through its USAID Huguka Dukore Akazi Kanoze (USAID - HDAK), TVET schools, Private Industries, GIZ Hanga Ahazaza Project and other individuals who greatly contributed from the initial concept towards publication of this training manual.

Under Rwanda Polytechnic (RP) supervision and involvement

Under Workforce Development Authority (WDA) guiding policies and directives

With funding provided by USAID through Huguka Dukore Akazi Kanoze (HDAK) project

And with technical support by Education Development Center (EDC) through local and international USAID HDAK experts

Production Team

Authoring and Review

Mr. Felix Ntahontuye
Mr. Frank Rutayisire
Dr. Clement Bitwayiki

Conception, Adaptation, Review and Editing

Mr. John Paul Kanyike
Mr. Jean Marie Vianney Muhire
Mrs. Elizabeth Miller Pittman
Mrs. Lauren Hakizimana

Formatting, Graphics and Infographics

Mr. Albert Ngarambe
Mr. Simon Pierre Abayiringira

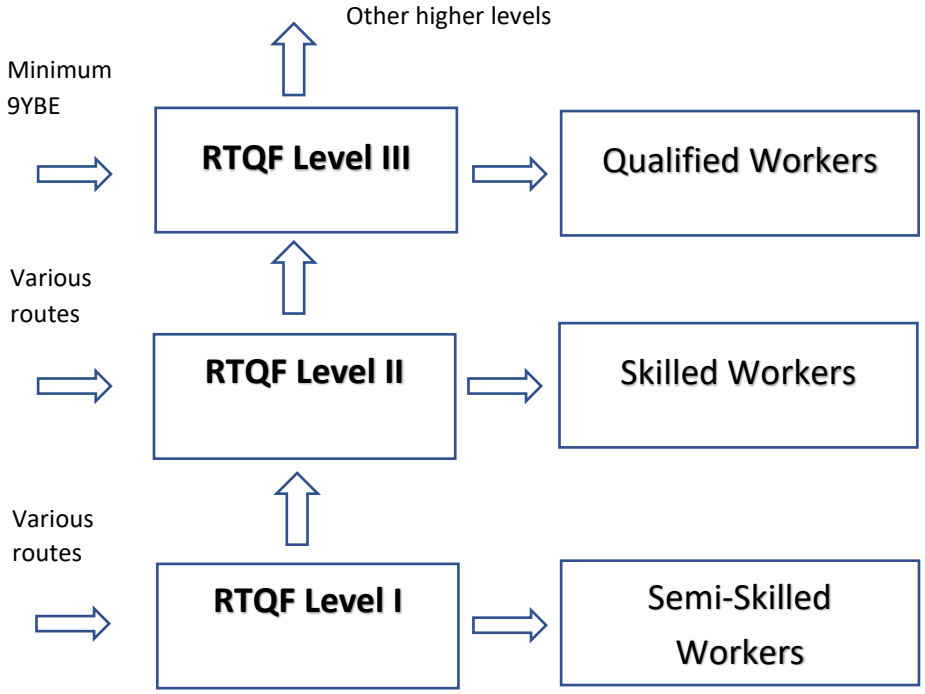
Technical Support

USAID Huguka Dukore Akazi Kanoze (HDAK) project
implemented by Education Development Center (EDC)

Introduction to RTQF Level II Training Modules

Background

Rwanda Polytechnic, with support of and in collaboration with USAID Huguka Dukore Akazi Kanoze, has developed RTQF TVET Level II programs that combine basic education, soft skills and vocational skills modules. Bridging the gap between Level I and Level III programmes, Level II aims to prepare learners who have a minimum education level of Primary 6 or equivalent to continue with their education or become skilled workers in the labour force.



Following the Workforce Development Authority (WDA) curriculum development process that involved experts from Rwanda Polytechnic, Rwanda Education Board, Ministry of Agriculture, technical vocational institutions, Education Development Center, Akazi Kanoze Access and other technical experts, training modules were developed in basic education, soft skills (work readiness) and, initially, agriculture. Additional vocational areas will be added over time. Trainees will be trained in all Basic Education and Soft Skills modules listed below, as well as in 6 - 8 modules that make up their chosen technical vocational programme.

Module Requirements:

Basic Education	Soft Skills	Vocational Skills
• English • Kinyarwanda • Mathematics	• Basic Entrepreneurship Skills • ICT Essentials • Communication Skills	• Vocational programmes will have a set of 6 – 8 required technical modules.

• Integrated Science (Physics, Chemistry, Biology)	• Safety, Health and Sustainable Environment • Personal Development and Career Guidance	E.g. Food Crop Production and Processing includes the following modules: 1. Food Crop Production 2. Small Scale Post-Harvest Operations 3. Growing Medium 4. Food Safety and Sanitation 5. Food Preservation and Storage 6. Flour Processing

Organization of the Training Manuals

For each module there is a Trainer Manual and a Trainee Manual. These manuals, based on the curricula for each subject, are divided into Learning Units, and each Learning Unit includes 3 – 5 Learning Outcomes. The learning outcomes make up the essential skills, knowledge and attitudes to be acquired by trainees. To make the Trainee Manual more user friendly, Unit and Topic are used respectively for Learning Unit and Learning Outcome. The number of hours per training module varies, ranging between 30 and 120 hours.

Teaching & Learning Methodology of RTQF Level II 2 TVET Materials

The teaching and learning methodology used in the materials is based in experiential and adult learning. Activities are designed to engage trainees, build upon what they know and learn and provide them with opportunities to build their skills in the classroom and in the workplace. More specifically, guiding principles in the development of the manuals include:

- Building on participants' knowledge, skills and experiences
- Facilitating a learning process through active engagement of participants rather than through lecturing
- Providing opportunities to practice – inquiry based and hands on practice, both in the classroom and workplace
- Using simple and clear language
- Connecting to the real world: use local resources and the environment for learning
- Promoting critical thinking through properly debriefing activities and asking questions that get learners to think, analyze, relate issues and topics to their own lives and come up with solutions

- Applying social inclusion principles: Finding ways to include all types of youth (and trainers) – males and females; different cultural/ethnic/religious backgrounds, people with disabilities (PWD); people with different types of health status …

- Encouraging risk taking – promote questioning and being free to explore

- Promoting habits of mind that support life-long learning: curiosity and wonder, open mindedness, creativity

These principles are reflected in the layout and flow of activities in the manuals:

1. **Key Competencies:** Table found at the beginning of each Learning Outcome that describes the main knowledge, skills and attitudes to be gained by the end of the activities.

2. **Self-Assessment:** Conducted at the beginning and end of each Learning Unit to get a sense of trainees' knowledge and skills going into it and what they have gained by the end of the Learning Unit (and steps they need to take to further their understanding and skills).

3.  **Getting Started Activity:** Typically, a quick activity or questions to 1) give the trainer a sense of trainees' existing knowledge and skills; 2) spark the interest of trainees in the topic; 3) introduce the objectives and key competencies of the topic.

4.  **Problem Solving Activity:** A challenging activity to get trainees engaged and to learn through discovery instead of memorization of facts. A variety of teaching and learning methodologies are used, including individual and group work such as reading real life work-based scenarios and answering accompanying questions to activities such as identifying proper tools and equipment from the school workshop to conduct a certain activity. Following the sharing of responses, the trainer guides trainees through the content and processes being introduced.

5.  **Guided Practice Activity:** Building on the concepts and skills gained in the Problem Solving Activity, the trainer guides trainees through practical examples.

6.  **Application Activity:** Consolidates trainees' knowledge and skills through a real-life application of the topic in the classroom, community or workplace. Trainees are given more independence in applying what they have learned.

7. **Key Facts boxes:** Throughout the Trainee Manual, one will find Key Facts boxes. These contain the main information or content for a given Learning Outcome. They are there for the trainees' reference and are used throughout the different types of activities.

8.  **Points to Remember:** List of the top key learning points or "take-aways" from the topic.

9.  **Formative Assessment:** Questions and activities to assess trainees' level of understanding of the concepts introduced.

10.  **Summative Assessment:** Based on the integrated, real life situation approach used in other TVET levels, this is done at the end of every module for agricultural modules and, with some variations, at the end of each Learning Unit for Basic Education and Soft Skills modules.

11.  **Self-Reflection:** Trainees re-take the Self-Assessment given at the beginning of the Learning Unit and identify their strengths, challenges and actions to improve their level of competence.

The Trainer and Trainee Manuals are meant to be used in conjunction with each other and are well coordinated through the headings and labelling of activities. The trainer will always be able to refer trainees to specific activities by the coordinated numbering system. For instance, a specific exercise might be labelled Topic 1.2 Task 2. The Topic is the number of the Learning Outcome and the task is the specific exercise to be done. The Key Facts are also numbered for easy reference. These nor the Self-Assessment tables are in the Trainer's Manual so the trainer should have a copy of both manuals.

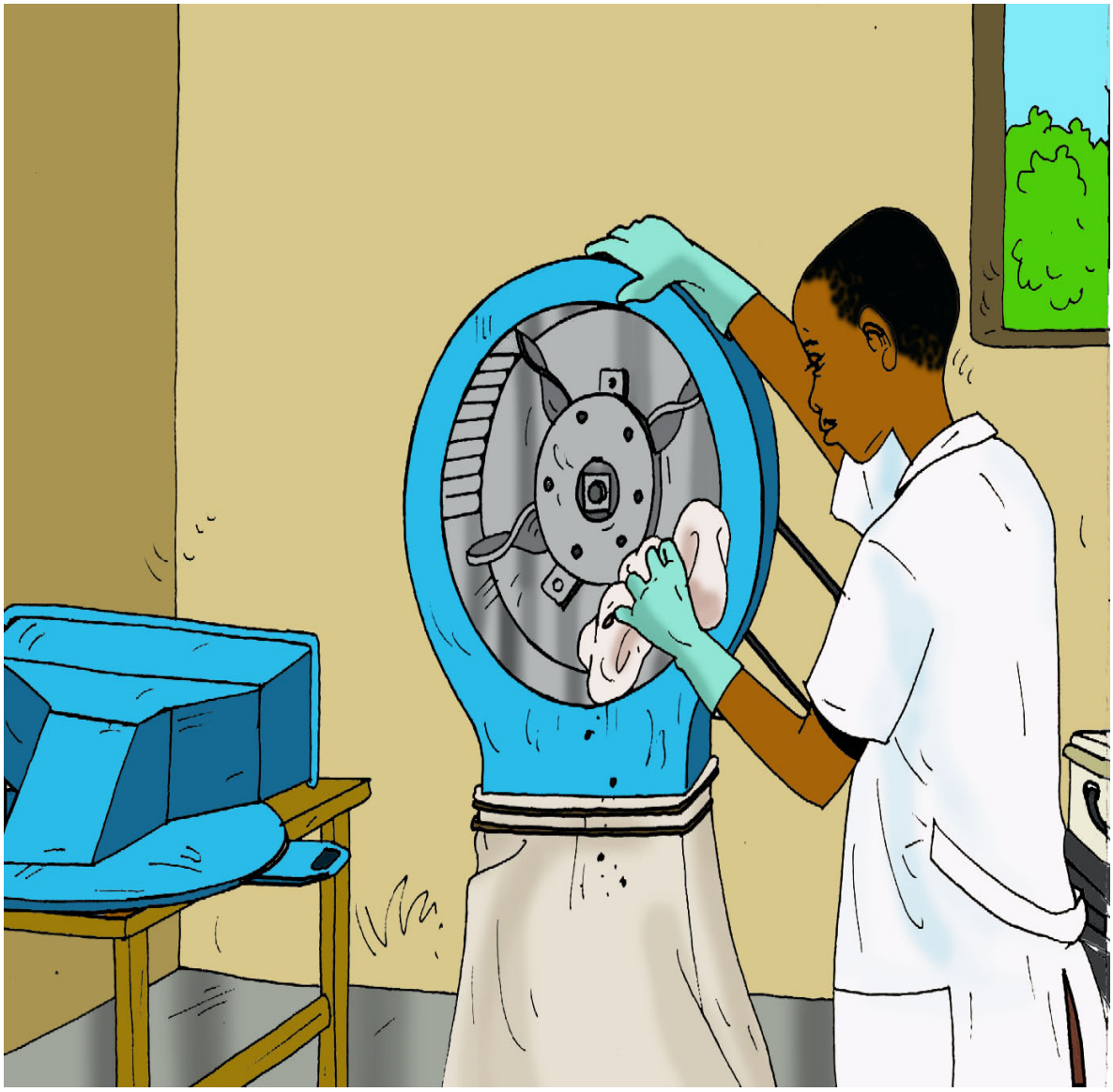
The Trainer's Manual includes answers (or guidelines to the trainer as appropriate) to Formative and Summative Assessments as well as to problems given throughout the activities. Summative Assessments are not included in the Trainee's Manual. These are meant to be used as a guide for those who will be developing a context-appropriative Summative Assessment at the end of the Module or Learning Unit. Basic Education and Soft Skills modules include Summative Assessments at the end of every Learning Unit while the technical modules include it only at the end of the module.

Lastly, there is a section in the Trainer's Manual for additional information to the trainer that includes either specific information or references to information that can help them deepen their understanding of the particular content.

FLOUR PROCESSING

Learning Units	Learning Hours	Learning Outcomes
Learning Unit 1: Prepare tools, utensils, instruments, equipment and consumables	20	**1.1** Clean tools, utensils, instruments and equipment
		1.2 Check the tools, utensils, instruments and equipment
		1.3 Maintain tools, utensils, instruments and equipment
Learning Unit 2: Process roots and tubers into flour	30	**2.1** Prepare roots and tubers
		2.2 Soak roots or tubers (cassava)
		2.3 Ferment root and tubers (cassava)
		2.4 Dry roots and tubers
		2.5 Grind and sieve roots and tubers
		2.6 Check the flour quality
Learning Unit 3: Operate grain mill	30	**3.1** Check the quality of incoming raw materials through physical parameters
		3.2 Set process parameters
		3.3 Maintain process parameters
		3.4 Participate in checking flour quality
Learning Unit 4: Package processed flour	20	**4.1** Select appropriate packages
		4.2 Package the products
		4.3 Label the product

Learning Unit 1: Prepare tools, utensils, instruments, equipment and consumables



Learning Outcomes

By the end of this Learning Unit, trainees will be able to:

1.1 Clean tools, utensils, instruments and equipment

1.2 Check tools, utensils, instruments and equipment

1.3 Maintain tools, utensils, instruments and equipment

Learning Unit 1 Self-Assessment

1. Ask trainees to look at Unit 1 illustration in their Trainee Manuals and discuss what they observe. What topics do they think this unit will include based on the illustration? Allow time for some brainstorming. Afterwards, share the main topics with the trainees.

2. Ask trainees to fill out the self-assessment at the beginning of the unit in their Trainee Manuals. Explain that the purpose of the self-assessment is to become familiar with the topics in the unit and for them to see what they know or do not know at the beginning. At the end of the unit, they will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas that need improvement and actions to take. The self-assessment is not a test!

Learning Outcome 1.1: Clean tools, utensils, instruments and equipment

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

a. Select cleaning products for different tools, utensils, instruments and equipment

b. Use different techniques to clean tools, utensils, equipment and instruments

c. Describe the consequences of a dirty milling room

Time Required: 8 hours

Learning Methodology: Roleplay, demonstration, practical exercise, field visit

Materials Needed:

- Brush, sprayers, Bucket, cleaning cloth, Mill/milling machine
- Detergents, soaps, disinfectants
- Piece of hose, long, thin piece of metal, broom, mop, water

Preparation:

❑ Choose one facility in your neighbourhood in advance and fix an appointment with milling operator or cleaner focusing on cleaning milling facilities, room floor and milling room generally. Ask the permission to assist cleaner for that particular day.

Cross Cutting Issues:

✓ **Environment and sustainability:** While cleaning tools, utensils, equipment and instruments, emphasize the need to work in a clean environment and be mindful of not polluting the environment when disposing of wastes.

✓ **Standardization culture:** Emphasize the need to follow necessary steps and standards while cleaning tools, utensils, equipment and instruments.

Prerequisites: Prior to class, trainees will have some knowledge of:

- Types of detergents
- Cleaning tools

Key Competencies:

Knowledge	Skills	Attitudes
1. Explain the importance of cleaning tools, utensils, instruments and equipment	**1.** Select cleaning products for different tools, utensils, instruments and equipment	**1.** Discerning
2. Identify cleaning products for different tools, utensils, instruments and equipment	**2.** Use different techniques to clean tools, utensils, equipment and instruments	**2.** Thorough
3. Describe cleaning techniques for tools, utensils, instruments, equipment	**3.** Clean tools, utensils, instruments and equipment properly	**3.** Safety oriented

Getting Started: What do we know and where are we going?

Topic 1.1 Task 1:

1. Separate trainees into groups of four or five.

2. Inform each group that they will have 40 minutes to discuss and put together their ideas on the questions below.

a. What types of flour are commonly used in your community?

b. Have you ever participated in or observed flour being processed?

c. What equipment and tools are typically used in the process of making flour?

d. How are these tools and equipment maintained?

3. After all groups have put their ideas together, ask a volunteer from each small group to share their responses.

4. After the sharing and discussions, ask trainees what topic they think this activity relates to.

5. Introduce the learning outcome and have trainees turn to the Key Competencies table in their manuals to see what they will gain from the learning outcome.

6. Explain that this learning outcome/session will focus on cleaning tools, utensils, instruments and equipment. Emphasis will be placed on the milling machine which is used in the production of different types of flours, including cassava, maize, soya beans, sorghum and wheat.

Problem Solving Activity

Topic 1.1 Task 2:

1. In small groups of four or five, inform trainees that they will read the following passage and answer questions that follow.

   Kagabo is the owner of Cassava processing unit located in Muhanga district, the management of the unit has received the order from Tembera Hotel of supplying 600 kg of cassava flour. They need to meet the deadline while providing safe and quality products.

   The management has called upon you as a technician in the unit of cleaning tools, utensils, instruments and equipment to get the milling machine and other equipment ready to process the flour.
   a. Mention the tools, utensils, equipment and instruments that will be needed in the processing the cassava.
   b. Explain to the management the need to clean the tools, utensils, instruments and equipment before, during and after processing the cassava
   c. Describe to the management the procedure to be followed while cleaning the tools, utensils, instruments and equipment during the cleaning process
   d. Describe to the management the types of cleaning products for each tools, utensils, equipment and instruments to be used while cleaning

2. After all groups have finished discussing the questions for 15 minutes, ask them to turn to **1.1 Key Facts** for information to supplement or correct their responses.

3. Ask volunteers from each group to present their main points for each question to the rest of the class. Encourage other groups to give their contributions.

4. Answer any questions trainees may have.

Guided Practice Activity

Topic 1.1 Task 3:

1. Before class, prepare the mill room at school to be able to demonstrate the use and cleaning of the milling machine. Gather any materials needed to clean the machine.

2. Assign trainees (still in their small groups) one flour product maize, soya beans, or cassava roots. Ask them to observe the materials, tools, and equipment found in the milling room and to use the information found in the **1.1** and **1.2 Key Facts** to:
   a. Identify the tools, utensils, equipment and instruments used in processing the identified flour.
   b. Describe the procedure for cleaning the tools, utensils, equipment or instruments identified above.
   c. Identify the products for cleaning the tools, equipment, utensils and instruments identified.

They can use the table below to answer the questions above.

Flour Product	**Maize**	**Soya beans**	**Cassava roots**
Tools, utensils, equipment and instruments used in processing the product	Milling machine	Milling machine	graters, dewatering machines / press, chippers, dryers and grinding / milling machines
Procedure for cleaning tools, utensils, equipment and instruments used in processing the product	Refer to **1.1 Key Facts:** Cleaning tools, utensils, equipment and instruments	Refer to **1.1 Key Facts:** Cleaning tools, utensils, equipment and instruments	Refer to **1.1 Key Facts:** Cleaning tools, utensils, equipment and instruments
Cleaning materials for tools, utensils, equipment and instruments used in processing the product	dry brush, piece of hose, and a long, thin piece of metal, water and moist piece of cloth	cloth, water, brush, liquid soap, scraper	cloth, water, brush, liquid soap, scraper dry brush, piece of hose, and a long, thin piece of metal, water and moist piece of cloth

3. Give each group enough time to do the task. As groups are working guide them where they find challenges.

4. After the discussions, let each group share their type of flour and the responses to the questions.

5. Show the trainees the milling machine and its different parts discussed in the previous activity. Explain to them how each part is cleaned. If possible, demonstrate how to clean it and let the trainees participate in the process.

6. After the presentations and demonstration, refer trainees to **1.2 Key Facts** and review them together. Answer any questions.

Application Activity

Topic 1.1 Task 4:

Explain to trainees that the following task links them to the world of work and tell them that you are ready to provide whatever assistance is needed.

1. Ask trainees to read the activity below and act accordingly

   Choose one facility in your neighbourhood, fix an appointment with grinding operator or cleaner focusing on cleaning grinding facilities, room floor and grinding room generally, ask the permission to assist cleaner for that particular day and upon completion, elaborate a short report preferably one half page on experience you will have gained on workplace exposure.

   Their report should include:
   a. Flour products processed
   b. Tools, utensils, equipment and instruments used in processing the product
   c. Procedure for cleaning tools, utensils, equipment and instruments used in processing the product
   d. Cleaning products for tools, utensils, equipment and instruments used in processing the product
   e. During which periods was the cleaning done? What was cleaned?

2. Tell trainees that each one will share his/her experience gained from workplace with the rest of the class

Points to Remember

When cleaning tools, utensils, instruments, and equipment:

- Disconnect the milling machine from the power supply before cleaning.
- Never use solvents to clean the machine.
- Never submerge the bearings in water.

Formative Assessment

Read the statements provided below and circle ONLY ONE response.

Answers in bold:

1. Sweep the mill room once every 2 working days.
   a. True
   b. **False**

2. The Mill must be cleaned before a period of rest.
   a. **True**
   b. False

3. If grease must be removed, a moist piece of cloth with some soap can be used.
   a. **True**
   b. False

4. Clean the outside of the body with water
   a. True
   b. **False**

5. Always disconnect the machine before cleaning.
   a. **True**
   b. False

6. Always use solvents to clean the machine.
   a. True
   b. **False**

7. Never submerge the Bearings in water
   a. **True**
   b. False

Read the statements provided below and circle ONLY ONE response.

8. If cleaning after grinding a greasy or wet product, wash turning burr, fixed burr, spherical washers, helix, and shaft with:
   a. Hard brush
   b. Soap
   c. Water
   d. **a, b, and c**
   e. a and b

9. After washing the burrs…
   a. Dry them with a towel, complete drying by laying burrs under shade, make sure not to place them on a metal surface.
   b. **Dry them with a towel, complete drying by laying burrs in the sun, make sure they are not placed on a metal surface.**
   c. Dry them with a towel, complete drying by laying burrs in the sun, make sure they are placed on a metal surface.

10. Clean the inside of the body with:
   a. A dry cloth
   b. A wet, soapy cloth
   c. A brush
   d. a, b, and c
   e. **b and c**
   f. None are true

Learning Outcome 1.2: Check the tools, utensils, instruments, and equipment

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

a. Demonstrate the calibration of small-scale tools, utensils, instruments and equipment

b. Describe the parameters of visual inspection and effective use of the equipment and materials

c. Monitor functionality of tools, utensils, instruments and equipment

Time Required: 5 Hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit

Materials Needed:

- Milling machine, milling room

Preparation:

- ❑ Prepare milling facilities so that it presents the defects such as: motor stops running, motor running but blows fuse, motor running but blows fuse when under load, motor develops unusual noise, motor smoking, motor over-heating, vibration of the mill, bearings overheating, overheating belts and unusual noise

Cross Cutting Issues:

- ✓ **Environment and sustainability:** Consider environment issue for its sustainability especially while exercising practical session for checking tools, instruments and equipment.
- ✓ **Gender inclusivity:** Consider gender while forming groups for practical exercises.
- ✓ **Standardization culture:** Follow pre-established standards while checking tools, utensils, instruments, and equipment.

Prerequisites:

- Electricity power supply
- Cleaning of tools, utensils, instruments, and equipment

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe functionality of small-scale instruments	**1.** Use tools, utensils, instruments, and equipment	**1.** Mindful
2. Explain what to check for the milling machine if a given situation happens	**2.** check the milling machine if a given situation happens	**2.** Attentive
3. Describe possible malfunction of small-scale milling machine	**3.** Monitor functionality of tools, utensils, instruments, and equipment	**3.** Detail-oriented

 **Steps:**

 **Getting Started: What do we know and where are we going?**

 **Topic 1.2 Task 1:**

1. Ask trainees to discuss the following with a partner:
   - **a.** Why do you think checking tools, utensils, instruments and equipment in a milling facility is important?
   - **b.** What types of problems might one encounter with the equipment?
   - **c.** What types of experience have you had with equipment that is not functioning properly and what steps did you take to try and resolve the problem?

2. Have some pairs share their responses with the class.

3. After the discussion, ask trainees what topic this activity relates to.

4. Introduce the learning outcome and have trainees turn to the Key Competencies table to see what they will gain from the learning the outcome and review it together.

5. Explain that this learning outcome/session will focus on checking the tools, utensils, instruments, and equipment.

Problem Solving Activity

Topic 1.2 Task 2:

1. Tell trainees to pair up with partner.

2. Inform trainees that the table below shows on one side the common faults in tools, utensils, instruments, and equipment found in a milling facility.

3. Complete the table by describing what to check for in the tools, utensils, instruments and equipment when a given situation happens.

Faults	What to check for?
Motor stops running	
Motor running but blows fuse	
Motor running but blows fuse when under load	
Motor develops unusual noise	
Motor over-heating	
Vibration of the mill	

4. Give each group enough time to do the task. As groups are working, guide them where they find challenging.

5. After the discussions, let each group share their responses to the questions.

6. After the presentations, have trainees refer to **1.3 Key Facts** and review them together. Answer any questions.

Guided Practice Activity

Topic 1.2 Task 3:

1. Divide trainees into four 4 small groups and have them go to the warehouse of the school where the milling machine is located. There they will meet the operator of the milling machine and ask him or her questions. They should find out how the milling machine is currently running, what problems it typically has and what the operator does to resolve these problems.

2. Ask trainees to then perform the following tasks to help the operator fix any problems (**Note:** ideally there will be an issue with the milling machine):
   a. Observe how the milling machine is functioning.
   b. Take the necessary steps to check the functionality of different parts of the milling machine.
   c. Identify and take steps to fix the problem.

3. After all groups have finished identifying and working on the issue, have them share their findings with the whole class.

4. Tell the rest of the class to note down comments and questions for clarification as other group presents their findings.

5. Give floor to the rest of the class for their comments.

6. Provide clarification if any and conclusion referring to **1.3 Key Facts** in the Trainee Manual.

Application Activity

Topic 1.2 Task 4:

1. Divide trainees into groups of 3 trainees each.

2. Provide with them the following scenario.

3. Ask trainees to read the scenario carefully as they do have it in their training manual, then give them some time to react to it:

Your school milling equipment has stopped running. Prior, the motor was running, but blew a fuse under load. It developed and unusual noise, released smoke, was over-heating. The mill was also vibrating, and the belts and bearings would overheat.

4. Have trainees describe the procedure you will follow to help the school:
- **a.** Monitor functionality of milling facility.
- **b.** Check functionality of milling machine.
- **c.** Fix minor faults of milling machine.

Points to Remember

When checking tools, utensils, instruments, and equipment in a milling facility:

- Never handle any parts with bare hands.
- Never put your hands in machines when still running.
- Do not operate the motor if it doesn´t work well.
- Please remember to disconnect the milling machine from the power supply before checking.

Formative Assessment

Read the machinery faults in Table 1 and choose a letter that matches with the corresponding causes from Table 2.

Table 1

Faults
1. Motor stops running
2. Motor running but blows fuse when under load

Table 2

Main causes	
a.	• When power is at incorrect voltage • When electrical cables have burned • When fuses have blown • When there are imbalances in case of more than one machine in power consumption
b.	• When neighbours' machines are working and cause imbalances of power • When the load is below the rated load. • When the fuse is incorrect size

3.	Motor running but blows fuse	**c.**	• If motor is overloaded • If connections on the motor are not satisfactory
4.	Motor over-heating, in this case check	**d.**	• If there is a loose fan, rotor or pulley • If shaft has bent • If hammers are unbalanced, loose, broken or wrong type • For wrong type of bearings
5.	Vibration of the mill	**e.**	• Motor wiring • Motor rating • If fan is working • Maintenance book (is motor due for service?) • Power supply • If Alignment of pulleys/belts is correct • Grease (is the quantity and quality correct?)

Answers:

1. a
2. c
3. b
4. e
5. d

Learning Outcome 1.3: Maintain of tools, utensils, instruments and equipment

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

a. Describe the installation techniques of the equipment
b. Describe the SOPs (standard operating procedures) for each equipment
c. Perform safety precautions of the equipment (effect on the user and product)
d. Correctly maintain equipment

Time Required: 5 Hours

Learning Methodology: Pair work, demonstration, practical exercise and Field visit

Materials Needed:

- Milling machine, milling room, oil, water.

Preparation:

❑ Prepare milling machine

Cross Cutting Issues:

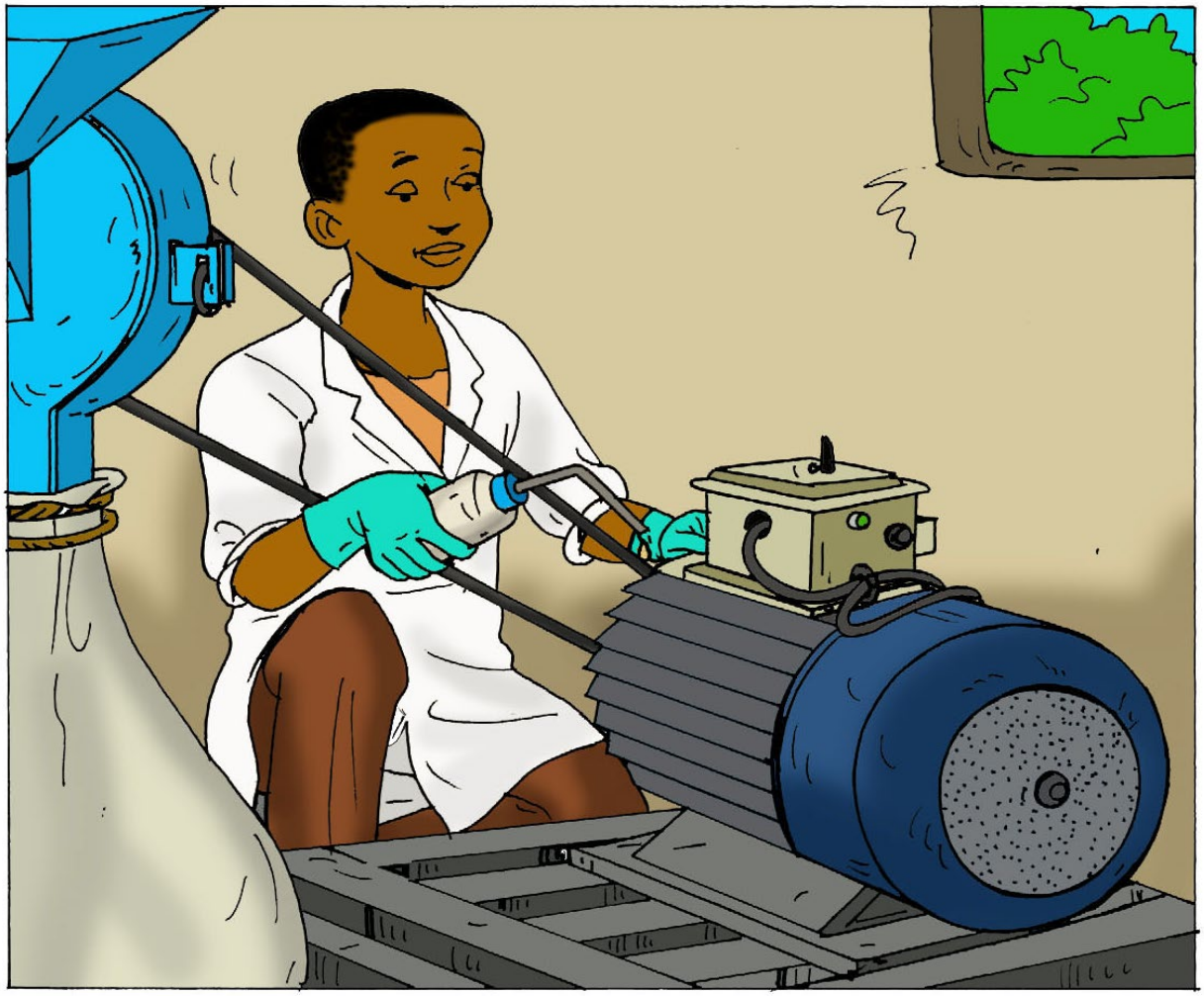
✓ **Environment and sustainability:** While carrying out practical exercise consider environment and sustainability issues.
✓ **Inclusive education:** Promote inclusiveness while assigning the roles for group
✓ **Gender:** Consider gender while dividing trainees into groups for practical exercise

Prerequisites: Prior to class, students will have some knowledge of:

- Fluids property
- Checking of the tools, utensils, instruments and equipment
- Cleaning of tools, utensils, instruments and equipment

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the installation techniques of the equipment	**1.** Carry out daily maintenance and adjustment of milling machines	**1.** Proactive
2. Describe the SOPs (standard operating procedures) for processing	**2.** Perform safety precautions of the equipment (effect on the user and product)	**2.** Creative
3. Describe the safety precautions for milling equipment	**3.** Correctly maintain equipment	**3.** Cautious



Steps:

Getting Started: What do we know and where are we going?

Topic 1.3 Task 1:

1. Get trainees into groups of four or five.

2. Ask them to observe topic 1.3 illustration above and respond to the questions below:
   a. What do you observe in the illustration?
   b. What do you think the person is doing in the illustration?
   c. Why is it important to perform the activity identified above?
   d. What do you think might happen to equipment in the milling facility in case the activity identified above is not done?

3. Have some pairs share their responses to the rest of the trainees.

4. After the discussion, ask trainees what topic this activity relates to.

5. Introduce the learning outcome and have trainees turn to Key Competencies table to see what they will gain from the learning the outcome and review it together.

6. Explain that this learning outcome/session is all about maintaining tools, utensils, instruments and equipment

Problem Solving Activity

Topic 1.3 Task 2:

1. Ask each learner to pair up with a partner, read the following scenario and respond to the questions.

   "Tapixa, a flour processing company, had a very urgent task to supply a hotel with maize flour which was ordered on very short notice. Due to the fact that the said hotel is normally a loyal customer of them, Tapixa management decided they had to honour the request and commit themselves to quality, the quantity requested and the deadline. While the company was in middle of processing the flour, the milling machine shut down itself. It took a while to fix the problem and resume processing which eventually resulted in a delay of the supply.

While they were packaging the processed flour, the management received a notice from the hotel that the contract to supply the flour was cancelled due to noncompliance of deadline on the side of the supplier. The hotel had gone ahead and accepted a proposal to work with another supplier."

a. In your opinion, what was wrong with Tapixa company?
b. What would you recommend to the Tapixa company from now on?

Possible Answers:

a. Tapixa hastily responded to the request and perhaps overestimated what they could do; Tapixa possibly does not maintain their milling machines on a regular basis; in the haste to finish the job, operators might have ignored any warning signs like loud noises, etc.
b. Make sure to have and uphold a regular maintenance schedule of equipment and tools; assess how realistic it is to meet a demand – if you cannot meet the demand, be upfront about what you can do, emphasizing that it will be high quality.

2. Give each pair enough time to do the task. As pairs are working guide them where they find challenging.

3. After the discussions, let each group share the responses to the questions.

4. After the presentations, refer trainees to **1.4 Key Facts.**

5. Divide them into 4 groups and assign each group a section of **1.4 Key Facts**:
- **Group 1:** Installation: Building, site selection and plant layout, sections "Buildings" and "For cassava flour."
- **Group 2:** Installation: Building, site selection and plant layout, sections "Plant Layout" and "Separations/demarcations"
- **Group 3:** Daily maintenance of milling equipment
- **Group 4:** Weekly maintenance

6. Their task is to:
a. Read through and discuss the information provided.
b. Create a poster or use some other creative way to present the information to the rest of the class.

7. Give trainees time to absorb the information and to make a creative presentation of that information for the class.

8. Ask each group to share their presentation. Encourage other groups to ask questions. Clarify any points as needed.

Guided Practice Activity

Topic 1.3 Task 3:

1. Before class, meet with the mill machine operator to plan for the class to come and work on two milling machines.

2. Inform trainees that they will visit the workshop where two machines are set. They will work with the milling machine operator to:
   a. Carry out daily maintenance of milling machine.
   b. Perform weekly maintenance of milling machine.
   c. Check fluid levels, filters and safety appliances for both milling machines.

3. Ask trainees to write a report for the activity, describing the procedures they followed to perform the activities above.

4. Ask a few volunteers to share their experience and highlights of their report with the class.

5. After the discussions, form small groups and refer trainees to **1.5 Key Facts**, which describes general maintenance of tools, utensils, instruments, and equipment in a milling facility, and review them together. Answer any questions.

6. Have trainees, in their groups, develop a pamphlet or series of posters that can be used to provide the information to employees who work in a flour processing plant. (**Note:** You can divide the sections of **1.5 Key Facts** between 3 groups or you can have each group create pamphlets/posters for all the sections).

7. Ask groups to share their pamphlets or posters with the other groups for feedback.

Application Activity

Topic 1.3 Task 4:

1. Inform trainees that they will visit a flour milling facility in their community and ask the operator if they can assist in performing daily and weekly maintenance tools, utensils, instruments and equipment

2. They will make a daily and weekly maintenance report which should include:
   a. Installation techniques of the equipment
   b. SOPs (standard operating procedures) for each equipment
   c. Maintenance and adjustment
   d. Effectiveness of the equipment
   e. Safety precautions of the equipment (effect on the user and product)

3. Ask them to prepare class presentation to give to the rest of the class on their findings.

Points to Remember

- If the wick that carries the oil becomes worn or thin, replace it immediately to avoid damage to the machine.

- If cleaning is done daily, it will increase the life of the machine.

- When a machine is not in use, make sure that power is switched off at the mains and that equipment has not been left switched on. This is very important when power cuts occur, because when power returns a machine that has been left on can injure an operator or cause a fire.

- Please remember to disconnect the milling machine from the power supply before maintenance.

Formative Assessment

Answers are in bold:

Read the statements below and circle the false statement.

1. For daily maintenance:
   a. Press the oil pump button 2-3 times while the machine is running until you see oil flowing through the feeder tube.
   b. This should be done every 3 hours of machine use.
   c. This should be done every 4 hours of machine use.
   d. **This should be done every 1 hours of machine use.**
   e. None of the above is correct

2. For weekly maintenance:
   a. Change the fuel filter every 340 working hours
   b. **Change the fuel filter every 320 working hours**
   c. Change the fuel filter every 360 working hours
   d. None of the above is correct

Determine if the following statements are true or false:

3. In daily maintenance we have to check the level of the oil pump, always replacing the cap to prevent oil lines becoming contaminated with dust and getting blocked
   a. **True**
   b. False

4. In daily maintenance we have to remove any dust with a brush especially around the bottom of the machine, the looper and the knives
   a. True
   b. **False**

Fill in the missing words to complete the following sentences:

5. Plunge the machine **vertically** into the oil bath so that it is immersed to the level of the throat plate.

6. Turn the machine manually **at the pulley** so that moving parts are cleaned by the oil.

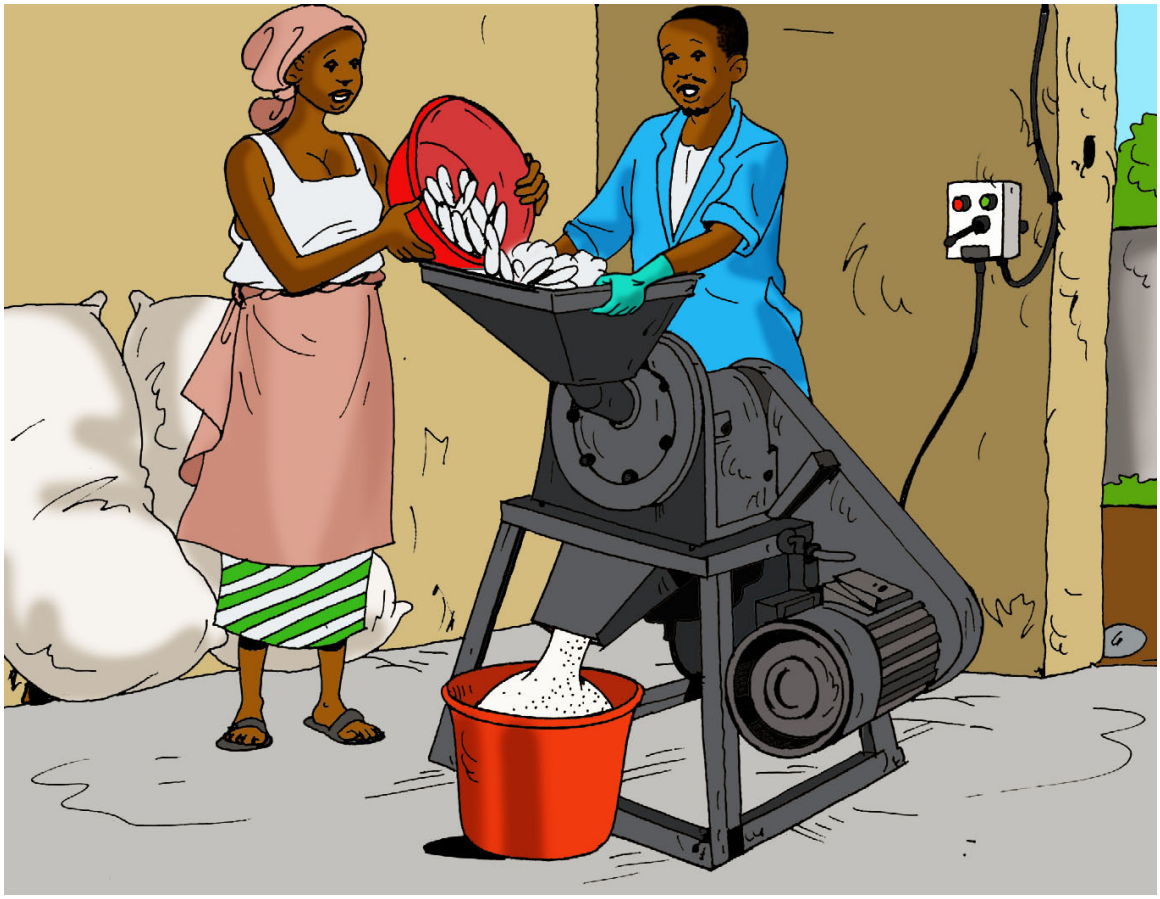
7. Clean the outside with a **small oiled brush,** wipe clean with a soft absorbent cloth.

Self-Reflection

1. Ask learners to re-take the self-assessment at the beginning of the unit. They should then fill in the table in the Trainee's Manual to identify their areas of strength, areas for improvement and actions to take to improve.

2. Discuss trainees' results with them. Identify any areas that are giving many trainees difficulties and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to go through commonly identified difficult concepts).

Learning Unit 2: Process roots and tubers into flour



Learning Outcomes

By the end of the Learning Unit, trainees will be able to:

2.1 Prepare roots and tubers

2.2 Soak roots or tubers (cassava)

2.3 Ferment root and tubers (cassava)

2.4 Dry roots and tubers

2.5 Grind and sieve roots and tubers

2.6 Check the flour quality

Learning Unit 2 Self-Assessment

1. Ask trainees to look at Unit 2 illustration in their Trainee Manuals and discuss what they observe. What topics do they think this unit will include based on the illustration? Allow time for some brainstorming. Afterwards, share the main topics with the trainees.

2. Ask trainees to fill out the self-assessment at the beginning of the unit in their Trainee Manuals. Explain that the purpose of the self-assessment is to become familiar with the topics in the unit and for them to see what they know or do not know at the beginning. At the end of the unit, they will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas that need improvement and actions to take. The self-assessment is not a test!

Learning Outcome 2.1: Prepare roots and tubers

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

a. State compound of cassava root
b. Sort cassava roots for processing
c. Develop culture of cleaning workplace
d. Recognize the consequences of poor prepared cassava root
e. Peel cassava roots for processing

Time Required: 4 hours

Learning Methodology: Simulation, demonstration, practical exercise and field visit

Materials Needed:

- Sorting table, roots and tubers, clean water
- Washing vats, roots and tubers, peeling machine, knives
- Audio/visual materials: DVD/downloaded videos, projector, computer

Preparation:

❑ Prepare audio-visual aids such as DVDs to enable the learner to watch how preparation of roots and tubers works

Cross Cutting Issues:

✓ **Environment and sustainability:** Ensure the environment is taken care of while in demonstrating or while the trainees are in practical exercise on how to prepare roots and tubers.
✓ **Gender:** Make sure that both sexes are represented while forming the groups in order to promote gender balance.
✓ **Standardisation culture:** Make sure that roots and tubers are cleaned as per standards.

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
1. State compound of cassava root	**1.** Sort cassava roots for processing	**1.** Teamwork spirit
2. Recognize the consequences of poor prepared cassava root	**2.** Peel cassava roots for processing	**2.** Cleanliness
3. Explain benefit of effective preparation of cassava roots	**3.** Wash cassava roots for processing	**3.** Detail-oriented

Getting Started: What do we know and where are we going?

Topic 2.1 Task 1:

1. Get the trainees into groups of five to discuss what the illustration above displays.

2. Ask team members to share their experience with preparing cassava roots.

3. Let them present the findings from their respective groups by choosing group representative who will present on behalf of others

4. Ask trainees what they think the learning outcome is all about

5. Introduce the learning outcome and review the Key Competencies table together.

Problem Solving Activity

Topic 2.1 Task 2:

1. Get trainees into groups of reasonable number according to the class size

2. Ask each group to read the following passage and attempt to respond to the question associate to it.

   Coprexa Company Ltd has opened its door very recently, the main purpose of the business is to produce high quality cassava flour, while the company was recruiting production manager, one member of panel asked him the very pertinent question on which basis the quality of flour is based on, then he responded that quality of flour depend on the raw materials used and how it is prepared, he added on that poor preparation of raw material is irreversible, all panel members kept quiet and got concentrated to assign the marks to the interview sheet.

   a. From the scenario, do you think the person being interviewed for the production manager position was right regarding the quality of the flour?
   b. Give reasons to support your response.
   c. In your opinion, what do you think is the most effective way to prepare cassava raw material?

   Possible Answers:
   a. Yes, he was right.
   b. If poor quality roots are not sorted out, the resulting flour will not be good.
   c. How to prepare cassava
      - **Sorting:** Select healthy roots from the lot for processing. Discard the unwholesome roots.
      - **Washing:** Wash peeled roots in clean water at least twice to remove pieces of peel, sand and other dirt. Clean cloth and used sack can also be used to facilitate washing.

- **Cassava roots**: Use fresh cassava roots harvested 10-12 months after planting. The fresh
  roots must be healthy without rot and well-handled from farm.
- **Peeling:** Peel with clean stainless-steel knives and remove woody tips. Ensure that the rind is completely removed and avoid excessive waste of roots. Mechanical peelers are available in medium to large scale processing.
- **Note:** Sorting and peeling can be done simultaneously in small scale processing.

3. Give them enough time to think about the passage in their respective groups.

4. Have them present the findings to the rest of the class.

5. Take them through the related **2.1 Key Facts** as they are attempting to respond to the questions.

Guided Practice Activity

Topic 2.1 Task 3:

1. Divide trainees into groups of 4 by counting 1 to 4.

2. Tell trainees to imagine that they are given a basket of cassava roots.

3. Ask trainees to describe how they should prepare the cassava roots for processing in each of the processes:
   a. Sort cassava roots for processing
   b. Peel cassava roots for processing
   c. Wash cassava roots for processing

4. Attend to each group for providing assistance and demonstration.

5. Reconvene the groups to share their experiences from this session.

6. Provide clarification where needed referring to the **2.1 Key Facts** Preparation of roots and tubers

Application Activity

Topic 2.1 Task 4:

Explain to trainees that the following task link them to the world of work and tell them that you are ready to provide whatever assistance is needed.

1. Ask trainees to read the following and act accordingly

   Fix an appointment with cassava flour processors in your community. As you join them for preparation of raw material, your role is to identify strength and shortcomings upon completion of raw material preparation activities. Tell the workers what you have learned in class about sorting, peeling, and washing.

2. Ask trainees to note down the important points and prepare a report after the visit regarding:
   a. Sorting cassava roots for processing
   b. Peeling cassava roots for processing
   c. Washing cassava roots for processing

3. Organize presentations of the findings.

Points to Remember

- Always discard unhealthy roots during the sorting process because unhealthy roots will ruin the flour.
- Always completely peel the cassava root before continuing with processing steps.

Formative Assessment

Read the statements below and determine if they are true or false.

Answers in bold:

1. Select healthy roots from the lot for processing.
   a. **True**
   b. False

2. Wash peeled roots in clean water at least once to remove pieces of peel, sand and other dirt.
   a. True
   b. False

3. Sorting and peeling can be done simultaneously in small scale processing.
   a. True
   b. False

4. Use fresh cassava roots harvested 5-10 months after planting.
   a. True
   b. False

5. Fresh roots must be healthy with rot and well-handled from farm.
   a. True
   b. False

6. Discourage the use of mixed varieties in processing
   a. True
   b. False

Read the statement below and respond in 2-3 sentences.

7. Discuss importance and process of peeling cassava roots prior to its processing
   Answer: Refer to **2.1 Key Facts**.

Learning Outcome 2.2: Soak roots or tubers (cassava)

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

a. Identify cause of diseases associated to cassava
b. Perform soaking process
c. Explain soaking process
d. Treat bitter cassava

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, and field visit

Materials Needed:

- Roots and tubers
- Soaking tanks

Preparation:

❑ Prepare water tank or water container before hand

Cross Cutting Issues:

✓ **Environmental sustainability:** While disposing the waste,
✓ **Gender:** During practical exercise the groups will be formed putting into considerations both sexes.

Prerequisites:

- None

Key Competencies

Knowledge	Skills	Attitudes
1. Identify cause of diseases associated to cassava	**1.** Perform soaking process	**1.** Diligent
2. Explain soaking process	**2.** Treat bitter cassava	**2.** Innovative
3. Define soaking length	**3.** Estimate number of days for soaking process	**3.** Detail-oriented

Steps:

Getting Started: What do we know and where are we going?

Topic 2.2 Task 1:

1. Ask trainees to brainstorm and write their ideas regarding the following questions:
   a. What is the importance of processing cassava roots after soaking?
   b. What are the consequences if cassava roots are processed without soaking?

2. Ask a few trainees to share their ideas.

3. After the discussion, ask trainees what topic they think this activity relates to.

4. Introduce the learning outcome and have trainees turn to the Key Competencies in their training manuals to read what they will gain from the learning outcome.

5. Explain that this learning outcome/session will focus on soaking roots or tubers, specifically cassava.

Problem Solving Activity

Topic 2.2 Task 2:

1. Put trainees in small groups.

2. Ask trainees of each group to go through the following passage and attempt to respond to the question associate to it.

Manuma visited the centre of Kirambura and was warmly welcomed by his old friend Kambaga, who lives in the region. During his stay, Manuma was surprised to see citizens consuming ugari. Kambaga asked him why he was surprised and Manuma told him that many people in their region do not consume it because 5 years ago, many people fell sick. They suffered from irreversible paralysis of the legs (especially children and young women), impaired neurocognition (in children), tropical ataxic neuropathy (in older people) and aggravation of iodine deficiency disorders (such as goitre and cretinism) in iodine deficient areas. Kambaga could not understand the scenario. Give them enough time to think about the passage in their respective groups.

3. Ask them to respond to the following questions with their groups:
   a. From the scenario, what do you think was the main cause of the sickness?
   b. What do you think could have been done to prevent the sickness?

4. Have them to present the findings,

5. Take them through the related **2.2 Key Facts** as they are attempting to respond to the questions

Guided Practice Activity

Topic 2.2 Task 3:

1. Ask each learner to pair up with a partner and read the following scenario:

   Konzo is an upper motor neuron disease that occurs mainly in children and young women and is associated with high cyanogen intake amongst people living on a monotonous diet of bitter cassava.

   In 2010 the wetting method was taught to the women in Kay Kalenge village, Popokabaka Health Zone, Bandundu Province, DRC, where there were 34 konzo cases. Over the intervention there were no new cases of konzo and the urinary thiocyanate of the school children fell to safe levels. Fourteen months later they found no new cases of konzo in Kay Kalenge, the women were still using the soaking method.

2. Ask trainees to read carefully the scenario and answer the questions below
   a. What do you think was causing Konzo?
   b. What do you think reduced the Konzo?

3. Organize a large group session for trainees to share their findings.

4. Encourage trainees to ask questions for clarification.

5. Provide clarification where needed referring to **2.2 Key Facts**.

Application Activity

Topic 2.2 Task 4:

1. Tell trainees to go for a field trip to a nearby farm during the cassava soaking period. Encourage them to ask as many questions as they can to the workers with the aim of understanding the various benefits of cassava soaking.

2. Ask trainees to note down the important points and prepare a report after the visit and make a report of your trip noting:
   a. The processing of soaking cassava
   b. The importance of soaking cassava

3. Organize a class presentation for trainees to share their findings.

Points to Remember

- Peeled cassava roots should be soaked in water in a large vessel or a running stream for 3-4 days.

- Do not reduce soaking time to 1-2 days (called short soaking) because cyanogen is only partially removed, and cassava flour has high cyanide content.

Formative Assessment

Answers in bold:

Read the statements below and determine if each one is true or false.

1. Peeled cassava roots are soaked in water in a large vessel or a running stream for 1-2 days.
   a. True
   b. **False**

2. Soaking process causes roots to soften and enzyme breaks down Linamar and HCN gas bubbles off.

a. True

b. False

3. Soaking method removes cyanogen satisfactorily, but if the soaking time is reduced to 3-4 days (called short soaking) cyanogen are only partially removed and cassava flour has high cyanide content

a. True

b. False

Learning Outcome 2.3: Ferment root and tubers (cassava)

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

a. Explain fermentation process
b. Carry out grating
c. Estimate fermentation length
d. Perform pressing
e. Describe pressing process
f. Ferment cassava mash

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit, think-pair-share

Materials Needed:

- **Materials**: Roots and tubers, water, clean sacs, basin
- **Tools and equipment**: cassava mash, grating machine, hydraulic press

Preparation:

- ❑ Prepare grating machine and hydraulic press to be used while fermenting.

Cross Cutting Issues:

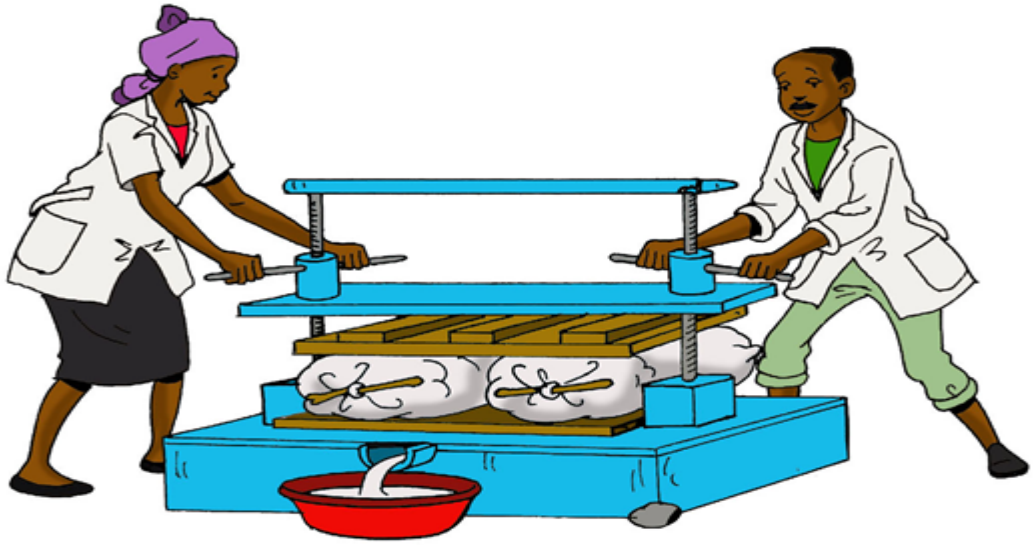
- ✓ **Environment and sustainability:** While carrying out practical exercise, ensure that the environment is taken care of especially during waste disposal.
- ✓ **Gender:** During practical exercise put into considerations gender balance.
- ✓ **Standardisation culture:** While fermenting, make sure to follow the standards.

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
1. Explain fermentation process	**1.** Carry out grating	**1.** Critical thinking
2. Estimate fermentation length	**2.** Perform pressing	**2.** Teamwork spirit
3. Describe pressing process	**3.** Ferment cassava mash	**3.** Diligent



Steps:

Getting Started: What do we know and where are we going?

Topic 2.3 Task 1:

1. Ask trainees to think about the illustration above in their training manual and respond to the following questions.
   a. What do you see?
   b. what do you think the people on illustration are doing?
   c. Have you ever participated in such activities? If so, share with your neighbour

2. Have some groups share their responses with the rest of the trainees.

3. After the discussion, ask trainees what topic they this activity relates to.

4. Introduce the learning outcome and the Key Competencies table which shows what they will gain from the learning the outcome. Explain that this learning outcome/session will focus on fermenting root and tubers (cassava)

Problem Solving Activity

Topic 2.3 Task 2:

1. Form four groups of trainees and assign a category to each group: fermenting, grating, de-watering/pressing, and granulating.

2. Ask trainees to read carefully the following scenario and answer the questions that follow.

   Manuma has been learning a lot about how to safely process cassava from his friend Kambaga. He realizes the illnesses in his region have been caused by consuming gari or fufu high in cyanogen. He would like you to help him create flyers on how to properly and safely prepare cassava flour for farmers in his region.

3. Tell trainees to work with their groups to complete the tasks below:
   a. What key information would you include in the flyers?
   b. Read **2.3 Key Facts** and add any information you missed in the previous question.
   c. Create a flyer showing the safe way to prepare cassava for flour processing. Be creative!

4. Ask each group to present your flyer to the class. Each group should provide the details for their assigned category: fermenting, grating, de-watering/pressing, and granulating.

5. Pass the flyers around so all can see.

6. After sharing, refer trainees to **2.3 Key Facts** in their manual and review them together. Answer any questions trainees may have on the different processes involved in making cassava flour.

Guided Practice Activity

Topic 2.3 Task 3:

1. Create groups of six trainees each.

2. Bring trainees to the workshop of the school where four stations are set. Explain to them that first station is for grating, second station is for fermenting, the third station is for de-watering/pressing, and the fourth one is for granulating. The stations are labelled from one to four respectively.

3. Upon arrival to the workshop, provide each group with peeled fresh cassava roots to trainees and ask them to perform the following in their respective group and under your guidance:
   a. Grate peeled fresh cassava roots
   b. Fermenting
   c. De-watering/pressing grated cassava mash
   d. Cake breaking / granulating

4. Provide clarification where needed to each group.

Application Activity

Topic 2.3 Task 4:

1. Tell trainees that they will visit a cassava processing unit in the community to observe how they process their cassava and write a report regarding:
   a. Fermenting
   b. Grafting
   c. De-watering
   d. Pressing

2. When they are back from the visit, guide them on how to share their findings. Discuss as a group and harmonize their findings.

Points to Remember

- Never chip high cyanide cassava to produce cassava flour meant for human consumption.
- Any cassava variety known to be bitter or to contain a high amount of cyanogen must be grated.
- Any variety whose level of bitterness or cyanogen content is unknown should be grated.

Formative Assessment

1. Name the main stages of processing low cyanide cassava variety and high cyanide cassava variety into flour and put them in order.

Answers:

Main stages for low cyanide cassava variety:	Main stages for high cyanide cassava variety
1. Chipping	1. Grating
2. Fermenting	2. De-watering/pressing
3. Drying	3. Fermenting
4. Milling	4. Cake breaking/granulating
	5. Drying

Read the statements below and determine if each one is true or false.

Answers in bold:

2. Put cassava mash into a clean sack and tie. Allow to stand in a fermenting trough for 1-2 days.

a. True

b. False

3. Arrange sacks in such a way that there is contact with sand or dirt that can contaminate the mash.

a. True

b. False

4. Allow free seeping of water from the sacks
   a. **True**
   b. False
5. Fermentation should not be less than 1 day (to allow development of the characteristic sour taste of Gari)
   a. True
   b. **False**

6. Grating is very efficient in hydrolysing more than 95% of the toxic compounds within 3 hours, after which the compounds can be almost entirely removed by dewatering.
   a. **True**
   b. False

7. The cassava is usually grated at least 5 minutes after washing in order that excess water can drain off the peeled and washed cassava, otherwise the roots are too slippery and too difficult hold during grating.
   a. True
   b. **False**

8. Pressing takes place before fermentation.
   a. True
   b. **False**

9. With a parallel board press a pulp filled bag is placed between two parallel boards which are screwed together to apply pressure to the bag.
   a. **True**
   b. False

10. The fermented mash in sacks is pressed to remove as much moisture as possible. Pressing is completed when water is no longer dripping from the sacks.
   a. **True**
   b. False

11. The pressing time depends on the efficiency of the press and moisture content of the mash.
   a. **True**
   b. False

12. Sacks should be used for too long and many times to maximize the profit.
   a. True
   b. **False**

Learning Outcome 2.4: Dry roots and tubers

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

a. Explain drying cassava flour process
b. Carry out cassava flour sun drying
c. Identify acceptable percentage of moisture content
d. Spread cassava mash over black polyethylene sheet pressing
e. Describe drying cassava flour process
f. Dry cassava mash

Time Required: 5 Hours

Learning Methodology: Simulation, demonstration, practical exercise and Field visit, think pair share square

Materials Needed:

- Sifted mash or the chips, Elevated platform, Black polythene sheet
- Poster paper, Markers, Sheets of papers

Preparation:

- ❑ Prepare elevated platform where to spread sifted mash or chips and be in possession of black polythene sheet, you also need to prepare poster paper and markers for each sub-group, and a sheet of papers for each individual

Cross Cutting Issues:

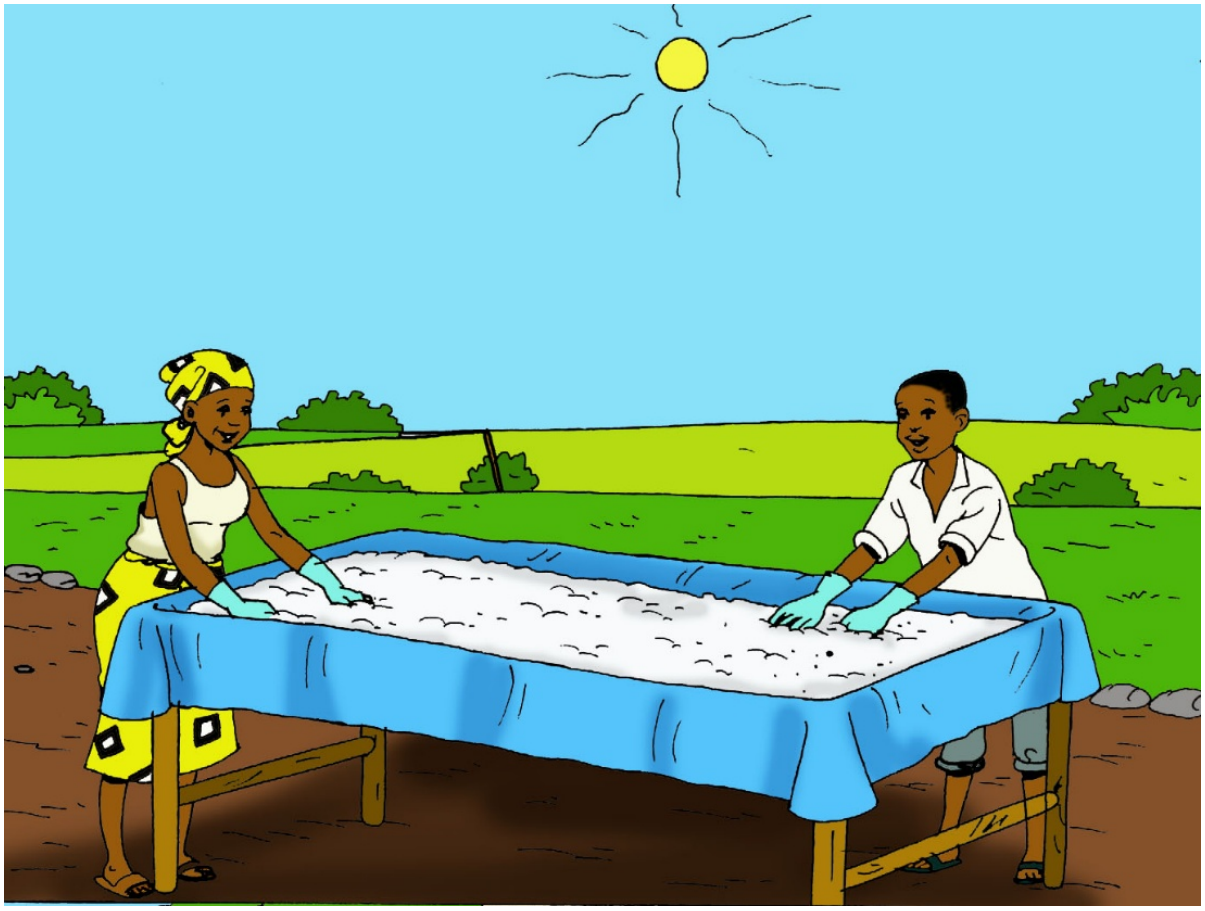
- ✓ While carrying out practical exercise, ensure that Environment and sustainability is taken care of especially on waste disposal
- ✓ During practical exercise put into considerations gender balance

Prerequisites:

- **N/A**

Key Competencies:

Knowledge	Skills	Attitudes
1. Explain drying cassava flour process	**1.** Carry out cassava flour sun drying	**1.** Critical thinking
2. Identify acceptable percentage of moisture content	**2.** Spread cassava mash over black polyethylene sheet pressing	**2.** Teamwork spirit
3. Describe drying cassava flour process	**3.** Dry cassava mash	**3.** Safety conscious



Getting Started: What do we know and where are we going?

Topic 2.4 Task 1:

1. Tell trainees to study the illustration above and answer the following questions:
   a. What do you see?
   b. What do you think the above picture displays?
   c. Have you ever been involved in such activity? If so, share with your classmates experience you have acquired.

2. After the discussion, ask trainees what topic they think this activity relates to.

3. Introduce the learning outcome and the Key Competencies table, which includes what they will gain from the learning the outcome. Explain that this learning outcome/session will focus on drying roots and tubers

Problem Solving Activity

Topic 2.4 Task 2:

1. Ask trainees form small groups and have them read the following scenario:

   Mabura is cassava flour producer. One day he supplied 250 kg of cassava flour to retailers in Konko market, but the clients rejected the flour claiming it was poor quality due to the unusual colour and horrible smell. Some claimed that maybe it was due to the way the cassava was dried.

2. Tell trainees to work with their groups to answer the following questions:
   a. What are the signs of a poorly dried cassava?
   b. What drying methods do you think Mabura used that could have affected the quality of the cassava?
   c. Mention some good methods Mabura could have used while drying the cassava.

3. After the discussion, guide them to share their responses. Discuss as a group, then review **2.4 Key Facts** together to harmonize their responses.

Guided Practice Activity

Topic 2.4 Task 3:

1. Ask trainees to form small groups and tell them to read the following:

At the workshop of your school there is 200 kg of cassava wet granules prepared by your classmates. Your respective group is assigned to dry cassava wet granules under directive and guidance of your trainer.

2. With their groups, instruct trainees to do the following:
   a. Choose appropriate method and describe why the method has been chosen to this particular exercise.
   b. Dry cassava wet granules.

3. After the discussion, guide them to share their answers. Discuss as a group to harmonize their answers

Application Activity

Topic 2.4 Task 4:

1. Ask trainees to form small groups.

2. Tell trainees to do the following:

Visit a cassava drying facilities in your community, seek an appointment with flour processor to assist him or her while drying cassava flour, upon completion discuss with him best practices for better drying method that attracts best prices. Make a report regarding:

   a. The method of drying used
   b. Importance of drying cassava

3. When they are back from the visit, guide them to share their findings and discuss as a group to harmonize their findings.

Points to Remember

- The poor quality of the product (discoloured, changed tastes, offensive smell, etc.) lead to poor market acceptability and low prices.

- Roots are dried to 12-14% moisture before storage.

Formative Assessment

Read and complete the following sentences by filling in missing words.

Answers in bold:

1. Dry the disintegrated/sifted cake in a dryer to reduce the **moisture** level to an acceptable level.

2. Sun-drying should be carried out by spreading the sifted mash or the chips on an elevated platform covered with a **black polythene** sheet.

3. The black polythene facilitates drying by absorption of solar heat and the **elevated platform** prevents dust and other dirt from contaminating the drying product.

4. Roots are dried to **12-14%** moisture before storage.

Learning Outcome 2.5: Grinding and sieving roots and tubers

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

a. Describe milling cassava flour process
b. Perform cassava milling
c. Classify fineness of cassava flour based on its use
d. Sieve cassava flour
e. Explain cassava flour sieving process
f. Prepare cassava flour for consumption

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit, think-pair-share

Materials Needed:

- **Tools and equipment:** Mill/milling machine, fermented and well dried chips, 1 mm sieve, basin
- **Presentation materials**: poster paper, markers, sheets of papers

Preparation:

- ❑ Prepare fermented chips and milling machine (in case there is no machine at school, fix a rendezvous with nearby milling machine operator for practical session).
- ❑ Prepare poster paper and markers for each sub-group, and a sheet of paper for each individual.

Cross Cutting Issues:

- ✓ **Environmental sustainability:** While carrying out practical exercise, ensure that Environment and sustainability is taken care of especially on waste disposal
- ✓ **Gender:** During practical exercise put into considerations gender balance
- ✓ **Standardization culture:** While milling, make sure to follow the standards especially fineness of flour depending on its final use

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe milling cassava flour process	**1.** Perform cassava milling	**1.** Detail-oriented
2. Classify fineness of cassava flour based on its use	**2.** Sieve cassava flour	**2.** Attentive
3. Explain cassava flour sieving process	**3.** Prepare cassava flour for consumption	**3.** Flexible

Getting Started: What do we know and where are we going?

Topic 2.5 Task 1:

1. Ask trainees to think about the illustration above in their training manual and respond to the following questions.
   a. What do you see?
   b. What do you think the people on illustration are doing?
   c. From your experience, how is prepared cassava ground in your community?

2. Have some groups share their responses to the rest of the trainees.

3. After the discussion, ask trainees what topic they this activity relates to.

4. Introduce the learning outcome and the Key Competencies table with what they will gain from the learning the outcome. Explain that this learning outcome/session will focus on grinding and sieving roots and tubers

Problem Solving Activity

Topic 2.5 Task 2:

1. Tell trainees to each reflect on his/her community and think about how different flour for different purposes is prepared.

2. With a partner, tell the trainees to describe how flour is prepared in their communities for:
   a. Animal feed
   b. Home use
   c. Bread making

2 After the discussions, guide trainees to share their responses, discuss as a group and review **2.5 Key Facts** in their manual together to harmonize their findings.

Guided Practice Activity

Topic 2.5 Task 3:

1. Ask trainees to form small groups.

2. Inform trainees that at the workshop of the school there is 50 kg of dried cassava chips, and that under your guidance in their respective groups, they must mill the dried cassava to fine flour for human consumption.

3. Visit each group to provide clarification if needed.

4. After the activity has been completed, ask them to share their experiences. Discuss as a group to harmonize their responses.

Application Activity

Topic 2.5 Task 4:

1. Have trainees from small groups and tell them to visit a cassava milling facility in their communities. They should make an appointment with flour processor to assist him or her while grinding cassava. Upon completion, trainees should discuss best practices for grinding method that attracts best prices with the worker.

2. After the visit, instruct trainees to write a report regarding:
   a. The grinding process
   b. The cassava sieving process

3. After the visit, guide the trainees to share their findings, discuss as a group to harmonize their findings.

Points to Remember

- Avoid overloading the mill.
- Cassava for animal feed should be milled gritty.
- Flour for home use needs to be fine while the flour for bread baking and starch must be very fine.

Formative Assessment

Carefully read the following statements and determine if each one is true or false.

Answers in bold:

1. Cassava for animal feed should be milled gritty.
   a. **True**
   b. False

2. Flour for home use needs to be very fine.
   a. True
   b. **False**

3. Flour for bread baking and starch must be fine.
   a. True
   b. **False**

Write complete sentences to complete the following tasks:

4. What size of sieve that is recommended for well dried cassava?
   Answer: A 1 mm sieve is recommended for well dried cassava.

5. Write one paragraph on the process of flour milling and sieving.
   Answer: Refer to **2.5 Key Facts**

Learning Outcome 2.6: Checking flour quality

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

a. Identify types of flour based on its end consumption

b. Check quality of flour by comparing colours and assessing particle size

c. Classify and grade flour

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit, brainstorming, group discussion

Materials Needed:

- Flour, bowl, water, teaspoon, small pouch, colour chart

Preparation:

- ❑ Prepare fermented chips and milling machine.
- ❑ Prepare poster paper and markers for each sub-group and a sheet of paper for each individual.

Cross Cutting Issues:

- ✓ **Environment and sustainability:** While carrying out practical exercise, ensure that the environment is taken care of especially while disposing waste.
- ✓ **Gender:** During practical exercise consider gender balance within groups.

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
4. Describe milling cassava flour process	**4.** Perform cassava milling	**4.** Detail-oriented
5. Classify fineness of cassava flour based on its use	**5.** Sieve cassava flour	**5.** Attentive
6. Explain cassava flour sieving process	**6.** Prepare cassava flour for consumption	**6.** Flexible

Getting Started: What do we know and where are we going?

Topic 2.6 Task 1:

1. Ask trainees to think about the illustration above in their training manuals and respond to the following questions.

a. What do you see?
b. What do you think the people on illustration are doing?
c. From your experience, how do people assess the quality of cassava flour in your community?

2. Have some trainees share their responses with the rest of the class.

3. After the discussion, ask trainees what topic they this activity relates to.

4. Introduce the learning outcome and the Key Competencies table. Explain that this learning outcome/session will focus on checking flour quality

Problem Solving Activity

Topic 2.6 Task 2:

1. Ask trainees to form small groups and have each group read the following scenario:

Skiver Milling Ltd has supplied to cassava flour to Kagote, but Kagote doubts that the flour is fine enough. Before processing the payment, he wants you to help him test the fineness of the flour and confirm him whether it is suitable for human consumption.

2. Tell trainees to discuss the following questions with their groups:
a. Which methods would you use to come up with results as quickly as possible?"
b. Why is important to check for the quality of the flour?

3. After the discussions, guide trainees to share their responses and discuss as a group. Review **2.6 Key Facts** in their manual together and harmonize their responses

Guided Practice Activity

Topic 2.6 Task 3:

1. Separate the trainees into small groups. Provide each group with samples of different types of flour.

2. Under your directive and guidance, ask trainees to do to the following, referring to **2.6 Key Facts** as needed.
a. Assess the particle size of flour.

b. Check taste and cleanliness for quality of flour.
c. Evaluate the colour of flour.

3. Then, ask them to share their findings. Discuss as a group and harmonize their findings

Application Activity

Topic 2.6 Task 4:

1. Separate trainees into small groups and tell them do the following:

Visit a cassava grinding facility in your community. Make an appointment with quality assurer to assist him or her while testing quality of produce. Upon completion, discuss best practices for quick methods to test flour quality with him or her.

2. Each group must write a report on:
a. What the facility checks for to determine flour quality.
b. The methods the facility uses to check for flour quality.

3. After the visit, ask trainees to share their findings. Discuss as a large group and harmonize their findings.

Points to Remember

- In order to compare colours, keep a set of samples so that a new lot can be compared to previous ones.

- Quick method to test particle size are:
  - Sensing with fingers and mouth.
  - Mixing with water.
  - Washing flour in fine mesh pouches.

Formative Assessment

Carefully read the following statements and complete them with the missing words.

Answers in bold:

1. **Method 1 - Feeling with fingers and mouth**

The size of the biggest particles can be detected by taking a bit of flour between the **thumb** and **index finger** or on the hand. Put some flour in your mouth and press it between the **tongue** and **mouth ceiling**. Ideally it "dissolves" without leaving sandy particles.

2. **Method 2 - Mixing with water**

Mix a teaspoon of flour with two teaspoons of water in a plate or similar shallow deposit. The **big and dark particles** become more visible as the **fine particles** are washed away.

3. **Method 3 - Washing flour in fine mesh pouches**

Put a teaspoon of flour into a small pouch made of a fine fabric. Keep the pouch closed and wash it in a deposit with a few litres of water or under faucet. The water should wash away the **fine particles** and the **coarse particles** can be observed. The pouches can be dried to keep the sample for weighing or comparing with standards.

4. **Methods to compare the flours colour**

In order to compare colours, a set of **samples** should be kept so that a new lot can be compared to previous ones or samples with the expected whiteness.

Self-Reflection

1. Ask trainees to re-take the self-assessment at the beginning of the unit. They should then fill in the table in the Trainee's Manual to identify their areas of strength, areas for improvement and actions to take to improve.

2. Discuss trainees' results with them. Identify any areas that are giving many trainees difficulties and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to go through commonly identified difficult concepts).

Learning Unit 3: Operate grain mill

Learning Outcomes

By the end of the Learning Unit, trainees will be able to:

3.1 Check quality of incoming raw materials through physical parameters

3.2 Set process parameters

3.3 Maintain process parameters

3.4 Participate in checking flour quality

Learning Unit 3 Self-Assessment

1. Ask trainees to look at Unit 3 illustration in their Trainee Manuals and discuss what they observe. What topics do they think this unit will include based on the illustration? Allow time for some brainstorming. Afterwards, share the main topics with the trainees.

2. Ask trainees to fill out the self-assessment at the beginning of the unit in their Trainee Manuals. Explain that the purpose of the self-assessment is to become familiar with the topics in the unit and for them to see what they know or do not know at the beginning. At the end of the unit, they will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas that need improvement and actions to take. The self-assessment is not a test!

Learning Outcome 3.1: Checking quality of incoming raw materials through physical parameters

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

a. State compound of cassava root
b. Assess quality of maize grains
c. Recognize poor quality of maize grains
d. Determine maize grades
e. Explain parameters to classify maize grains
f. Classify maize grains

Time Required: 6 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit

Materials Needed:

- **Sample grains**: White maize grains, yellow maize grains, diseased maize grains, vermin diseased grains
- **Measuring tools and equipment**: Moisture meter, warm water, 100 kg of maize, warm water (60-70°C), container, basin, sieve, balance

Preparation:

- ❑ Prepare 100 kg of maize grains with different with different aspects: diseased grains, vermin damaged grains, and grains mixed with foreign matter.

Cross Cutting Issues:

- ✓ **Environmental sustainability**: Ensure environment is taken care of while demonstrating or while the trainees are performing practical exercise on how to check incoming raw materials.
- ✓ **Gender:** Make sure that both sexes are represented while forming the groups in order to promote gender balance.
- ✓ **Standardization culture:** Make sure that practical exercise follows pre-established standards.
- ✓ **Inclusivity:** Ensure people living with disabilities are integrated into different groups for inclusion.

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
1. State standard requirement of maize grains	**1.** Assess quality of maize grains	**1.** Be pragmatic
2. Recognize poor quality of maize grains	**2.** Determine maize grades	**2.** Be safety oriented
3. Explain parameters to classify maize grain	**3.** Classify maize grains	**3.** Strive for quality standards

Steps:

Getting Started: What do we know and where are we going?

Topic 3.1 Task 1:

1. Ask trainees to consider their own community as they discuss the following questions with a partner:
   a. How do the people in your community check the quality of flour before processing?
   b. Why do you think it is important to this?

2. After the discussion, ask trainees what topic they this activity relates to.

3. Introduce the learning outcome and the Key Competencies table. Explain that this learning outcome/session will focus on checking quality of incoming raw materials through physical parameters

Problem Solving Activity

Topic 3.1 Task 2:

1. Divide trainees into small groups. Tell each group to read the following scenario:

Kanyamanza Company is a big supplier of maize flour to supermarkets in Kigali due to its processing unit. They normally process maize grains supplied by local farmers after being the grains have been accredited by its quality control staff in terms according to quality parameters. One day, the quality controller fell sick and the farmers supplied

maize grains from different processing unit locations. Then, the management of Kanyamanza Company decided to hire a temporary quality controller staff in order to bridge the gap.

2. Tell trainees to imagine that they are among the candidates to compete for the job mentioned above. They are given a bag full of maize grains to analyse.
   a. What steps would you go through to convince the assessors panel that you are the best candidate and qualified for the job?
   b. Why is it necessary to go through the steps identified above?

3. After the discussion, guide trainees to share their responses and discuss as a group. Review **3.1 Key Facts** in their manuals together to harmonize their responses.

Guided Practice Activity

Topic 3.1 Task 3:

1. Ask trainees to form small groups. Provide each group with 50 kg of maize grains.

2. Under your guidance, ask trainees to assess the quality of maize grains and compute maize grades by determining the followings:
   a. % of foreign matter
   b. % of inorganic matter
   c. % of broken grain
   d. % of pest damaged grain
   e. % of rotten and diseased grain
   f. % of discoloured grains
   g. % moisture
   h. % of immature/shrived grains

3. After the discussions, guide trainees to share their responses and discuss as a group. Then, review **3.2 Key Facts** in their manuals together to harmonize their responses

Application Activity

Topic 3.1 Task 4:

1. Help the trainees make an appointment with a quality controller in one of their community's grain mill facilities.

2. Tell them to join him/her while checking incoming raw material. Their role is to identify the strengths and shortcomings of the process.

3. Upon completing the checking activities, tell trainees to discuss the best way to improve the quality controller's process.

4. After their visits, trainees must write a report which includes:
   a. What to check for in incoming materials.
   b. What methods to use while checking incoming materials.
   c. The importance of checking incoming materials.

5. Finally, ask the trainees to share their findings and discuss as a group to harmonize their findings.

Points to Remember

- A maize kernel is considered of a certain colour if 50% or more of its surface is of that colour.

- Diseased grains are unsafe for human consumption due to decay, moulding, bacterial decomposition, or other causes.

Formative Assessment

Read the statements below and circle the **false** process statements for the following tests

Answers are in bold.

1. **Method 1 - Testing for foreign odour**
   a. Obtain a representative sample.
   b. Spread out the sample on a flat surface and smell it.
   c. **If odour is detected, return the sample into the container and seal it. → If NO odour is detected, return the sample into the container and seal it.**
   d. Leave the sealed container for 2 hours and re-examine the sample.
   e. The smell should be typical of maize without other smells, such as chemicals, mouldiness, earthy, rotten, and/or musty smell.

2. **Method 2 - Rapid test for foreign odour**
   a. Obtain a representative sample.
   b. Put a small quantity of ground or un-ground maize kernels in a container.
   c. **Pour some cold water onto the maize and cover the container. → Pour some warm water (60-70 ˚C).**
   d. After 40-60 minutes, decant the water and note whether foreign odour is present.

3. **Determining moisture content**
   a. Select a random sample of maize.
   b. Fill a glass half-way with the maize sample (the glass must be dry).
   c. Add 4 teaspoons of dried salt (the salt should be previously dried in a pan over a fire for 15 minutes).
   d. Shake the mixture for 2 minutes.
   e. **Leave to settle for 4 minutes → Leave to settle for 20 minutes.**
   f. Pour out the mixture.
   g. Check for any salt clinging on the walls of the glass.
   h. If any salt is found on the walls of the glass, then moisture content is greater than 14%.

Learning Outcome 3.2: Set process parameters

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

a. State compound of cassava root
b. Assess quality of maize grains
c. Recognize poor quality of maize grains
d. Determine maize grades
e. Explain parameters to classify maize grains
f. Classify maize grains

Time Required: 6 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit

Materials Needed:

- **Sample grains**: White maize grains, yellow maize grains, diseased maize grains, vermin diseased grains
- **Testing materials and equipment**: Moisture meter, warm water, 100 kg of maize, warm water (60-70°C), container, basin, sieve, balance

Preparation:

- ❑ Prepare maize grains 100 Kgs with different with different aspects: diseased grains, vermin damaged grains, and grains mixed with foreign matter.

Cross Cutting Issues:

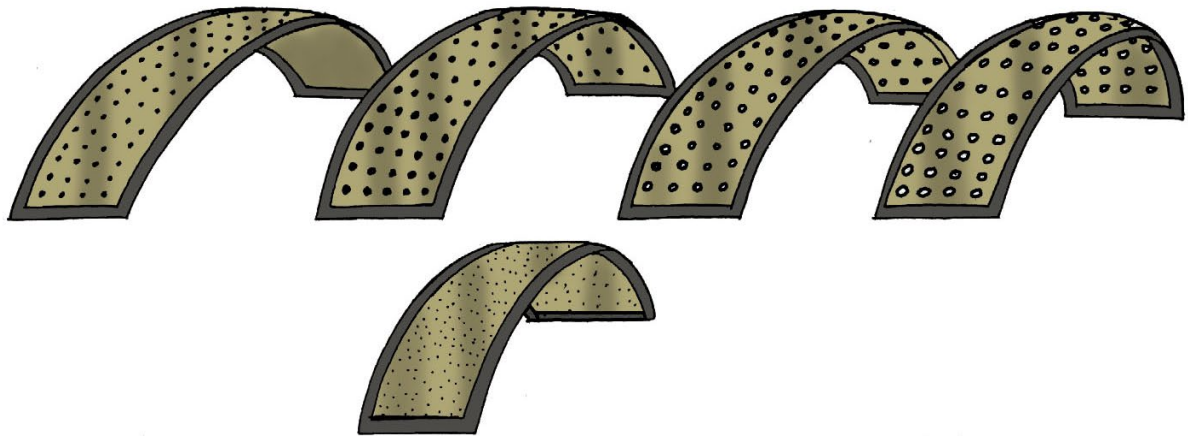
- ✓ **Environment and sustainability**: Ensure the environment is taken care of while demonstrating or while the trainees are performing practical exercises.
- ✓ **Gender:** Make sure that both sexes are represented while forming the groups in order to promote gender balance.
- ✓ **Standardization culture:** Make sure that practical exercise follows pre-established standards.
- ✓ **Inclusivity:** Ensure people living with disability are integrated into different groups for inclusion

Prerequisites:

- None

Key Competencies

Knowledge	Skills	Attitudes
1. Identify types of sieves	**1.** Regulate the flow of material	**1.** Pragmatic
2. Describe process of charging motor to its full capacity	**2.** Select appropriate sieve	**2.** Safety oriented
3. Explain how to regulate flow of products	**3.** Regulate flow of products	**3.** Diligent



Getting Started: What do we know and where are we going?

Topic 3.2 Task 1:

1. Ask trainees to think about the illustration above in their training manual and respond to the following questions in small groups:
   a. What do you see?
   b. What do you think the above picture displays?
   c. How does it relate to the learning outcome?

2. Ask some groups to share their responses to the rest of the trainees.

3. After the discussion, ask trainees what topic they this activity relates to.

4. Introduce the learning outcome and the Key Competencies table. Explain that this learning outcome/session will focus on setting process parameters

Problem Solving Activity

Topic 3.2 Task 2:

1. Ask trainees to form groups of 2-3 people depending on the class size.

2. Ask the trainees to read the scenario carefully:

   Florex Company is a new company that established its flour processing unit in the village. One local supermarket wanted to test its performance and send sample of maize grains to be grinded. But when the processing was complete, the supermarket was not satisfied with the fineness of the flour and preferred to work with another grinding facility.

3. Ask each group to discuss the following questions:
   a. In your opinion, what do you think Florex did wrong that pushed away the clients?

   b. What should Florex have done in the first place while processing the flour?

4. Encourage each person to share their views briefly and respond to the comments of others within their group.

5. Ask each group to nominate a representative who will present on behalf of the group.

6. Move around the classroom to help or make clarifications if necessary. Give a 1-minute warning before the end of the discussion time

7. After the discussions, ask trainees to share their responses. Discuss as a group and review **3.3 Key Facts** in their manual together to harmonize their responses.

Guided Practice Activity

Topic 3.2 Task 3:

1. Separate trainees into small groups.

2. Bring trainees to the nearby flour milling machine or in the school workshop.

3. Give each group 1 kg of dried maize and 1 new sack.

4. Ask trainees to perform the following tasks group by group:
   a. Select appropriate sieve.
   b. Regulate the flow of material for feeder.
   c. Regulate flow of product to the helix and to the milling burrs.

5. Monitor the activity. After all groups have finished, ask them to share their experiences and what they have gained throughout the session.

6. Provide clarification and refer back to **3.3 Key Facts** as needed.

Application Activity

Topic 3.2 Task 4:

1. Tell trainees to form small groups. Organize a visit to a flour milling facility located in the community.

2. Tell each group to discuss best practices of setting parameters for the milling machine with the facility's operators.

3. Then, instruct each group to write a report regarding:
   a. Selection of appropriate sieve.
   b. Regulation of the flow of material for feeder.
   c. Regulation the flow of product to the helix and to the milling burrs.

4. After the visit, ask trainees to share their findings and reports. Discuss as a group to harmonize their findings.

Points to Remember

- Separators remove iron particles.
- Vibrating separators remove straw and dirt.
- Aspirators remove dust and de-stoners remove stones.
- Disc separators separate the various sizes of wheat kernels.

Formative Assessment

Read the statements below and determine if each one is true or false.
Answers are in bold.

1. Cleaning of grains can involve magnetic separators to remove iron particles.
   a. **True**
   b. False

2. Cleaning of grains can involve vibrating separators to remove straw and dirt.
   a. **True**
   b. False

3. Cleaning of grains can involve aspirators to remove dust.
   a. **True**
   b. False

4. Cleaning of grains can involve de-stoners to remove stones.
   a. **True**
   b. False

5. Which size sieves should be used on maize grains?
   Answer: For well dried maize 0.7 mm sieve is recommended.

Learning Outcome 3.3: Maintain process parameters

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

a. Explain grain conditioning process
b. Adjust moisture content
c. Identify moisture content rate
d. Carry out tempering process
e. List tempering steps
f. Perform milling

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit, think-pair-share

Materials Needed:

- **Materials**: Maize grain, water
- **Tools**: Moisture meter

Preparation:

❑ Prepare maize grain to be tempered.

Cross Cutting Issues:

✓ **Environment and sustainability** Ensure the environment is taken care of while demonstrating or while the trainees are performing practical exercises.
✓ **Gender:** Make sure that both sexes are represented while forming the groups in order to promote gender balance.
✓ **Inclusivity:** Ensure people living with disabilities are integrated into different groups for inclusion.

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
1. Explain grain conditioning process	**1.** Adjust moisture content	**1.** Precise
2. Identify moisture content rate	**2.** Carry out tempering process	**2.** Methodical
3. List tempering steps	**3.** Perform milling	**3.** Safety-oriented

Steps:

Getting Started: What do we know and where are we going?

Topic 3.3 Task 1:

1. Tell trainees to read the following individually:

Consider how often we go to the shop to buy bread and how there is often a long queue. Similarly, kids love to buy bread to go with their tea in the mornings before school.

2. Next, trainees should reflect and write down answers to the questions:
- **a.** Where do you think the bread come from?
- **b.** Where do the ingredients come from?
- **c.** Who manages their production quality?

3. Tell trainees to discuss their ideas with a partner.

4. Then, ask volunteers to present their ideas. Write down their points on the board/flipchart and omit/skip similar ideas.

5. After everyone has shared, guide the trainees to the correct answers.
Answers:
- **a.** Wheat flour from wheat grain
- **b.** Ingredients come from processing units, such as flour milling facilities
- **c.** Managers in the flour processing centre

6. Introduce the learning outcome and the Key Competencies table.

Problem Solving Activity

Topic 3.3 Task 2:

1. Ask trainees to find a partner and discuss the following case study:

Homebred, a bakery located in Kigali city, employs the leading Rwandese bread makers. The bakery dominates the market with a 73% share, up from 63% in 2006. One day, the staff at Homebred ordered flour for processing bread as usual to the Falu Milling Company located in their neighbourhood. Surprisingly, the supplier delivered the flour that had a dark grey colour. Immediately, the flour was rejected because the flour did not meet the requirements they desire at the bakery.

2. With their partners, tell trainees to discuss and take notes on the following questions:
- **a.** What does grey colour in flour mean to you and what seems to be the main cause?
- **b.** What do you think caused the flour to turn grey?
- **c.** What do you think Falu Milling Company could have done to meet the requirements?
- **d.** In your opinion, what happened to the Falu Milling Company after supplying poor quality flour?

3. Move around the classroom to help or clarify as needed. Give a 1-minute warning before the end of the discussion time.

4. Ask volunteers to share their ideas. Write down their findings and omit/skip similar ideas as they present.

5. Ask trainees to turn to **3.4 Key Facts** in their manuals and review it together. Explain, and demonstrate where possible, the steps in processing wheat flour. If demonstration is not possible, find a video on the internet to show in class.

Guided Practice Activity

Topic 3.3 Task 3:

1. Separate trainees into small groups. Tell each group to read the following scenario:

Imagine you oversee maintaining process parameters in a grain milling facility.

2. Then, instruct the groups to work together to write answers in response to the following questions/tasks:
   a. Describe the kind of parameters that you will maintain.
   b. How will you maintain the following?
      - Grain conditioning process
      - Adjustment of moisture content
      - Moisture content rate
      - Tempering steps

3. After the discussions, ask trainees to share their findings. Discuss them as a group to harmonize their answers and ideas.

Application Activity

Topic 3.3 Task 4:

1. Separate trainees into small groups.

2. Help the groups make an appointment and visit flour milling facilities in their communities. Help them arrange the visit to that they are there before the facility begins processing wheat flour and just after the wheat grain has arrived at the site.

3. Encourage trainees to participate actively throughout the process during the visit. Upon completion, trainees should discuss with operators the pros and cons of the process they witnessed.

4. With your group, write a report regarding:
   a. Grain conditioning process
   b. Adjustment of moisture content
   c. Moisture content rate
   d. Tempering steps

5. After, ask the groups to share their findings. Discuss together as a group to harmonize their findings

Points to Remember

- Conditioning is the adjustment of moisture content.
- Conditioning takes place before milling to produce a uniform moisture content throughout the grain.

Formative Assessment

Read the following statements and determine whether they are true or false.

Answers are in bold.

1. During conditioning bran should become elastic to avoid splintering and contamination of flour.
   a. **True**
   b. False

2. During conditioning a lot of power is required to grind to flour.
   a. True
   b. **False**

3. Conditioning takes place after milling to produce a uniform moisture content throughout the grain.
   a. True
   b. **False**

4. Moistening helps to increase break-up of the bran (hard outer layer) during milling and prevent separation from the floury endosperm (the mass that forms the white flour of the grain).
   a. True
   b. **False**

5. What is moisture content interval desirable during tempering?
   Answer: 15-20% moisture content

Learning Outcome 3.4: Participate in checking flour quality

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

a. Determining moisture content
b. Carry out basic test for moisture content
c. Identify acceptable percentage of moisture content
d. Carry out basic tests for ash Content
e. Determine overall mineral content of the wheat
f. Assess the particle size of flour

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit, think-pair-share

Materials Needed:

- **Quality testing tools and materials**: Moisture dish, sample of flour, ash cup, ash oven, teaspoon, small pouch, colour chart

Preparation:

- ❑ Obtain and arrange moisture dish, ash cup, ash oven, small pouch, and colour chart.
- ❑ Prepare sample for moisture test and ash test.

Cross Cutting Issues:

- ✓ **Environmental sustainability:** While carrying out the practical exercise, ensure that the environment is taken care of, especially while performing waste disposal.
- ✓ **Gender:** Consider gender balance by mixing both sexes into each group.

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
1. Determining moisture content	**1.** Carry out basic test for Moisture Content	**1.** Strive for wheat flour quality
2. Identify acceptable percentage of moisture content	**2.** Carry out basic tests for Ash Content	**2.** Adhere to quality standards
3. Determine overall mineral content of the wheat	**3.** Assess the particle size of flour	**3.** Maintain positive perception of clients towards organization

Steps:

Getting Started: What do we know and where are we going?

Topic 3.4 Task 1:

1. Tell trainees to observe the illustration above and discuss the following questions with a partner:

a. Describe what you see.

b. Why do you think they are doing the task in the illustration?

c. Before making ugali or buying flour:

- What do you do?
- Why do you it?
- How do you it?

2. After the discussion, ask trainees what topic they think this activity relates to.

3. Introduce the learning outcome and have trainees review the Key Competencies table.

4. Explain that this learning outcome/session will focus on participating in checking flour quality

Problem Solving Activity

Topic 3.4 Task 2:

1. Separate trainees into small groups. Provide each group with the scenario to read:

Kagaya Milling has supplied wheat flour to Compa Bakery, but Compa Bakery is doubting the moisture content and the overall flour quality. Before processing the payment, he wants you to help him to test the moisture and mineral content of the flour as quickly as possible and to confirm whether is suitable for human consumption.

2. With their groups, tell trainees to discuss and note answers to the following questions:

a. What do you think Compa Bakery will check for in the flour?

b. How will Compa Bakery check for the moisture content in the flour?

c. Who else should be involved in the process?

3. After the discussions, ask the trainees to share their findings. Discuss as a group and review **3.5 Key Facts** in their manual together.

Guided Practice Activity

Topic 3.4 Task 3:

1. Divide trainees into small groups. Take trainees to the laboratory where an ash oven and moisture dish are placed.

2. Give to each group 2 kg of wheat flour.

3. Ask trainees to perform the following tasks group by group
   a. Identify the tools you will use to measure the flour.

   b. Identify the tools you will use to measure ash content.

   c. Test for moisture content.

   d. Test for ash content.

   e. Assess the particle size of flour.

   Note: For any tasks the trainees are unable to perform, instruct them to discuss and write a description of how they would perform these tasks instead.

4. Monitor the groups as they carry out the tasks and help where needed.

5. After all groups have finished, ask them to share experience they have gained throughout the session.

6. Invites group representatives to display their work in front of the class. Encourage trainees to compare and discuss their different findings.

7. Share your expertise to conclude the session.

Application Activity

Topic 3.4 Task 4:

1. Separate trainees into small groups. Organize a visit to a wheat milling facility in your community and make an appointment with flour processor to assist him or her while testing final products.

2. After assisting, discuss best practices and elaborate protocols for quality assurance.

3. After the visit, each group must write a report regarding:
   a. The tools used to measure contents.
   b. The tools used to measure ash content.
   c. How they tested for moisture content.

d. How they tested for ash content.
e. How they assessed the particle size of the flour.

4. Ask each group to share their findings. Discuss as a large group to harmonize their findings.

Points to Remember

- Moisture content results are expressed as a percentage. Wheat or flour ash is usually expressed on a common moisture basis of 14%.

Quick methods to assess the particle size are:

- Method 1: Sensing with fingers and mouth
- Method 2: Mixing with water
- Method 3: Washing flour in fine mesh pouches

Formative Assessment

Read and complete the following sentences by filling in the missing words for the various quality assurance methods.

For a basic test for moisture content:

1. Weigh and place a sample of flour or ground wheat (**2-3 grams**) in an ash cup.

2. Heat the sample at **130°C** in an ash oven for one hour.

3. Cool the residue to **room temperature** and then weigh it.

Determine whether each statement is true or false regarding a basic test for ash content:

4. Weigh a sample of flour or ground wheat (3–5 grams) and placed it in an ash cup.
a. True
b. False

5. Heat the sample at 200°C in an ash oven until its weight is stable (usually overnight).
a. True
b. False: Heat at 585°C

6. Cool the residue to room temperature and then weigh it.
a. True
b. False

7. Describe one of the methods that can be used to assess the particle size.
   Answer: Refer to **3.5 Key Facts**.

Self-Reflection

1. Ask trainees to re-take the self-assessment at the beginning of the unit. They should then fill in the table in the Trainee's Manual to identify their areas of strength, areas for improvement and actions to take to improve.

2. Discuss trainees' results with them. Identify any areas that are giving many trainees difficulties and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to go through commonly identified difficult concepts).

Learning Unit 4: Package processed flour

Learning Outcomes
4.1 Select appropriate packages
4.2 Package the products
4.3 Label the product

Learning Unit 4 Self-Assessment

1. Ask trainees to look at the Unit 4 illustration above (in their Trainee Manuals) and discuss what they see. What topics do they think this unit will include based on the illustrations? After some brainstorming, share the main topics.

2. Ask trainees to fill out the self-assessment at the beginning of the unit in their Trainee Manuals. Explain that the purpose of the self-assessment is to become familiar with the topics in the unit and for them to see what they know or do not know at the beginning. At the end of the unit, they will do a self-reflection, which includes re-taking the self-assessment and identifying their strengths, areas that need improvement and actions to take. The self-assessment is not a test!

Learning Outcome 4.1: Select appropriate packages

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

a. Identify types of packages
b. Maintain flour quality
c. Select packages according to client preferences
d. Package flour product
e. Prevent flour mycotoxin contamination
f. Prevent products from reabsorbing moisture

Time Required: 6 Hours

Learning Methodology: Simulation, demonstration, practical exercise and Field visit

Materials Needed:

- Multiwall paper bags for any sizes from 1kg to 40 kg,
- Woven polypropylene bags for any sizes from 20 kg, 30 kg, 40 kg, 50 kg
- Small Polyethylene bags for premix sachets, Corrugated cardboard boxes for sachets
- Paper bags for 1 kg

Preparation:

- ❑ Prepare different types of packages according to the following flour product; wheat flour, maize flour, cassava flour, sorghum flour

Cross Cutting Issues:

- ✓ **Environment and sustainability:** Ensure Environment is taken care for its sustainability while disposing waste derived from practical exercise
- ✓ **Gender:** Make sure that both, female and male are represented while forming the groups
- ✓ **Inclusivity:** Ensure people living with disability are integrated into different groups while forming different groups and engaged in different activities

Prerequisites:

- N/A

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify types of packages	**1.** Maintain flour quality	**1.** Detail-oriented
2. Select packages according to client preferences	**2.** Package flour product	**2.** Precise
3. Prevent flour mycotoxin contamination	**3.** Prevent products from reabsorbing moisture	**3.** Diligent

Steps:

Getting Started: What do we know and where are we going?

Topic 4.1 Task 1:

1. Tell trainees to observe the illustration above and discuss the following questions with a partner:
   - **a.** What do you see?
   - **b.** How are products in the illustration handled or packed?
   - **c.** How is sugar you buy from a shop packaged?
   - **d.** Do you care if you buy something and they give it you without covering? Why? Why not?

2. After discussing, ask trainees to share their answers and discuss as a class.

3. After the discussion, ask trainees what topic they this activity relates to.

4. Introduce the learning outcome and have trainees turn to the Key Competencies table. Review it together.

5. Explain that this learning outcome/session will focus on selection of appropriate packages.

Problem Solving Activity

Topic 4.1 Task 2:

1. Divide trainees into small groups. Provide each group with the following scenario.

   Kafaro is one of the Rwandese's favourite wholesalers of flour, recognized for offering choice, value, and convenience in terms of packaging. There are different packages from 0.5 kg up to 50 kg. Over 100,000 retailers are supplied by the company. They sell a wide range of flours such as maize flour, cassava flour, and wheat flour. They are commonly known to distribute their products all over the country.

   On the other hand, there is another company named Fufuso Company, which produces the same varieties of flour as Kafaro. They have preferred to focus on 25 kg and 50 kg packaging.

   Both companies were found by Tchat organization. They were launched at the time but had different managing. Eventually, Tchat decided to close Fufuso Company claiming that the company faced bankruptcy and decided to strengthen Kafaro for flourishing more.

2. With their groups, tell trainees to discuss and note their responses to the following questions about the scenario:
   a. What do you understand by packaging?
   b. Mention some types of packaging you know.
   c. What criteria or factors do you consider when selecting packaging material?

2 After the discussions, ask the groups to share their responses. Discuss as a group and review **4.1 Key Facts** in their manuals together while harmonizing their responses.

Guided Practice Activity

Topic 4.1 Task 3:

1. Divide the trainees into four groups.

2. Give the first group 2 kg of wheat flour, the second group 1 kg of cassava flour, the third group 4 kg of maize flour, and the fourth group 1.5 kg of sorghum flour.

3. Ask trainees to perform the following tasks group by group
   a. Identify types of packages based on their product.
   b. Select appropriate packages.

4. Visit groups as they carry out the tasks and help where needed.

5. After all groups have finished, ask them to share the experience they have gained throughout the session.

6. Invites group representatives to post their work in front of the class. Encourage trainees to engage in a discussion by agreeing and disagreeing with each other's findings.

7. Share your expertise to conclude the session.

Application Activity

Topic 4.1 Task 4:

1. Divide trainees into small groups and organise a visit to the neighbouring retailers shops selling different products of flour.

2. Encourage trainees to discuss with shop owners with respect to the different packages in terms of size and specifications. Tell trainees to ask what gives them a competitive advantage regarding customers' preferences.

3. After, instruct them to write a report regarding:
   a. The types of packaging the shop owners use.
   b. What the criteria and factors shop owners consider when selecting packaging material.

4. After the field visit and discussion with the retailers, ask them to share their findings. Discuss as a group to harmonize their findings

Points to Remember

- Flour is hygroscopic.
- Moisture absorbed from the atmosphere leads to mould growth and spoilage.
- Polythene bags, paper, or polypropylene bags lined with polythene are suitable for packaging of flour products.

Suitable packages for premixes are:

- Multiwall paper bags for any sizes from 1kg to 40 kg.
- Woven polypropylene bags for any sizes from 20 kg to 50 kg.
- Small Polyethylene bags for premix sachets.
- Corrugated cardboard boxes for sachets and 1 kg paper bags.

Formative Assessment

Read the following statements and determine if each one is true or false.

Answers are in bold.

1. Pack desired quantities of flour in polythene bags and/or sacks, seal or stitch as appropriate. This avoids absorption of moisture of the flour from the environment.
   a. **True**
   b. False

2. Flour should be packaged in clean, insect- and moisture- proof materials that guarantee the wholesomeness of the product and the retention of its nutritional, physical and sensory qualities.
   a. **True**
   b. False

3. Packaging should add toxic substances or unusual odours/flavours to the product.
   a. True
   b. **False**

4. Proper packaging and appropriate storage conditions preserves quality characteristics and shelf life of flour.
   a. **True**
   b. False

5. Packaging materials and storage conditions to be used for flour products must prevent the products from reabsorbing moisture and should avoid infestation by pest insects.
   a. **True**
   b. False

6. Polythene bags, paper, or polypropylene bags lined with polythene are not suitable for packaging of flour products.
   a. True
   b. **False**

Learning Outcome 4.2: Package products

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

a. Define packaging
b. Fill flour product into packages
c. Explain main purpose of packaging
d. Seal flour containers
e. Describe packaging process
f. Measure accurately quantity required for individual package

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit

Materials Needed:

- Multiwall paper bags for any sizes from 1kg to 40 kg
- Woven polypropylene bags for sizes from 20 kg, 30 kg, 40 kg, and 50 kg
- Small polyethylene bags for premix sachets
- Corrugated cardboard boxes for sachets
- Paper bags for 1 kg, wheat flour, cassava flour, sorghum flour, and maize flour
- Automated sealing machine

Preparation:

- ❑ Prepare packages of different sizes and types for maize flour, wheat flour, sorghum flour, and maize flour

Cross Cutting Issues:

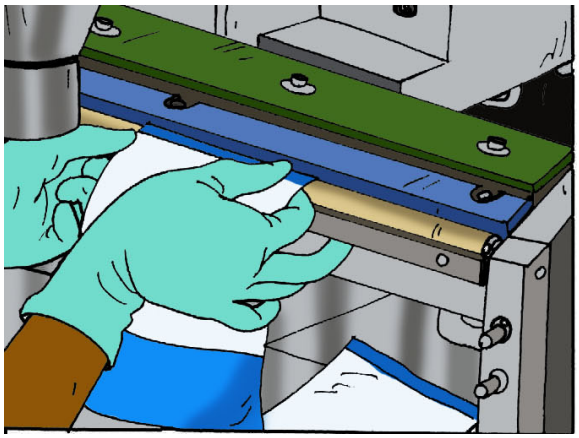
- ✓ **Environment and Sustainability:** Ensure environment is taken care of while disposing waste derived from practical exercise.
- ✓ **Gender:** Make sure that both females and males are represented while forming groups.
- ✓ **Inclusivity:** Ensure people living with disabilities are integrated into different groups while forming different groups and engaged in different activities.
- ✓ **Standardisation culture:** Ensure that practical exercise complies with pre-established standards.

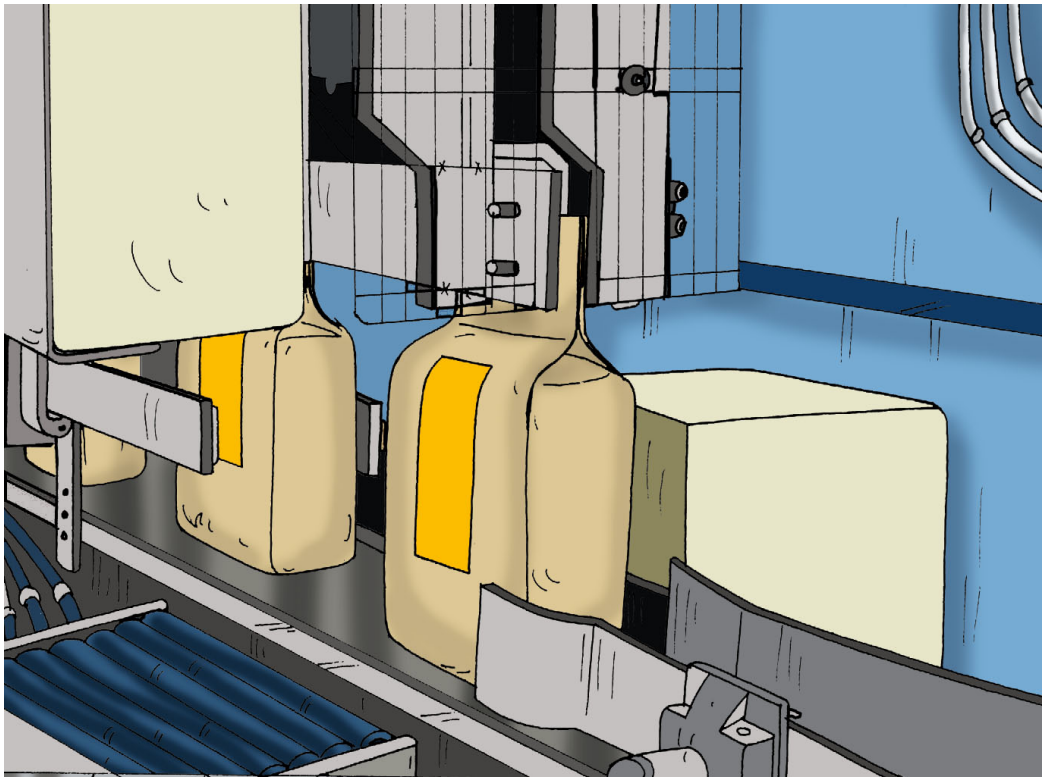
Prerequisites:

- None

Key Competencies

Knowledge	Skills	Attitudes
1. Define packaging	**1.** Fill flour products into packages	**1.** Safety-oriented
2. Explain main purpose of packaging	**2.** Seal flour containers	**2.** Self-motivated
3. Describe packaging process	**3.** Accurately measure quantities required for individual packages	**3.** Detail-oriented





Steps:

Getting Started: What do we know and where are we going?

Topic 4.2 Task 1:

1. Divide trainees into small groups.

2. Ask trainees to look discuss the following questions with their groups:
   a. In your opinion, why are flour products packaged?
   b. What is the importance of sealing flour products?

3. Ask groups to discuss among themselves. Direct them to the illustrations: What does each image portray and what seems to be the difference between them?

4. Have some groups share their responses to the rest of the trainees.

5. After the discussion, ask trainees what topic they think this activity relates to.

6. Introduce the learning outcome and have trainees turn to the Key Competencies table and review it together.

7. Introduce the learning outcome and the knowledge, skills, and attitudes they will gain from the learning outcome. Explain that this learning outcome/session will focus on packaging products.

Problem Solving Activity

Topic 4.2 Task 2:

1. Have trainees form small groups. Provide each group with the following scenario. Let each group read the scenario together:

   Karanga bought 2 bags of 25 kg each of cassava flour from YuA shop. He intended to share part with his 10 closest friends and family for Christian. He planned to distribute 5 kg to each family. Surprisingly, while he was dividing, he found out that 1 bag weighed only 23 kg. He brought the bag back to YuA shop to be replaced. The shop replaced the bag and immediately conducted a quick audit to check whether there were no other bags presenting the same problem. The findings revealed that out of 54 bags, 6 were not accurately measured. The shop management immediately contacted a lawyer to bring Kalu Milling Ltd—the main supplier of the shop—to court for attempting to cause bankruptcy to the shop through loss of trust from clients. With the court process, Kalu Milling Ltd was found guilty and fined 100 million Rwandan francs.

2. Now, tell the groups to discuss and note their responses to the following questions:
   a. What do you think caused the problem in the scenario?
   b. How did Karanga know that one bag weighed less?
   c. How did he know the amount of flour he bought initially?

3. After the discussions, ask the groups to share their responses. Discuss as a group and review **4.2 Key Facts** in their manual together to harmonize their responses.

Guided Practice Activity

Topic 4.2 Task 3:

1. Divide trainees into small groups. Tell each group to do the following:

   Imagine you are a production manager in flour processing facility. One of your responsibilities is ensuring quality through packaging.

2. Instruct the groups to discuss and write their responses for the following:
   a. Describe the procedure for filling flour product into packages.
      Answer:
      - Machine measures out the correct quantity of product required for each individual bag/closure.
      - The machine releases the product once a signal has been received from the bagging machine in the case of a fully automatic system, or on command from the operator, in a semi-automatic system whereas in manual system operator fill into package on scale for accuracy purpose.

   b. Describe the procedure for sealing flour containers.
      Answer:
      - Machines make the closure/bag from a roll of plastic film by filling the bag with the required product and seal it into a completed bag.

   c. Describe the procedure for accurately measuring the quantity required for individual package.

3. After the discussions, ask groups to share their responses. Discuss as a group and harmonize their responses.

Application Activity

Topic 4.2 Task 4:

1. Have trainees form small groups. Organize a visit to a flour milling facility located in your community. Make an appointment with the operators.

2. Inform trainees that they will assist him/her during the packaging process.

3. At the end of the activities, tell trainees to discuss best practices and shortcomings with the operator.

4. Tell trainees they will write a report with their groups regarding:
   a. The procedure for filling flour product into packages.
   b. The procedure for sealing flour containers.
   c. The procedure for accurately measuring the quantity required for individual package.

5. After the visit, ask trainees to share their findings. Discuss as a group to harmonize their findings.

Points to Remember

- In a manual system, the operator fills packages on scale in order to ensure accuracy.
- Use a machine that measures the correct quantity of product required for each individual bag/closure.

Formative Assessment

Read and write answers to the questions below using complete sentences.

1. What are two of the main purposes of packaging?

Possible Answers: Physical protection, barrier protection, security, convenience

2. Discuss the pros and cons of packaging.

Answer:
Pros: Packaging provide protection to the contents/products as well as security. Packaging also shows customers clearly what they are buying and the quantity.
Cons: There is a cost involved in packaging as well as an extra step in the process from production to sale.

3. While filling packages manually, what should you pay close attention to?

Answer: That the scale is calibrated, and all products being weighed are transferred to the package.

Learning Outcome 4.3: Label the product

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

- **a.** List items necessary for flour labelling
- **b.** Label flour product
- **c.** Warn end users in case of malpractices
- **d.** Explain flour labelling process and terminologies
- **e.** Provide consumers with the information they desire to make food choice
- **f.** Comply with general standard for the labelling of pre-packaged foods

Time Required: 5 hours

Learning Methodology: Simulation, demonstration, practical exercise, field visit, think-pair-share

Materials Needed:

- Maize grain, water, moisture meter

Preparation:

- ❑ Prepare maize grain to be tempered.

Cross Cutting Issues:

- ✓ **Environment and sustainability:** Ensure the environment is taken care of while demonstrating or while the trainees performing the practice exercise.
- ✓ **Gender:** Make sure that both sexes are represented while forming the groups in order to promote gender balance.
- ✓ **Inclusivity:** Ensure people living with disabilities are integrated into different groups for inclusion.

Prerequisites:

- None

Key Competencies:

Knowledge	Skills	Attitudes
1. List items necessary for flour labelling	**1.** Label flour product	**1.** Detail-oriented
2. Explain flour labelling process and terminologies	**2.** Provide consumers with the information they need and desire to make food choices	**2.** Methodical
3. Define flour labelling	**3.** Select necessary information for labelling	**3.** Diligent

Steps:

Getting Started: What do we know and where are we going?

Topic 4.3 Task 1:

1. Separate trainees into small groups. Ask each group to nominate a group representative.

2. Tell the groups to study the illustration above and answer questions that follow:
   a. What do you observe?
   b. What does the writing represent?

c. What is the purpose of the writing?
d. Why is it important to have the writing?

3. Gather all groups together and let their representatives present the findings.

4. After the discussion, ask trainees what topic they think this activity relates to.

5. Introduce the learning outcome and have trainees turn to the Key Competencies table.

6. Explain that this learning outcome/session will focus on product labelling.

Problem Solving Activity

Topic 4.3 Task 2:

1. Provide each group with the following scenario. First, tell the groups to read the scenario:

Cako is a company that produces flour and is the leader of distribution in its region. Recently, the company has developed an idea to expand its market share by exporting its product to Europe. In order to comply with exporting law, the company requested an export permit. Their request was rejected because the company's product does not display full information on its packaging to help consumers.

2. Tell the groups to discuss and note answers to the following:
a. List possible information that should have been put on package.
b. Why is it important for Cako to have such information on the package?

3. After the discussions, ask the trainees to share their responses. Discuss as a group and review **4.3 Key Facts** in their manual together to harmonize their responses.

Guided Practice Activity

Topic 4.3 Task 3:

1. With a partner, tell trainees to read and consider the following scenario:

You have been asked to advise one of your community companies that produces different types of flour with respect to the labelling.

2. Tell each partner to create a sample label for the company.

3. After the group discussions, ask the pairs to present their samples to the class, explaining the importance of what they have included.

Application Activity

Topic 4.3 Task 4:

1. Have trainees to form small groups. Tell them to visit a flour milling facility in your community.

2. At the facility, tell them to participate in the labelling process and participate actively throughout the process.

3. Upon completion, instruct trainees to discuss the pros and cons of the labelling process with the operator(s).

4. Finally, tell each group to write a report regarding:
   a. The processing involved in labelling.
   b. The information included on a label.

5. After the visit, ask them to share their findings. Discuss as a group to harmonize their findings.

Points to Remember

Information on package must include:

- The name of the food
- List of ingredients
- Net contents and drained weight
- Name and address
- Country of origin
- Lot identification
- Date marking and storage instructions
- Instructions for use

Formative Assessment

Read the following statements and determine whether they are either true or false.

Answers are in bold.

1. The name shall indicate the true nature of the food and normally be specific and not generic.
   a. **True**
   b. False

2. Except for single ingredient foods, a list of ingredients shall be declared on the label in ascending order of weight.
   a. **True**
   b. False

3. The net contents shall be declared in the metric system.
   a. **True**
   b. False

4. The name and address of the manufacturer, packer, distributor, importer, exporter, or vendor of the food shall be declared.
   a. **True**
   b. False

5. The country of destination of the food shall be declared if its omission would mislead or deceive the consumer.
   a. **True**
   b. False

6. Each container shall be embossed or otherwise permanently marked in code or in clear to identify the producing factory and the lot.
   a. **True**
   b. False

7. Instructions for use, including reconstitution, where applicable, shall be included on the label, as necessary, to ensure maximum utilization of the food.
   a. True
   b. **False**

Self-Reflection

1. Ask trainees to re-take the self-assessment at the beginning of the unit. They should then fill in the table in the Trainee's Manual to identify their areas of strength, areas for improvement and actions to take to improve.

2. Discuss trainees' results with them. Identify any areas that are giving many trainees difficulties and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to go through commonly identified difficult concepts).

Summative Assessment

Integrated Situation	Resources
For the preparation of its various dishes, Embrella Restaurant located in Kigali City Centre needs cassava and maize flours. The manager of the restaurant has ordered 5 kg of cassava flour and 4 kg of maize flour from Teras Milling Ltd. In order to supply Embrella Restaurant, the production manager at Teras Milling Ltd has requested you to process the needed products within 8 hours. The flour should have a moisture content not exceeding 13%.	**Products**: Cassava and maize grains, water, detergents, soaps, disinfectants **Materials and equipment**: Brushes, sprayers, buckets, serviettes, mops, basins, P.P.E (Personal Protective Equipment), soaking tanks, washing tanks, knives, dryers, choppers, cutters, milling machine, drying beds, crushers, settling tanks, sieves and filters, filling machines, packaging machine (filling and sealing), sealer, vats, mills, thermometer, dryers, flour mixer, centrifuge, peeling machine, packages, moisture meter, tempering bins, conveyors, purifier, de-stoner, separator, , aspirator

While trainers carrying out task as per integrated situation above tick appropriately as she/he moves further

.

Assessment Criterion 1: Quality of Process

Checklist	Score	
	Yes	No
Indicator 1: Tools, utensils, instruments, and equipment are cleaned		
Tools		
Equipment		
Instruments		
Utensils		
Indicator 2: Tools, utensils, instruments, and equipment are checked		
Functionality		
Calibration for small scale instruments		
Parameters of visual inspection		
Effective use of the equipment and materials		
Indicator 3: Tools, utensils, instruments, and equipment are maintained		
Installation techniques of the equipment		
SOPs (standard operating procedures) for each piece of equipment		
Maintenance and adjustment		
Effectiveness of the equipment		
Safety precautions of the equipment (effect on the user and product)		
Indicator 4: Cassava tubers and roots are prepared		
Sorting		
Washing and peeling roots and tubers		
Peeling roots and tubers		
Indicator 5: Cassava roots or tubers are soaked		
Soaking conditions		
Soaking methods and techniques		
Indicator 6: Cassava roots and tubers are dried		
Drying conditions		
Drying method and techniques		
Indicator 7: Dried cassava roots and tubers are grinded and sieved		
Grinding and sieving conditions		
Grinding and sieving methods and techniques		
Indicator 8: Flour quality is properly checked		
Flour quality parameters		
Moisture Content		
Particle size of the flour		
Colour		
Indicator 8: Quality of incoming maize is checked through physical parameters		
Physical parameters		

Appearance		
Colour		
Visual defects		
Infestation		
Odour		
Indicator 9: Processing parameters are set		
Flow rate of raw material and air		
Speed		
Rotation		
Grain cleaning machineries		
Indicator 10: Processing parameters are maintained		
Material flow rate		
Speed		
Rotation		
Time		
Moisture content		
Indicator 11: Quality of maize flour is checked		
In-process testing		
Sample collection procedure		
Indicator 12: Appropriate packages are selected		
Types of packages		
Specification of packages		
Selection of the package based on products and requirement		
Indicator 13: Products are packaged		
Filling and sealing techniques		
Filling and sealing conditions		
Monitoring, filling, and sealing process		
Observation		

Assessment Criterion 2: Quality of product

Checklist	Score	
	Yes	No
Indicator 11: Quality of maize flour is checked		
In-process testing		
Sample collection procedure		
Indicator 14: Product is labelled		
Label contents		
Expiration date		
Methods and techniques of labelling		
Observation		

Assessment Criterion 3: Relevance

Checklist	Score	
	Yes	No
Indicator 1: Time is effectively managed		
Duration: 8 hours		
Indicator 2: Quantity is accurately respected		
5 kg for cassava flour		
4 kg for maize flour		
Indicator 3: Desirable moisture content is respected		
Below 13%		
Observation		

REFERENCES

Abass, A. (2006). *How to make high quality cassava flour (HQCF)*. International Institute of Tropical Agriculture (IITA). https://www.iita.org/wp-content/uploads/2016/06/How_to_make_high_quality_cassava_flour_HQCF.pdf

Abass, A., Towo, E., Mukuka, I., Okechukwu, R., Ranaivoson, R., Tarawali, G., & Kanju, E. (2014). *Growing cassava - A training manual from production to postharvest*. International Institute of Tropical Agriculture (IITA). https://hqcf.iita.org/wp-content/uploads/2016/04/1_cassava-training-manual.pdf

Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). (2014). *Quality assurance for cassava flour processing: A training manual*. https://hqcf.iita.org/wp-content/uploads/2016/04/5_harmonized-standards-_cassava.pdf

Awulachew, M. T. (2020). *Understanding basics of wheat grain and flour quality*. Science Publishing Group. https://article.sciencepublishinggroup.com/pdf/10.11648.j.jher.20200601.12.pdf

Bockstaele, F. V. (2017, May 16). *Milling technology for cereals*. Ghent University. http://ffinetwork.org/about/calendar/2017/documents/Zambia_6.1_Milling_technology_for_cereals_Bockstaele.pdf

Bradbury, J. H., Cliff, J., & Banea, J. P. (2010). *Making cassava flour safe using the wetting method*. South Sudan Medical Journal. https://www.southsudanmedicaljournal.com/archive/february-2015/making-cassava-flour-safe-using-the-wetting-method.html

Butt, M. S., Nasir, M., Akhtar, S., Sharif, K., & Institute of Food Science & Technology, University of Agriculture, Faisalabad. (n.d.). *Effect of moisture and packaging on the shelf life of*

wheat flour. Internet Journal of Food Safety. https://www.foodhaccp.com/internetjournal/ijfsv41.pdf

Clarke, B., & Rottger, A. (2006). *Small mills in Africa: Selection, installation and operation of equipment*. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/j8482e/j8482e.pdf

CORAF/WECARD. (2011, May). *Training manual: Processing of cassava into gari and high quality cassava flour in West Africa*. https://www.coraf.org/pmb/opac_css/doc_num.php?explnum_id=71

Duville, K. E. (2012). *Sorghum flour production manual for Compatible Technology International (CTI) burr grinders*. Digital Commons - University of Nebraska Lincoln. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1008&context=intsormilpubs

Dziedzoave, N. T., Abass, A. B., Amoa-Awua, W. K., & Sablah, M. (n.d.). *Quality management manual for production of high quality cassava flour*. International Institute of Tropical Agriculture (IITA).

East African Community. (2011). *Maize grains — Specification and grading*. East African Standard. https://law.resource.org/pub/eac/ibr/eas.2.2011.html

Food and Agriculture Organization of the United Nations. (1991). *Codex general standard for the labelling of prepackaged foods*. https://www.fao.org/3/Y2770E/y2770e02.htm

Food and Agriculture Organization of the United Nations. (2006). *Typical construction of hammer mill* [Drawing]. http://www.fao.org/3/j8482e/j8482e.pdf

Food and Agriculture Organization of the United Nations. (2006). *Typical construction of plate mill* [Drawing]. http://www.fao.org/3/j8482e/j8482e.pdf

Food and Agriculture Organization of the United Nations. (2009). *Processing techniques to reduce toxicity and antinutrients of cassava for use as a staple food*. AGRIS:

International Information System for the Agricultural Science and Technology. https://agris.fao.org/agris-search/search.do?recordID=GB2012104615

Food and Agriculture Organization of the United Nations. (2009). *Agribusiness handbook: Wheat flour*. https://www.fao.org/3/al376e/al376e.pdf

Food and Agriculture Organization of the United Nations. (n.d.). *Chapter 16: Grain crop drying, handling and storage*. https://www.fao.org/3/i2433e/i2433e10.pdf

Food and Agriculture Organization of the United Nations. (n.d.). *Chapter 5 - Processing of roots and tubers*. https://www.fao.org/3/x5415e/x5415e05.htm

Fuse box. (n.d.). Wikimedia. https://upload.wikimedia.org/wikipedia/commons/2/28/Pae_64_-_fuse_box.JPG

Liu, K. (2009). *Some factors affecting sieving performance and efficiency*. Powder Technology. https://naldc.nal.usda.gov/download/55382/PDF

Manalili, N. M., Dorado, M. A., & Van Otterdijk, R. (2014). *Appropriate food packaging solutions for developing countries*. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/a-mb061e.pdf

Mill feeder [Drawing]. (n.d.). https://html1-f.scribdassets.com/21mdqnq81s5mxyqp/images/4-18bfb9ab29.jpg

Musuga, M. (2019). *Maize grain quality standards*. Uganda National Bureau of Standards (UNBS). https://blog.unbs.go.ug/?p=10753

Packaging and labeling. (n.d.). Marketing Management. https://mktngmanagement.blogspot.com/2012/06/packaging-and-labeling.html

Patil, K. (2015, April 9). *Milling and milling equipments*. LinkedIn SlideShare. https://www.slideshare.net/ketaki8938/milling-and-milling-equipments

University of Nebraska - Lincoln. (2012). *Helix* [Photograph]. DigitalCommons@UNL. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1008&context=intsormilpubs

University of Nebraska - Lincoln. (2012). *Hopper* [Photograph]. DigitalCommons@UNL. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1008&context=intsormilpubs

University of Nebraska - Lincoln. (2012). *Third pass* [Photograph]. DigitalCommons@UNL. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1008&context=intsormilpubs

US National Library of Medicine, National Institutes of Health. (2017, September 1). *Cassava, konzo, and neurotoxicity*. Lancet Glob Health. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6995356/

Wheat Marketing Center, Inc. (2004). *Wheat and flour testing method: A guide to understanding wheat and flour quality*. Nebraska Wheat. https://nebraskawheat.com/wp-content/uploads/2014/01/WheatFlourTestingMethods.pdf

This publication is made possible by the support of the American People through the United States Agency for International Development (USAID). The contents of this are the sole responsibility of Education Development Center (EDC) and do not necessarily reflect the views of USAID or the United States Government.

RWANDA POLYTECHNIC – RP


P. O. BOX 164 Kigali Rwanda


info@RP.gov.rw


www.RP.gov.rw