



TVET LEVEL II



AGRICULTURE

Milk Processing

TRAINER MANUAL



Approved by:  Workforce
Development
Authority



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Acknowledgements

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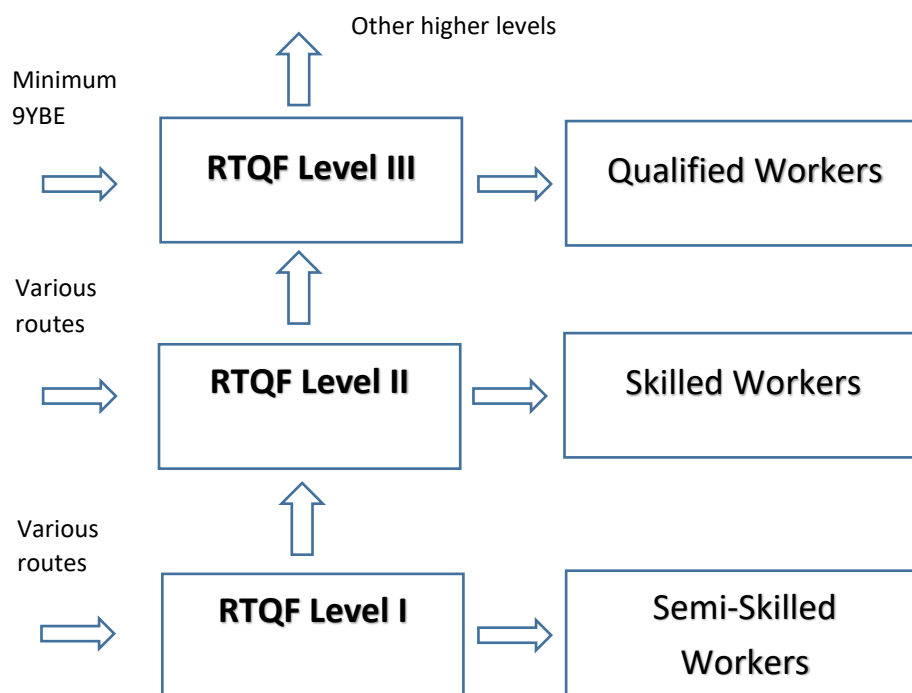
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Introduction to RTQF Level II Training Modules

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-appropriate 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.

Milk Processing

Learning Units	Learning Hours	Learning Outcomes
Learning Unit 1: Receive milk	50	1.1 Prepare the workplace and equipment
		1.2 Receive raw milk
		1.3 Grade and cool raw milk
Learning Unit 2: Assist in milk processing	50	2.1 Organize and prepare work area
		2.2 Make dairy products
		2.3 Pack and store processed products
		2.4 Keep dairy product records

Learning Unit 1: Receive milk



Learning Outcomes

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

- 1.1** Prepare the workplace and equipment
- 1.2** Receive raw milk
- 1.3** Grade and cool raw milk

Learning Unit 1 Self-Assessment

- 1.** Ask trainees to look at the illustration above (in their Trainee Manuals) and discuss what they see. What topics do they think this unit will include based on the picture? After some brainstorming, share the main topics.
- 2.** Explain that this unit will focus on milk processing, specifically making sure that the workplace is clean and sanitized to receive milk, how to prepare the equipment, and how to grade and cool raw milk.
- 3.** 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 trainees to see what they know or do not know. 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: Prepare the workplace and equipment

	Objectives: By the end of the learning outcome, trainees will be able to: - Identify equipment for receiving milk - Describe procedures for cleaning and sanitizing the workplace and equipment - Depict the adjustment techniques for equipment when receiving milk - Prepare equipment for receiving milk - Clean and sanitize the workplace and equipment - Adjust equipment for receiving milk
	Time Required: 20 hours
	Learning Methodology: Practical exercises, demonstrations, industrial visits.
	Materials Needed: Sample Cleaning Materials: cleaning cloth, stainless steel tanks, detergent, buckets, disinfectants, PPE, cleaning manuals, brushes, basins, mops, brooms, sanitizer, and water
	Preparation: ☐ Contact the milk processing plant nearby to request a field visit for the trainees.
	Cross Cutting Issues: ✓ Gender and inclusivity: While forming small groups consider gender balance and inclusion of people with disabilities. ✓ Financial education: While identifying consumables, such as PPE, cleaning materials, tools and equipment, consider cost, availability, and durability. ✓ Environment and sustainability: Emphasize the need to protect the environment through proper disposing of waste materials as some of the used materials and equipment are pollutants and represent hazards for employees and the environment.
	Prerequisites: ▶ Cleaning methods, cleaning materials and sanitizers ▶ Food- safety and hazards (biological, chemical, and physical) ▶ Equipment handling and safety precautions ▶ First aid principles

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify equipment for receiving milk.	1. Prepare equipment for receiving milk.	1. Attention to detail regarding requirements.
2. Describe procedures for cleaning and sanitizing the workplace and equipment.	2. Clean and sanitize the workplace and equipment.	2. Respecting standards.
3. Depict the adjustment techniques of equipment for receiving milk.	3. Adjust equipment for receiving milk.	3. Applying protocol.



Steps:



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



1. In groups of 4-5 people, ask trainees to discuss the following:
 - a. Look at the picture in **Topic 1.1. Task 1**, what is happening?
 - b. Share any experiences and thoughts that you have about the different equipment (tools, utensils and materials) necessary to clean the milk processing area. *(Possible answers: accept all answers, explaining that this will be covered in detail later on in the topic).*
 - c. Why is it important to keep this area clean? *(Answer: to stop contamination and spread of disease).*
 - d. List some of the different ways or methods we use to properly clean the area. *(Possible answers: explain that the process to clean the milk processing area will be explored in detail later in the topic).*
2. Ask each group to provide an answer to ONE of the questions. Ask other groups to add any information not covered. Explain to groups that you will now look in detail at what equipment is used and how to clean the milk processing area correctly.
3. Ask trainees to look at the table of knowledge, attitudes, and skills in the manual to see what they will learn in this topic.



Problem Solving Activity

Topic 1.1 Task 2:

1. Read the following to trainees (**Topic 1.1 Task 2**); let trainees know they can follow the text in their manuals:

Mr. Graham, the production manager of Impact Dairies Ltd. knows that keeping the milk processing area clean can be a challenge. He spots Mildred, a new employee, forgetting to use rubber/plastic gloves and using the same cloth to wipe down the equipment as used on the floor. Mr. Graham decides to give all employees a refresher course on the correct tools, utensils, and materials necessary to keep the milk processing area clean.

2. In groups of 3-4, look at the list/drawings of different tools, utensils and materials.

Group of tools, utensils and materials	Specific examples
Tools and utensils	Brushes, mops, torchons (towels), basins, buckets
Disinfectants	Caustic soda, Nitric Acid
Detergents	Powder Detergent, Liquid soap
Sanitizers	Air driers, chlorine
PPE	Gloves, boots

Groups have 20-30 minutes to decide the following:

- a. Is this tool, utensil, or material necessary to help clean the milk processing area?

(Answer: yes)

- b. If yes, what is the specific purpose of the tool/utensil/material and where should it be used?

(Answers:

- *Brushes, torchons and mops are used to remove physical debris from dairy equipment as well as from the floor surfaces of the processing area.*
- *Caustic soda and Nitric acid are used to breakdown and remove fat residues and organic stains from the equipment and floor surfaces.*
- *Air Driers are used to generate hot air for surface drying and sanitization.*
- *Chlorine is used to disinfect the food contact surfaces after cleaning.*
- *Omo and liquid soap play the same role as disinfectants but are less active compared to Caustic soda and Nitric Acid.*
- *Buckets and basins are used to handle disinfectants and detergents.*
- *PPE are used for protection purposes).*

3. Ask each group to provide ONE answer of a specific tool, utensil, or material, correcting any misconceptions. Continue until all tools, utensils, and materials have been discussed.
4. Explain: Tools, utensils and materials must ALWAYS be used for the right job and not for anything else. If they are not used correctly, there is a risk that the milk will become contaminated and not be able to be used.

Topic 1.1 Task 3:

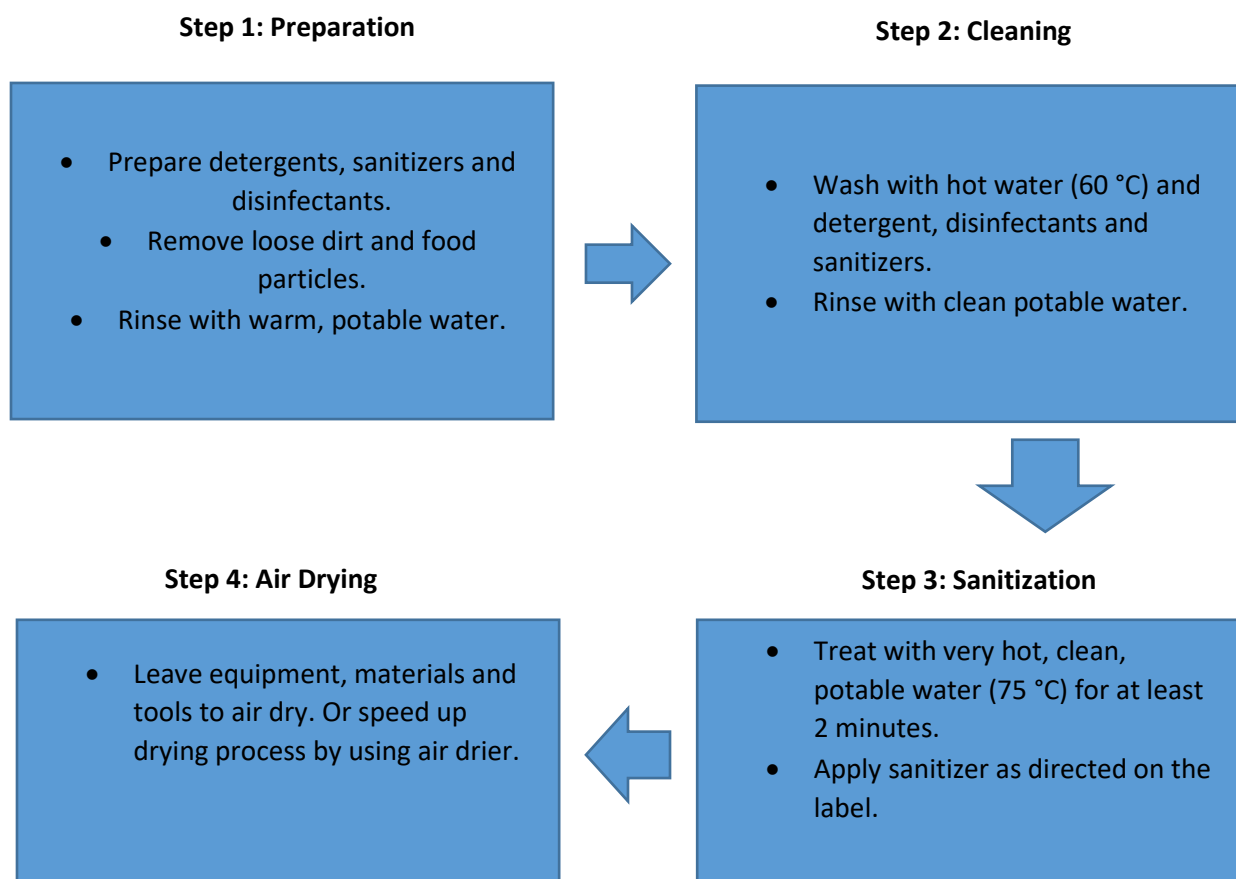
1. Read the following to trainees (**Topic 1.1 Task 3**):

Mr. Graham, the production manager of Impact Dairies Ltd. knows that most of his employees are familiar with the 4-step process in keeping the milk processing area clean. However, he also knows that sometimes employees may miss a step or get the steps confused. To help the employees follow the different steps in the correct order, he

decides to put some posters on the wall. He asks Fred, an employee, to stick the posters on the wall in the correct order of the different stages that must be followed when preparing and cleaning the milk processing area. Fred is eager to help but sees that some of the posters are incomplete, and he also forgets which order the posters should follow as they are not numbered. Can each group help Fred put the posters in the correct order so that employees can follow the 4-step cleaning process?

2. Tell trainees to work in the same groups as before and to look in their manuals at the different posters. Groups should:
 - a. Decide what order the posters should go to correctly show the 4-step process for keeping the milk processing area clean.
 - b. Identify what is missing from the posters – hint: there is 1 thing missing from each poster.

Answer:



3. Ask one group to present what order they think the posters should go in. Ask other groups if they agree or disagree and why. Show the correct order of posters. (*Answer: see posters above for correct order and missing information*).

- a. Ask different groups to state one item missing from a poster. Ask other groups if they agree. Explain what is missing. *(Answer: see posters above for missing information).*
- b. How does the equipment that receives the milk need to be adjusted? *(Answer: the milk reception equipment e.g. milk reception tank may be adjusted by turning on the control unit (thermometers, flow meters)).*

Topic 1.1 Task 4:

1. Ask trainees to answer the following questions, answers should be written in their notebooks (**Topic 1.1 Task 4**):
 - a. What could happen if the 4-step process for keeping the milk processing area clean were followed in an incorrect order? *(Answer: the area may not be properly cleaned and this can result in the milk becoming contaminated, perishing, and needing to be thrown away).*
 - b. What could happen if only 1, 2 or 3 steps of the 4-step process for keeping the milk processing area clean were followed? *(Answer: the area may not be properly cleaned, which can result in the milk becoming contaminated and needing to be thrown away).*
 - c. Why is it important to use the correct tools, utensils, and materials for cleaning the milk processing area? *(Answer: to ensure proper cleanliness of processing area otherwise the area may not be properly cleaned, and this can result in the milk becoming contaminated and needing to be thrown away).*
 - d. What could happen if the milk receiving equipment is not adjusted correctly? *(Answer: milk may be wasted or contaminated or perish, meaning that it will need to be thrown away).*
2. Ask different trainees to provide answers to each question (remember to include everyone including girls, people with disabilities, or trainees who may be lacking in confidence).
3. Refer trainees to **1.1 Key Facts: Preparation of the workplace and equipment for milk processing** in the Trainee Manual.



Guided Practice Activity

1. Put trainees in groups of 4-5. Explain to trainees that they will now review the equipment and cleaning products in the school milk processing area (if none are available at school, visit a nearby dairy).

2. Ask groups to do the following (**Topic 1.1 Task 5**):
 - a. Identify all the different tools, utensils, and materials required and their uses for cleaning the milk processing area.
 - b. Make a note of any tool, utensil, or material that is different to what has been previously described. Suggest a use for this.
 - c. Look closely at any cleaning fluids/liquids used and carefully read the preparation instructions. Copy and complete the table.

S/N	Name of sanitizer	Concentration of the detergent (%)	Temperature (OC)	Mode of application	Time of exposure (Min)

Trainer Note: Each locality will have different cleaning fluids available, meaning it is not possible to provide answers in the table above. Trainers should ensure that trainees have correctly identified the cleaning fluids and how they should be used.

3. Tell groups to correctly prepare each of the cleaning fluids/liquids by carefully following the instructions.
4. Ask groups to answer the following:
 - a. Why is it important to follow the instructions for correctly preparing cleaning agents/disinfectants? *(Answer: to make sure that the right conditions are used to clean the milk processing area and to make sure the milk is not contaminated with pathogens/bacteria, dirt, or by the disinfectant).*
 - b. What do you think could happen if you do NOT dilute the cleaning agent/disinfectant enough (e.g. it is very strong)? *(Answer: the milk can become contaminated as the disinfectant is too strong, this may give the milk a strange smell or taste meaning the milk will need to be thrown away).*
 - c. What do you think could happen if you dilute the cleaning agent/disinfectant too much (e.g. it is very weak)? *(Answer: the cleaning solution may not be **effective FOR removal OF the dirt and killing OF the pathogens**. the milk processing area may not be cleaned properly; there may still be dirt, pathogens/bacteria present meaning that the milk may be contaminated and need to be thrown away).*
5. Ask groups to go through the 4-step process for cleaning and to adjust the equipment as necessary to receive the milk (see **1.1 Key Facts**). Tell groups that to do this task they

must be organized and focused and that they may want to nominate a group leader to direct and focus the group on the task.

6. Give each group enough time to do the task; guide and support groups on any area they find challenging to implement.
7. After groups have completed the task, ask groups to report back on what they found easy and/or difficult about the task.



Application Activity

1. Read the following (**Topic 1.1 Task 6**) to trainees:

Last year, Mr. Graham gave 10 students from the TVET Level 2 milk processing module the opportunity to work for him. He has been very impressed with their commitment to the work and how they are able to follow the instructions and processes for cleaning the milk processing area. He is very happy with how the students work together as a team. Mr. Graham wants to give the same opportunity to 5 new students from this year's TVET course and has asked your group to help this new group when they start. Mr. Graham has asked you to:

- a. Develop a 5 minute presentation (it can be a speaking presentation or done by singing, dancing, acting etc!) to show the new group of 5 employees what utensils, tools and materials are needed and what their uses are; the 4-step process; and what adjustments to equipment are necessary.
2. Explain to groups that Mr. Graham has asked you (the trainer) and other trainees to assess which group does the best presentation as he would like to congratulate them afterwards.



Points to Remember

- Avoid cleaning and disinfecting the floors in dry state.
- Clean, disinfect, and thoroughly rinse the equipment, tools, utensils, and work surfaces with running water and put everything away, clean and protected from dust.
- Empty the dust bins into the appropriate facility and then wash and disinfect.



Formative Assessment

Ask the trainees to choose the right answer to the questions below.

1. Sanitizing is the first step in creating a safe food contact surface.
 - a. No
 - b. Not sure
 - c. Usually
 - d. Yes

Answer: D - Yes

2. After sanitizing, equipment, utensils, and tools should always be _____ dried.
 - a. Air
 - b. Vacuum
 - c. Towel
 - d. Speedy

Answer: A – air dried

3. The only way to correctly sanitize surfaces and equipment in a milk processing establishment are with _____ and _____.
 - a. Soap and water
 - b. Hot and cold water
 - c. Disinfectant/cleaning fluids and heat
 - d. Heat and water

Answer: C: - Disinfectant/cleaning fluids and heat

4. To prevent _____ of food, cleaning supplies, equipment, and chemicals should be stored separately and well away from food contact surfaces.
 - a. Freezing
 - b. Burning
 - c. Rotting
 - d. Contamination

Answer: D - contamination

5. Which of the following are approved for sanitizing food contact surfaces and equipment?
 - a. Chlorine
 - b. All of those
 - c. Mercury

d. Zink

Answer: A - Chlorine

6. Proper three compartment sink cleaning procedures are_____.

- a. Pre-wash, rinse, sanitize, towel dry.
- b. Wash, rinse, sanitize, towel dry.
- c. Wash, rinse, air dry
- d. Pre-wash, wash, rinse, sanitize and air dry

Answer: C - wash, rinse, air dry

Further Information for the Trainer

- 1. <https://www.glanbiaconnect.com/farm-management/detail/article/importance-of-dairy-hygiene>
- 2. <https://milk.procon.org/view.resource.php?resourceID=000658>
- 3. <https://www.sspindia.com/dairy-industry.html>

Learning Outcome 1.2: Receive raw milk

	Objectives: By the end of the learning outcome, trainees will be able to: - Determine and practice techniques of controlling raw milk - Describe and practice the procedure of filtrating and weighing raw milk - Identify methods for keeping records
	Time Required: 20 hours
	Learning Methodology: Practical exercises, experimentation, industrial visits
	Materials Needed: Measurement and Storage Materials: thermometer, pH-meter, butyrometer, lactometer, balances, mastitis kit, antibiotic kit, Burette, Pipette, beakers, test tubes, funnels, Reagent bottles, Soxhlet apparatus, Kjeldha flask, 75% ethanol, hand soap, stainless steel stirrer, lintine cloth, aluminium paper, and brushes Standard Training Materials: Flip charts, Pens, Markers, Handouts Visual Materials: Dairy manual, video, cameras Sample Milk Products: Milk samples (some which are bad, others that are good), milk coolers, milk tanks
	Preparation: ☐ The trainer will need to contact the milk processing plant nearby to request a field visit for the trainees.
	Cross Cutting Issues: ✓ Gender and inclusivity: Consider gender balance and inclusion of people with disabilities while forming groups and allocating roles. ✓ Financial education: Consider cost, availability, and durability while identifying consumables such as PPE, cleaning materials, tools, and equipment. ✓ Environment and sustainability: Emphasize the need to protect the environment through proper disposal of waste materials as some of the used materials and equipment are pollutants and represent hazards for employees and the environment.
	Prerequisites: ▶ Cleaning methods, cleaning materials and sanitizers. ▶ Food-safety and hazards (biological, chemical, and physical) ▶ Equipment handling and safety precautions. ▶ First aid principles

Key Competencies:

Knowledge	Skills	Attitudes
1. Determine techniques of controlling raw milk.	1. Control raw milk.	1. Safety-oriented awareness
2. Describe the procedure of filtrating and weighing raw milk.	2. Filtrate and weigh raw milk.	2. Attention to detail
3. Identify techniques for keeping records.	3. Keep records.	3. Diligence



Steps:



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



Topic 1.2 Task 1:

1. Brainstorm the following with trainees:
 - a. The milk arrives at the dairy. What happens next and why is this important?

2. Ask trainees to look at the picture above and answer the following:
 - a. What do you think is happening in the picture?
3. Explain to trainees:
 - a. It is important that the milk is processed as soon as it arrives; it needs to be tested to make sure that it is fresh; it needs to be stored correctly so that the milk does not go bad too quickly. Proper records of what happens to the milk as soon as it arrives need to be maintained.
 - b. That this topic/outcome will look at the different techniques for controlling raw milk, how raw milk is filtrated and weighed, and the correct way to keep records.
4. Refer trainees to the knowledge, attitudes, and skills for this learning outcome, 'Receive milk.'



Problem Solving Activity

Topic 1.2 Task 2:

1. Ask trainees in pairs to complete the following:
 - a. Look at the instructions below for milk sampling. This is the process that first occurs when the milk arrives in the dairy. The instructions are not in the correct order. Show with numbers 1-6 the correct order for sampling milk.

Instruction for sampling milk	Correct ordering of sampling
Mix milk at least 5 minutes.	2
Wash and dry hands; keep hands clean during sampling operation.	1
Seal the sample container immediately after filling.	4
Rinse equipment used for sampling after use.	6
Take the sample as soon as possible after mixing.	3
Label the sample with the necessary information.	5

2. Review the correct order of instructions with trainees and answer any questions they may have.

Topic 1.2 Task 3:

1. Ask trainees to complete the following:
 - a. After a sample of milk has been taken, there are different tests and observations that must be completed. One test is to observe what the milk looks like.

b. The following statements show some observations that a dairy man has made of 5 different samples of milk. Write the statements and fill in the missing spaces using the words in the box. Each word can only be used **ONCE**.

- i. The color of cow milk should be slightly yellowish-white; a different color may indicate milk which is unsuitable for processing.
- ii. Reddish milk could indicate that there is blood in the milk.
- iii. A “blue thin” color and a thin and watery appearance can indicate that the milk contains added water or skimming (fat removal).
- iv. Large clots can indicate sour milk or mastitis milk.
- v. Small white clots or grains can indicate either Mastitis milk or milk adulterated with flour and / or skim milk powder

Blood	Flour	Water	Clots	Yellowish-white
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2. Ask different learners to provide answers. Answer any questions trainees may have.

Topic 1.2 Task 4:

- 1. Explain to trainees: Another way to find out if the milk is fresh is to smell or taste it. The taste of the milk can tell us many things about the milk e.g. If the cow has mastitis, what the cow has been eating, and much more.
- 2. Ask trainees to complete the following from **Topic 1.2 Task 4**:
 - a. The statements are mixed up. Correctly match the parts of the statements in the first and second column. The first two have already been done for you.

Statement	Statement
Acid flavours are easily detected by smell and taste.	beets, poorly made silage, certain plants and pastures can cause off-flavours to milk
Rancid and bitter flavours: a pure bitter flavour can be detected by taste only.	The flavour is caused by the growth of acid-producing bacteria that reduce lactose to lactic acid.
Feed flavours like garlic, onion.	A very slight oxidized flavour suggests flat flavour as well as low solids and/or low-fat milk.
Flat flavours are quite easy to detect.	The rancid flavour can be detected by both the senses of smell and taste and is caused by lipolysis (deterioration) of fat.
Other flavours such as drugs, disinfectants and	detergents can also be causes bad smell and flavour.
Malty flavours are very suggestive of malt.	It is caused by an increase in chlorine and decrease in lactose content
Salty flavours are easy to detect; and often associated with milk from cows in an advanced stage of lactation or mastitis milk.	The oxidized flavour is characterized by a quick taste reaction.
Oxidized flavours are sometimes described in such terms as “oily”, “stale”, “tallowy”, “cardboard” or “sunshine”.	The flavour is caused by the growth of the bacteria <i>Streptococcus lactis</i> var. <i>maltigenes</i>.

3. Review responses with trainees.

4. Summarize that as soon as the milk arrives at the dairy/milk processing area, a sample of milk must be taken and observations should be made about a) what it looks like, b) what it tastes like. These observations should be recorded.

Topic 1.2 Task 5:

1. Tell trainees that another way to test the milk is to look at its density. Ask trainees (Topic 1.2 Task 5):

- What do you understand by the term density? (*Answer: Density describes how compact or concentrated something is; in scientific terms it means the mass of the substance in a given volume. Different substances have different densities—for example the densities of milk and water are not the same.*)

Explain: The density of milk is measured in grams per milliliter or g/ml and is measured using a lactometer. Density depends on how much fat and protein is present in the milk. The density of fresh milk should be between 1.028 and 1.034g/ml. The density of water is 1g/ml. Milk can be filtered with a clean lintine cloth.

- b. Share: Mr. Graham is asking for help. He thinks that a recent delivery of milk has been 'thinned' by the farmer by adding water to it. In pairs, think of how Mr. Graham could find out if his suspicions are true. *(Answer: He could test the density of the milk; if it is close to 1g/ml, his suspicions may be true. He could also look at the appearance of the milk; if it looks thin and watery, he is probably correct)*
 - c. Share: Mr. Graham has another inventory of milk from a different farmer. This milk looks like it has some unwanted material in it. How could the unwanted material be removed, and what procedures should be followed? *(Answer: The milk could be filtered using a lintine cloth, this will remove any unwanted material. The worker should make sure that the cloth is clean and that all conditions are clean to prevent unwanted contamination).*
 - d. Share: Mr. Graham has asked for our support. He wants us to explain to his new employees what records to keep about the milk. In groups of 4, record all the different things about milk that should be recorded. *(Answer: Time and date the milk was delivered, identification of the milk with number, name of the person responsible for the record, name of person doing the testing, what the milk looks like, the taste and flavour, the density of the milk).*
2. After all groups have presented, refer participants to **1.2 Key Facts** and read through them together. Answer any questions trainees may have regarding the milk sampling process, testing, how to measure milk density, and record keeping.



Guided Practice Activity

Topic 1.2 Task 6:

1. Read the following:

The president of Terimbere Milk Collection Centre has received a notice from the head of Rwanda Energy Group informing him of the likelihood of power disturbances on Saturday. The collection centre has 5000 litres of raw milk in the cooling tank. He asked

the Impact Dairies Ltd. production manager to help him and receive this quantity of milk to prevent spoilage.

2. Ask trainees in groups of 4 to:
 - a. Think of the impact of power disturbances if the milk is not moved.
 - b. Develop a plan for receiving the milk, after identifying clear roles and responsibilities for each group member.
 - c. Determine what tests should be done on the milk.
 - d. Conduct the different tests on the sample of milk provided, ensuring that the plan is followed.
 - e. Record results
3. Support trainees as necessary; trainees should follow the procedures as outlined below:
 - He/she has first to Wash hands with a soap, dry them and keep them clean during sampling operation.
 - Mix milk at least 5 minutes using a stainless-steel stirrer.
 - Take 500ml of a representative sample after mixing
 - Cover the sample container with an Aluminum paper immediately after sampling.
 - Label the sample with the necessary information
 - Rinse the sampling equipment with water, soap and brush.
 - Judge the color, smell, and taste of milk sample (Good milk is yellowish in color, no off odors and tastes sweet and clear).
 - Dip the lactometer to check the density of milk (Normal milk density ranges from 1.028 to 1.034 g/ml)
 - Filtrate milk using the filter cloth
 - Weigh milk on the electronic/digital balance
 - Keep records of the Quantities, organoleptic parameters, and density in the record book.
4. Ask different groups to present their results.
5. Ask groups:
 - a. What did they find easy with the different procedures?
 - b. What did they find difficult with the different procedures?
 - c. What if anything and why would they change their plan?



Application Activity

Topic 1.2 Task 7:

1. Each group of 4 will be given 3-4 milk samples. Determine which sample is “good” milk and could be consumed.
2. Each trainee should craft a report, including recommendations on what milk is suitable for consumption. The following table can be used within the report if helpful.

Record sheet for sample milk testing

Sample No	smell	sight	alcohol	Lactometer
1				
2				
3				



Points to Remember

- Milk that already has many bacteria will not keep as long even once cooled.
- Proper hygiene practice in milk production and handling is key to a longer shelf life for milk.
- Cooling of milk will slow down the multiplication of bacteria and prolong shelf life.



Formative Assessment

Ask trainees to choose the correct answer.

1. How can the quality of milk be assessed?

- a. Taste of the milk
- b. Taste, density and smell of the milk
- c. Taste and odour of the milk
- d. Taste, smell, colour and density

Answer: d (taste, smell, colour and density)

2. What does the word density mean?

- a. The weight of a substance in a given volume
- b. The weight of a substance
- c. The mass of a substance in a given volume
- d. The mass of a substance

Answer: c (the mass of a substance in a given volume)

3. The density of milk can be measured by:

- a. A Lactometer
- b. Weighing scales
- c. A butyrometer
- d. A pipette

Answer: a (A lactometer)

4. A red or pinkish tinge to the milk may indicate:

- a. Red clay in the milk
- b. Blood in the milk
- c. Carrot or beet in the milk
- d. Water in the milk

Answer: b (Blood in the milk)

Learning Outcome 1.3: Grade and cool raw milk

	Objectives: By the end of the learning outcome, trainees will be able to: - Describe milk grading techniques - Explain optimal milk cooling temperature range. - Grade milk - Cool milk
	Time Required: 10 hours
	Learning Methodology: Practical exercises, experimentation, industrial visits.
	Materials needed • Measurement and Cleaning Materials: thermometer, butyrometer, lactometer, balances, antibiotic kit, burette, pipette, beakers, test tubes, funnels, reagent bottles, soxhlet apparatus, kjeldhal flask, 75% ethanol, PPE, water, stainless stirrer, Lovibond comparator • Visual Materials: dairy manuals, video cameras • Sample Milk Products: milk samples (Grade A & B), milk cooler • Additives: sulphuric acid, amyl alcohol, saturated aqueous potassium oxalate, phenolphthalein solution, N/9 NaOH, 40% neutral formalin, Resazurin
	Preparation: ☐ Contact the milk processing plant nearby to request for a field visit for the trainees.
	Cross Cutting Issues: ✓ Gender and inclusivity: Consider gender balance and inclusion of people with disabilities while forming groups and allocating roles. ✓ Financial education: Consider cost, availability, and durability while identifying consumables such as PPE, cleaning materials, tools, and equipment. ✓ Environment and sustainability: Emphasize the need to protect the environment through proper disposal of waste materials as some of the used materials and equipment are pollutants and represent hazards for employees and the environment.



Prerequisites:

- ▶ Basic milk science (milk properties)
- ▶ Milk testing equipment and methods
- ▶ Laboratory safety rules and regulations
- ▶ Food- safety and hazards (Biological, chemical and physical)
- ▶ Equipment handling and safety precautions
- ▶ First aid principles
- ▶ Use of PPE

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe milk grading techniques.	1. Grade milk.	1. Thorough
2. Explain optimal milk cooling temperature range.	2. Cool milk.	2. Attention to detail



Steps:



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



Topic 1.3 Task 1:

1. Brainstorm with trainees:
 - a. Describe what you see in the picture.
 - b. What do you think the words 'grading milk' mean and why do you think this is important? *(Answer: grading of milk is when a grade (A or B) is assigned to milk. The grade is determined by testing the fat and protein content, measuring the density of the milk, and testing for the amount of bacteria present in the milk. Grade A milk is used for fluid consumption e.g. drinking of milk; Grade B milk is used to make butter, cheese, ice cream etc; Grade C milk is not suitable for human consumption).*
 - c. Do you know what tests can be done to measure fat and protein content, density of milk, and the amount of bacteria in the milk? *(Explain that this will be looked at in detail during the module).*
 - d. Does anyone know the process for cooling milk? *(Explain this will be looked at in detail during this module).*
2. Explain that this topic will teach trainees about how to grade milk and the best way to cool milk.



Problem Solving Activity

1. Show trainees the different equipment used for grading and cooling milk. Ask if they have any questions.
2. Explain health and safety procedures while using the different chemicals.
3. Explain that you will now show them the different ways to grade milk and that they will also try this out afterwards. Model procedures for trainees.
4. Ask trainees to read **(Topic 1.3 Task 2):**

One day, Jean de Dieu, an employee of Impact Dairies arrived to work late. He knew that there were deliveries of milk that needed to be completed immediately as customers were waiting. Jean de Dieu decided the best way to keep his customers happy was not to grade the milk as it was all fresh in and looked and smelt fine.

- a. What are the risks in this approach? *(Answer: Grade A milk is the only milk that should be consumed in liquid form. Since the employee had not graded the milk, he may have given Grade B milk (with a higher bacteria content) to customers who could drink it and become sick).*
 - b. Do you think the employee made the right decision to get the deliveries out so that customers did not have to wait for their milk? *(Answer: No, as the result may be that if Grade B was given to customers, they could become sick and then the company's reputation could be lost).*
 - c. What advice would you give the employee for the future? *(Answer: To come to work on time. The employee should let his boss know if he is going to be late ahead of time. The employee should always follow the correct procedures).*
5. Divide trainees into 4 groups (each group should have 4-5 people). Explain that each group is going to become an “expert” in grading one area of milk – measuring **fat content**, measuring **protein content**, checking the **bacteria count**, and measuring the **density**.
 6. Give each group one task out of the tasks listed above. Explain they will have 10 minutes to do the following. They should refer to **1.3 Key Facts** whilst preparing, but during the presentation should use their own words in explaining.
 - a. Prepare a short presentation to tell the other groups how to do the task
 - b. Show the actual equipment/materials needed to carry out the task (you should make these equipment/materials available to them).
 - c. After a group presents their task, do an actual demonstration of the test for the trainees. Be sure to wear PPE and explain the importance of it when handling chemicals.
 7. After you demonstrate one of the tasks, refer trainees to the appropriate section in **1.3 Key Facts** and read through it together. Answer any questions trainees have regarding conducting the various tests for grading milk.



Guided Practice Activity

Prepare the necessary equipment, tools, and samples of milk to be tested by trainees in small groups.

Topic 1.3 Task 3:

1. Present the scenario and questions to the trainees:

Impact Dairies Ltd. needs to provide various milk grades to exhibit at the East African dairy quality exhibition that is supposed to take place in two days at KCC in Kenya. The production manager has informed the dairy technician to receive milk and grade it in accordance with protein, fat content, total bacteria count, and density. This milk needs to be preserved to ensure a shelf life of 4 days of exhibition.

While you are still in your respective groups, perform the following tasks based on what you observed in the previous activity and read in **1.3 Key Facts**:

- a. Cool milk (describe the process)
 - b. Grade milk (perform the various tests on the sample given to you)
2. Assist groups as they perform the various tests. Make sure they are wearing the proper PPE and adhering to safety procedures.
 3. Ask each group to share their results and discuss any questions trainees may have regarding the tests.



Application Activity

Prepare 3 samples of milk to be tested by small groups (you want at least one sample to be Grade A and another to be Grade B).

1. Form 3 main groups of trainees and give them each a sample of milk. They can be further divided into sub-groups to test the sample given to each main group. Read the following to trainees:

Mr. Graham hired a new employee to watch and help Cesar while he graded the milk for an exhibition that he was attending in Kenya. Cesar asked the new employee to put

labels on the milk to show the different grades. Unfortunately, the new employee got confused and couldn't remember which label should go on which milk. Cesar asks for your help to test the milk again so that grades can be correctly assigned. He gives each group one sample to test.

- a. Let groups of trainees grade their assigned milk (labelled red, green, and blue) using the various tests. They should write their results in a table like the one below and identify whether their sample is Grade A or Grade B.
- b. Ask trainees to present their results and explain how they determined whether the sample was Grade A or B.
- c. Review with trainees the different uses for Grade A and Grade B milk. (*Answer: Grade A milk is used for drinking (fluid milk) and Grade B milk is used for making butter, yoghurt, cheese and other milk products.*)

2. Answer any questions trainees have regarding grading milk.

Table: Record sheet for sample milk testing

Label Colour	Density	Protein content	Fat content (%)	Total Bacterial Count (TBC)	Temperature	Grade
Red						
Blue						
Green						



Points to Remember

- Cooling the milk will slow down the growth of spoilage bacteria and prolong the milk's shelf life.
- Testing milk shows what grade it is and what the milk can be used for.
- Grade A milk is used as fluid milk; Grade B milk is used for making butter, yoghurt, cheese, and other milk products.



Formative Assessment

1. What is the recommended temperature for the storage of milk?

- a. 8°C
- b. 9°C
- c. 4°C
- d. 5°C

Answer: c - 4°C

2. Which of the following equipment is used for chilling milk at a dairy?

- a. Refrigerator
- b. Freezer
- c. Dry Ice
- d. Plate heat exchanger

Answer: a - refrigerator

3. What is the reason for the presence of an agitator in a milk silo?

- a. To prevent cream separation by gravity
- b. To prevent spoilage
- c. To prevent leakage
- d. To prevent off taste

Answer: a - to prevent cream separation by gravity

4. When milk is graded, the following is checked:

- a. Water, protein, and density
- b. Water, fat, and protein
- c. Protein and fat
- d. Protein, fat, and density

Answer: d- protein, fat and density



Self-Reflection

1. Ask the trainees to re-take the self-assessment from the beginning of Unit 1. They should then fill in the table in the Trainee's Manual to identify their areas of strength, areas for improvement, and actions needed to improve.
2. Discuss the trainees' results with them. Identify any areas that are giving many trainees difficulty and plan to give additional support as needed (ex. Before you begin the next learning outcome, use class time to go through commonly identified difficult concepts).

Further Information for the Trainer

1. Milk reception operations must be strictly performed in accordance with standard procedures and specifications to ensure good quality milk is received.
2. www.yourarticlelibrary.com/dairy-farm-management/storage-of-milk-importance-and-methods-of-cooling/35807

Learning Unit 2: Assist in milk processing



Learning Outcomes

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

- 2.1** Organize and prepare the work area
- 2.2** Create dairy products
- 2.3** Pack and store processed dairy products
- 2.4** Keep dairy product records

Learning Unit 2 Self-Assessment

- 1.** Ask trainees to look at the illustrations above (in their Trainee Manuals) and discuss what they see. Ask what topics they think this unit will include based on the illustrations? After some brainstorming, share the main topics.
- 2.** Explain that this learning unit is going to focus on milk processing, including cleanliness of the work area, producing milk products, packing and storing products, and keeping dairy product records.
- 3.** 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. Organize and prepare work area

	Objectives: By the end of the learning outcome, trainees will be able to: - Identify cleaning products effective for milk work area - Describe the different cleaning methods and techniques used in the milk area - Apply appropriate cleaning methods and techniques
	Time Required: 10 hours
	Learning Methodology: Practical exercises, experimentation, industrial visits
	Materials Needed Standard training materials – flip chart, markers, tape, A4 paper Visual material (optional) of cleaning tools and products – laptop, projector, internet Sample materials/tools – Reagent bottles, 75% ethanol, cleaning cloths, stainless steel tanks, buckets, sprayers, PPE, cleaning manuals, mops, brooms, brushes, basins, milk cooler, packaging materials, milk samples Sample cleaning products – detergents, disinfectants, sanitizer, water, hand soap
	Preparation: ☐ Contact the milk processing plant nearby to request for a field visit for the trainees.
	Cross Cutting Issues: ✓ Gender and inclusivity: Consider gender balance and inclusion of people with disabilities while forming groups and allocating roles. ✓ Financial education: Consider cost, availability, and durability while identifying consumables such as PPE, cleaning materials, tools, and equipment. ✓ Environment and sustainability: Emphasize the need to protect the environment through proper disposal of waste materials as some of the used materials and equipment are pollutants and represent hazards for employees and the environment.
	Prerequisites: ▶ Food- safety and hazards (Biological, chemical, and physical) ▶ Equipment handling and safety precautions ▶ First aid principles ▶ Use of Personal Protective Equipment (PPE)

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify cleaning products for the milk work area.	1. Select cleaning products for the milk work area.	1. Analytical
2. Describe the cleaning methods and techniques.	2. Apply cleaning methods and techniques.	2. Attention to detail
3. Identify precautions to take while cleaning.	3. Take proper precautions when cleaning.	3. Respectful of safety precautions



Steps:



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



Topic 2.1 Task 1:

1. Recap with trainees: What is the necessary equipment needed to keep the milk processing area clean (**from Learning Unit 1 Topic 1.1**)?

Group of tools, utensils, and materials	Specific examples
Tools and utensils	Brushes, mops, torchons, basins, buckets
Disinfectants	Caustic soda, Nitric Acid
Detergents	Powder detergent, Liquid soap
Sanitizers	Air driers, chlorine
PPE	Gloves, boots

2. In groups of 4-5, ask trainees to turn to **Topic 2.1 Task 1** and discuss the following. Ask each group to provide an answer to ONE of the questions:
 - a. We can use 2 disinfectants to help clean the milk processing area. These are Caustic soda and Nitric Acid. What precautions, if any, does a worker need to take when using these? (**Answer:** *Use protective clothing including goggles, gloves, long sleeves, trousers, boots, and gloves. Always store the disinfectants in their original bottles with labels, store in locked cupboards, and store no higher than waist height. The area should be adequately ventilated. Always pour the caustic soda into the water, not the other way around.*)
 - b. What should be done if someone is splashed with nitric acid or caustic soda? (**Answer:** *Go to a well-ventilated area. If in eyes or on skin, flush with water for 15 minutes. If on skin wash with soap after flushing with water. Seek IMMEDIATE medical attention. If ingested (goes into mouth), do NOT make the person vomit; instead, give a glass of water or milk, and seek IMMEDIATE medical attention.*)
 - c. Look at the picture in **Topic 2.1. Task 1**; what advice would you give the workers about health and safety if their job was to clean and prepare the milk processing area? (**Answer:** *Ensure their arms are covered, use goggles if necessary, do not have someone carry a tray while the other person is pouring milk.*)
3. Ask other groups to add any missed information. Explain to groups that you will now look in detail at what equipment is used and how to correctly clean the milk processing area.
4. Ask trainees to look at the table of knowledge, attitudes, and skills in the manuals to see what they will learn in this topic.



Problem Solving Activity

Topic 2.1 Task 2:

1. Explain to trainees that the following are the 3 different activities related to cleaning:
 - a. Identify and select cleaning products for the milk work area.
 - b. Consider what cleaning methods and techniques are appropriate.
 - c. Apply cleaning methods and techniques.
2. Read the following to trainees (**Topic 2.1 Task 2**); let trainees know they can follow the text in their manuals:

Mr. Graham, the production manager of Impact Dairies Ltd., knows that keeping the milk processing area clean can be a challenge, especially when there are lots of deliveries in one day. He is worried that if the area is not kept clean, Impact may send contaminated or spoiled milk products to customers who will then complain and demand their money back. Thus, he decides to organize a quiz for groups of employees to review effective cleaning techniques.

3. Put trainees into groups of 3-4 and ask them to pretend to be Mr. Graham's employees who are taking part in the quiz. Tell groups that you will read a question aloud, and they must write down answers to the questions. At the end, the group with the highest number of correct answers will win.

Read the following questions and instructions aloud:

- a. Write down all the cleaning utensils and materials that are needed to keep the milk area clean.

Answer:

Group of tools, utensils and materials	Specific examples
Tools and utensils	Brushes, mops, torchons, basins, buckets
Disinfectants	Caustic soda, Nitric Acid
Detergents	Powder detergent, Liquid soap
Sanitizers	Air driers, chlorine
PPE	Gloves, boots

- b. Write down a use for 3 of the utensils and materials that you have identified.
(**Answer:** Answers may vary; accept any accurate answer).
- c. What special clothing should someone wear when cleaning the area? (**Answer:** rubber gloves, rubber wellies, hair net, overalls or other uniform to over ordinary clothes).

- d. What should be done if someone comes into the milk processing area who is not wearing the correct clothing? (**Answer:** *He/she should be sent away and told to change into the appropriate clothing*).
 - e. There are 4 steps to cleaning milk—these are: preparation, cleaning, sanitizing and air drying—what could happen if only 3 steps are followed? (**Answer:** *The area/equipment may not be properly cleaned which can result in the milk becoming contaminated and needing to be thrown away*).
 - f. What should be done if a sick employee comes to work? (**Answer:** *The employee should either be assigned a task where he/she does not come into direct contact with the milk processing area or be sent home until he/she is well*).
 - g. What could happen if the 4 steps are followed in the wrong order? (**Answer:** *The area/equipment may not be properly cleaned which can result in the milk becoming contaminated and needing to be thrown away*).
 - h. Why is it important to use the correct tools, utensils, and materials for cleaning the milk processing area? (**Answer:** *The area may not be properly cleaned which can result in the milk becoming contaminated and needing to be thrown away*).
 - i. When should cleaning of the area/equipment occur? (**Answer:** *Ideally, immediately before any milk arrives*).
 - j. How often should employees clean the area? (**Answer:** *If one delivery of milk has been processed and moved, the area needs to be cleaned again in preparation for the next delivery of milk*).
 - k. What should be done if there is a large spillage of milk over the floor? (**Answer:** *The area needs to be thoroughly cleaned, even if it was cleaned right before the spill*).
4. Refer trainees back to **1.1 Key Facts** in **Topic 1.1** in the Trainee’s Manual for information on preparation of the workplace and equipment for milk processing.



Guided Practice Activity

1. Put trainees in groups of 4-5 people. Explain to trainees, that they will now look at the equipment and cleaning products in the school milk workshop area (if nothing is available at school, visit a nearby dairy). Look back at **1.1 Key Facts** in **Topic 1.1** on the 4-stage process in cleaning the milk processing area.
2. Ask groups to (**Topic 2.1 Task 3**):
 - a. Review the different milk processing equipment (e.g. milk cans, milk cooler).
 - b. Practice cleaning the different equipment.

- c. Clean the equipment/tools/protective clothing necessary to clean the milk processing area.
3. Ask groups to answer the following:
 - a. Why is it important to keep tools and materials used for cleaning the milk processing area clean? (**Answer:** *If protective clothing, buckets etc. are not kept clean, the milk could become contaminated through contact*).
4. Give each group enough time to complete the task; guide and support groups on any areas they find challenging to implement.
5. After groups have completed the task, ask groups to report back on what they found easy and/or difficult about the task.



Application Activity

1. Read the following to trainees and encourage them to follow along in their manuals

Topic 2.1 Task 4:

Mr. Graham, the production manager of Impact Dairies Ltd. has just received a big order from IKAMBA Hotel for 150kg of cheddar cheese, 200 cups of strawberry yoghurt, and 50L of fermented milk. He knows that an order of this size can overextend the employees which may lead to mistakes. In preparation, he decides to call a meeting to talk to all the production staff about their roles and responsibilities. Mr. Graham realizes at the meeting that there is only one senior member of staff available to help clean the milk processing area and that all other employees are interns who only started a week ago. He decides to ask the senior employee to help him clearly demonstrate the different steps for cleaning the area.

2. In groups of 3-4 people, tell trainees they have 45 minutes to read **1.1 Key Facts** from **Topic 1.1** and develop posters or a song/poem or any other fun text that will help the interns remember the different stages for cleaning the milk processing area. Remind trainees that they need to include the following:
 - a. Identify the cleaning products needed for the milk work area including uses for each one.
 - b. Correctly apply cleaning methods and techniques.

3. Ask each group to present their posters/songs/poems on how to clean the milk work area.
4. Ask groups to critically evaluate other groups by:
 - a. Highlighting at least two successes.
 - b. Highlighting one area for improvement.
5. Trainees should then vote for the best group. Possible ways to vote include: putting their hands up for the best group, writing the name of their favourite group on paper, etc. Determine which group is the winner based on the classroom votes. Consider providing small prizes to encourage active participation in future modules.



Points to Remember

- Maintain high standards of cleanliness and sanitation in the work area and with all processing equipment.
- Schedule regular maintenance activities to avoid breakdowns.
- Keep work areas tidy and uncluttered to avoid accidents.



Formative Assessment

Ask the trainees to choose a correct answer.

1. In the correct order, the key steps involved in the milk equipment cleaning process are:
 - a. pre-rinse, acid-rinse, hot wash, sanitize
 - b. pre-rinse, hot wash, air-drying, sanitize
 - c. hotwash, pre-rinse, acid-rinse, sanitize
 - d. pre-rinse, hot wash, sanitize, air-drying

Answer: d

2. In the pre-rinse cycle, the water temperature should be maintained at:
 - a. 45°C
 - b. 55°C
 - c. 60 °C
 - d. 70°C

Answer: c

3. True or False: The purpose of the sanitizing cycle, prior to the next milking, is to kill any bacteria.

Answer: True

4. True or False: The sanitizing cycle should be run for 2 minutes prior to cleaning.

Answer: False -- sanitizing occurs after cleaning, NOT before.

Further Information for the Trainer

1. https://dairy-cattle.extension.org/cleaning-and-sanitizing-milking-equipment/#Sanitizing_Milking_Equipment

Learning Outcome 2.2: Make dairy products

	Objectives: By the end of the learning outcome, trainees will be able to: - Identify product ingredients - Describe products production techniques - Select ingredients - Use the right production techniques
	Time Required: 20 hours
	Learning Methodology: Group work, discussion
	Materials Needed: Standard training materials – flip chart, markers, tape, A4 paper Visual material (optional) of production tools and products – laptop, projector, internet Measurement and Storage Materials: thermometer, butyrometer, lactometer, balances, Reagent bottles, pH meter, 75% ethanol, water, milk cooler, aluminium paper, hand soap Additives: cultures, rennet, calcium chloride, salt, non-starter adjunct bacteria, sodium or potassium nitrate, milk solids- non-fat, stabilizers (plant, gum), sugar, milk fat, sweeteners, ice
	Preparation: ☐ Contact the milk processing plant nearby to request a field visit for the trainees.
	Cross Cutting Issues: ✓ Gender and inclusivity: Consider gender balance and inclusion of people with disabilities while forming groups and allocating roles. ✓ Financial education: Consider cost, availability, and durability while identifying consumables such as PPE, cleaning materials, tools, and equipment. ✓ Environment and sustainability: Emphasize the need to protect the environment through proper disposal of waste materials as some of the used materials and equipment are pollutants and represent hazards for employees and the environment.
	Prerequisites: ▶ Food- safety and hazards (Biological, chemical and physical) ▶ Equipment handling and safety precautions ▶ First aid principles ▶ Use of PPE

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify product ingredients.	1. Select ingredients.	1. Attentive to workplace requirements
2. Describe product production techniques.	2. Follow correct production techniques.	2. Respect the protocol



Steps:



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



1. Ask trainees to turn to **Topic 2.2 Task 1**, and in groups of 4-5, discuss the following:
 - a. List the ingredients needed to make:
 - i. Cheese
 - ii. Yoghurt
 - iii. Fermented milk
 - b. List the different production techniques needed to make:
 - i. Cheese
 - ii. Yoghurt
 - iii. Fermented milk

2. After 40 minutes, call on different groups to respond to different questions about products (e.g. ask group 1 about the ingredients and process to making cheese).
3. Explain to trainees that in this module they will learn and practice in detail the ingredients and processes that are required to make cheese, yoghurt, and fermented milk.
4. Refer trainees to the Key Competencies table which includes the knowledge, skills, and attitudes for this topic.



Problem Solving Activity

1. Refer trainees to **Key Facts 2.1**. Explain that the Key Facts clearly show how to produce different products from milk.
2. Refer trainees to the manual **Topic 2.2 Task 2** and read the following:

Impact Dairies Ltd. has received an order for 1000l of fermented milk, 300 bottles of yoghurt, 10kgs of Cheddar cheese and 25l of cream for the Radisson Blue Hotel who requires this new order for an international conference that will start in 2 days. The production manager finds the work area clean and organized. The production manager instructs the technical team to produce the products in 2 days.

3. In the same groups of 4-5 people, ask the trainees to develop a plan of action for production of 1,000l of fermented milk, 300 bottles of yoghurt, 10kgs of Cheddar cheese and 25l of ice cream. Explain that the plan should answer the following questions:
 - a. Who is the team leader and what is her/his role and responsibility?
 - b. What are the roles and responsibilities of the remaining team members?
 - c. Identify the ingredients necessary to make the different products.
 - d. What is the production process for the different products e.g. yoghurt, fermented milk, cheese, and ice cream?
4. Ask different groups to respond to different questions. For question (d), four groups can provide an answer for each of the different products.

5. After the presentations, ask trainees to refer to **2.1 Key Facts** and review them together. Answer any questions trainees may have.



Guided Practice Activity

Before class, gather the tools and materials necessary to create the dairy products found in **2.1 Key Facts**. If the right equipment is not available, arrange for a visit to a place where they make dairy products.

1. Explain to trainees:
 - a. In small groups of 4-5, you will produce a sample of the product for the Radisson Blue Hotel so that they can try the product before scaling up production.
 - b. Groups should follow their action plans developed in the previous activity; each person should be involved in each of the different production techniques.
 - c. Remember to:
 - i. Select ingredients.
 - ii. Use the right production techniques, following the steps in **2.1 Key Facts**.
 - iii. Ask the trainer for assistance as needed.
2. After groups have completed the task, ask the groups to discuss the following (**Topic 2.2 Task 3**):
 - a. What was easy about the task?
 - b. What has been difficult or challenging about the task?
 - c. If you were to do this task again, what would you change about the way that you initially did this?



Application Activity

Organize a visit to a dairy product producing plant in the area where they make fermented milk, yoghurt, cheese, or ice cream. Ask if trainees can observe and assist in any processes.

1. Explain to trainees that they are going to visit a local dairy product plant. They will (**Topic 2.2 Task 4**):
 - a. Observe and assist in the processes of making fermented milk, yoghurt, cheese, or ice cream.

- b.** Take note of any observations about safety and sanitation procedures used in the workplace, equipment used, and processes undertaken.
- 2.** Following the visit, ask trainees to share their observations and experiences at the plant. Link what they say back to what they have learned throughout this learning outcome.



Points to Remember

- All personnel involved in production, handling, and distribution of milk and milk products should be medically examined by an authorized medical practitioner every six months.
- Do not use colostrum and mastitis milk for making yogurt.
- Handle milk and processing ingredients hygienically to avoid bacterial contamination.



Formative Assessment

In this section, please circle the correct answer and provide an explanation.

1. Butter milk is a fluid product resulting from the manufacture of:
 - a. Cheese
 - b. Yoghurt
 - c. Ice Cream
 - d. Butter

Answer: D - Butter
2. Yoghurt contains mixed lactic acid culture containing which of the following:
 - a. Lactobacillus bulgaricus and Streptococcus thermophilus
 - b. Lactobacillus bulgaricus and Propionibacterium
 - c. Lactobacillus bulgaricus and Leuconostoc
 - d. Leuconostoc and Propionibacterium

Answer: A - Lactobacillus bulgaricus and streptococcus thermophilus

3. Ice cream mix is homogenized to:
 - a. Make a smoother, creamier ice-cream
 - b. To make the fat globules in the mix larger
 - c. Make it safer to eat
 - d. To remove any bacteria from the mix
- Answer: A - Make a smoother, creamier ice-cream**

Learning Outcome 2.3: Pack and store processed products

	Objectives: By the end of the learning outcome, trainees will be able to: - Recognize different types of packaging materials and techniques used - Depict storing techniques - Select right packaging materials for product - Apply techniques to package and store the products
	Time Required: 10 hours
	Learning Methodology: Practical exercises, experimentation, industrial visits
	Materials Needed: Standard training materials – flip chart, markers, tape, A4 paper, PPE Sample packaging materials – packaging machine, Packaging materials, crates, Labels, paper, fibreboard, plastic, glass, sample products Sample Measurement materials – lactometer, Balances, 98% ethanol
	Preparation: ☐ Contact the milk processing plant nearby to request for a field visit for the trainees.
	Cross Cutting Issues: ✓ Gender and inclusivity: Consider gender balance and inclusion of people with disabilities while forming groups and allocating roles. ✓ Financial education: Consider cost, availability, and durability while identifying consumables such as PPE, cleaning materials, tools, and equipment. ✓ Environment and sustainability: Emphasize the need to protect the environment through proper disposal of waste materials as some of the used materials and equipment are pollutants and represent hazards for employees and the environment.
	Prerequisites: ▶ Personal hygiene and sanitation ▶ Food- safety and hazards (Biological, chemical and physical) ▶ Equipment handling and safety precautions ▶ First aid principles ▶ Use of PPE

Key Competencies:

Knowledge	Skills	Attitudes
1. Recognize different types of packaging materials.	1. Select correct packaging materials.	1. Use relevant standards and product specifications.
2. Describe packaging techniques.	2. Apply appropriate techniques for packaging the products.	2. Apply protocol.
3. Depict storing techniques.	3. Use appropriate techniques for storing products.	3. Respect the protocol.



Steps:



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



1. In groups of 4-5, ask trainees to discuss the following for approximately 20-30 minutes (**Topic 2.3 Task 1**):
 - a. List as many different packaging materials for milk products that you can think of.

- b. What are some of the different ways or techniques that can be used to pack milk products (yoghurt, fermented milk, cheese, ice cream) efficiently and effectively?
 - c. What are some of the different ways or techniques that can be used to store the milk products (e.g. fermented milk, cheese, yoghurt)?
- 2. Ask different groups to provide input on different questions. Other groups can contribute as needed.
- 3. Explain to trainees that we now need to look at how we package and store the milk products (e.g. yoghurt, cheese).
- 4. Ask trainees in groups to discuss the following:
 - a. Why is it important to use the correct packaging for the product?
 - b. Why is it necessary to correctly store the product?
- 5. After discussion, explain:
 - a. If we don't use the correct packaging, the product may become contaminated or not keep for as long as it should (e.g. If we kept yogurt in an open container, it would very quickly start to ferment and go bad).
 - b. The correct storage of the different milk products is very important as the quality of the product may be reduced if we don't store things correctly (e.g. Letting ice-cream melt and then freeze again usually results in ice crystals forming, making the ice-cream less enjoyable to eat. Storing the product incorrectly can also result in more rapid spoiling (for example, if cheese is not kept in the fridge, it will quickly start to go bad).
- 6. Refer trainees to the Key Competencies table which includes the knowledge, skills, and attitudes for **Topic 2.3**.



Problem Solving Activity

Topic 2.3 Task 2:

1. In the same groups of 4-5, have trainees read the following (**Topic 2.3 Task 2**):

Mr. Ngabo, a production manager at Impact Dairies Ltd. decides that the new technicians who have just completed the milk processing course should have a refresher

course on packaging materials. However, he knows that lectures are not very effective for technicians, so he decides to set a task where they need to work in pairs.

2. The first task allows them to collaborate on the different packaging materials. Tell the trainees to review the list of packaging materials and identify what materials are suitable for which milk product:
 - a. Paper
 - b. Fibreboard
 - c. Plastic
 - d. Glass
 - e. Steel
 - f. Aluminium
3. Ask different pairs to share their answers (**Answer:** *Cheese can be wrapped in paper, yoghurt or fermented milk may be stored in plastic or glass containers, ice-cream can be packaged in steel or aluminium containers*).

Topic 2.3 Task 3:

1. Explain that Mr. Ngabo still has a task for you. Read the following **Topic 2.3 Task 3** together:

Mr. Ngabo knows that labelling the product is an important and essential job. He realizes that the dairy has not changed its labelling process for many years. He wants you to design new labels for fermented milk, yoghurt, cheese, or ice-cream.

2. In your pairs, choose one product to design a label for and:
 - a. Consider what information is required on the label (See **2.3 Key Facts** in the Trainee Manual BUT be sure to include: name of food, list of ingredients, net content and drained weight, name and address of producer and distributor, country of origin, LOT identifier, date marker, and storage instructions).
 - b. Design the label (Trainer: Encourage creativity and critical thinking).
3. Ask the different pairs to display their labels according to the product groups (e.g. all the labels for cheese should be placed together). Ask all trainees to review ALL labels and choose their favourite label for each product and then an overall winner. Trainees can mark their favourite label with a small dot or sticky note. Remind trainees that the best label may not always be the one with the best picture, etc. It must also contain all the necessary information.

- Count the votes for each label and congratulate the winning pair for each product and the overall winners. Consider giving out small prizes as an incentive.

Topic 2.3 Task 4:

- Tell trainees that Mr. Ngabo has two more tasks to be completed. Read the following **(Topic 2.3 Task 4)**:

Mr. Ngabo tells you that the packaging is an extremely important part of the product, not only to keep it safe to consume, BUT for 3 other reasons as well. These are convenience, promotion of the product, and clear identification of the product. Mr. Ngabo wants trainees, in pairs, to explain to a group of school children visiting the dairy why convenience, promotion, and identification of the product are so important in packaging.

- Ask different pairs to provide answers for the different reasons as to why packaging is so important. Let other pairs add information as necessary.

Answers:

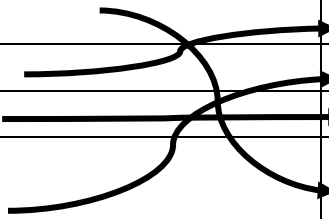
- Convenience** – easy to move from one place to another, can be easily stored and is easily consumed (e.g. packaging is easy to open)
- Promotion of the product** – type of packaging can be useful in encouraging more consumers to buy the product
- Product identification** – making the product packaging look different from competitors will help to promote the product and make the product easily identifiable.

Topic 2.3 Task 5:

- Explain that this is the final task **(Topic 2.3 Task 5)**.

Mr. Ngabo has the storage instructions for different products confused. Help him out by matching up the correct storage technique with the product.

Product	Storage instructions
Ice-cream	Store at 4-7°Celsius
Fermented milk	Store at 12°Celsius
Yoghurt	Store at 4-7°Celsius
Cheese	Store at 0 to -5°Celsius and not with smelly products e.g. fish



- Refer trainees to **2.2 Key Facts** on packaging and storing techniques of milk processed products and review them together. Answer any questions trainees may have.



Guided Practice Activity

1. Explain to trainees that in groups of 3-4, they will now package some of the products that have previously been created. They may use their labels that were developed in the previous activity. Each group will (**Topic 2.3 Task 6**):
 - a. Select the correct packaging materials for at least 2 out of 4 products (trainees may choose for themselves).
 - b. Apply techniques to correctly package the products.
 - c. Consider how their products should be stored after packaging.
2. Give each group enough time to complete the task. As groups are working, guide them where they find something challenging.
3. After trainees have completed the task, ask the following:
 - a. What was easy about this task?
 - b. What was challenging?
 - c. How can the challenges be overcome?



Application Activity

1. Explain to trainees (**Topic 2.3 Task 7**) that each group will be given 2 samples of the same product, but the packaging will be different.
 - a. Examine the packaging and consider which packaging you prefer and why.
Consider:
 - Labelling
 - Type of packaging
 - What the packaging is trying to do for the consumer.
 - If it responds to the promotional aspects required.
 - If it is easy to identify the product.
 - If the packaging provides the consumer with the convenience needed.
 - b. Explain to trainees that they must develop a short 2-minute presentation about their sample packaging, clearly showing which packaging they prefer and why.
2. Support trainees as needed.

3. Ask different groups to present.
4. Ask other groups if they have any additional input or questions.
5. Summarise main points from **2.2 Key Facts** and **Points to Remember**.



Points to Remember

- Package finished products in sanitized packaging material to prevent contamination.
- Store products in accordance with the recommended conditions (e.g. chilled or frozen).
- Packaging should avoid recontamination and exposure to light and environmental contaminants.



Formative Assessment

1. What is the recommended temperature for the storage of fermented milk?
 - a. 0-4°C
 - b. 4-7°C
 - c. 0-8°C
 - d. 7-9°C

Answer : B - 4-7 °C

2. Which of the following equipment is used for chilling milk in dairy products?
 - a. Refrigerator
 - b. Cool box
 - c. Dry Ice
 - d. Plate heat exchanger

Answer: A - Refrigerator

3. Name 3 reasons why packaging is important.

Possible Answers: To keep products fresh; convenience; promotion of the product; product identification.

Learning Outcome 2.4: Keep dairy product records

	Objectives: By the end of the learning outcome, trainees will be able to: - Identify appropriate records for dairy products - Explain record techniques for dairy products - Use appropriate record design of dairy products - Take various records of dairy products
	Time Required: 10 hours
	Learning Methodology: Practical exercises, experimentation, industrial visits
	Materials Needed: Standard training materials – flip chart, markers, tape, A4 paper, Pens, Books Visual materials – computers, projector, internet
	Preparation: ☐ Prepare the office and equip it with record books and computers.
	Cross Cutting Issues: ✓ Gender and inclusivity: Consider gender balance and inclusion of people with disabilities while forming groups and allocating roles. ✓ Financial education: Consider cost, availability, and durability while identifying consumables such as PPE, cleaning materials, tools, and equipment. ✓ Standardisation culture: While keeping dairy records, consider the proper protocol.
	Prerequisites: ▶ Managerial skills ▶ Bookkeeping ▶ Record keeping ▶ Computer skills

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify appropriate record design of dairy products.	1. Use appropriate record design for dairy products.	1. Respect the requirements.
2. Explain record techniques for dairy products.	2. Take various records of dairy products.	2. Attention to detail in following the protocol.



Steps:



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



1. In groups of 2-3, ask trainees to discuss the following (**Topic 2.4 Task 1**):
 - a. What are some of the records that should be kept in the dairy when processing different milk products?

- b. What types of items should be recorded?
 - c. List the different reasons for keeping records.
2. After 20-30 minutes, invite different groups to share results from their discussions. Each group should only answer 1 question, and no group should repeat what the previous group has shared.
 3. Explain that keeping accurate and up to date records is very important. It provides a chain of evidence to help show where anything may have gone wrong in the process of producing a product. Records should be maintained and kept by all employees as relevant.
 4. Refer trainees to the Key Competencies table in their manuals for information on what knowledge, skills, and attitudes they will acquire throughout this learning outcome.



Problem Solving Activity

1. Read the following to trainees (**Topic 2.4 Task 2**):
Mr. Mutunzi, a dairy technician at Impact Dairy Ltd., had the responsibility of keeping accurate records of all processes for the day. Unfortunately, after 1 hour, he had to return home as his wife was sick. The dairy found no one to replace Mr. Mutunzi for 45 minutes, meaning that no records were maintained for that time. Mr. Sam, his replacement, quickly realized that without records for these 45 minutes, the client may refuse the product. Instead of stopping the production, Mr. Sam decided to fill in the records as if there had been no 45-minute gap.
2. Ask trainees in groups of 3-4 to consider the following:
 - a. Do you think what Mr. Sam has done is correct or incorrect? Explain.
 - b. What would your suggestion be for Mr. Sam?
3. Ask different groups for their responses.
4. Read to trainees:

Mr. Ngabo explained to the dairy technicians that they would be moving from paper-based records to using computers for records. The dairy technicians were initially excited about this as they felt it would be less work for them. Mr. Ngabo wanted all the technicians to think about the benefits and challenges of using computers for record

keeping. He tells the technicians to work in pairs and to write down as many benefits and challenges they can think of for using computers. He says that the winning pair will win the employee of the month award.

5. Tell the trainees to pretend that they are dairy technicians; using the table below, write down as many benefits and challenges that you can think of to use computers for record keeping.

Advantages/benefits to using computers for record keeping	Disadvantages/challenges to using computers for record keeping
Records are permanent	Users need to be computer literate
Records are easily accessible	Records could be deleted by mistake
Records cannot be as easily destroyed/ruined	Recorders may make digital mistakes
Takes less time to input information	Need constant electricity supply
Computer programme should easily identify errors	Computers need to be kept virus free
Computer programme does not allow technicians to miss a step in the recording process	Employees may use computers for other uses and not stay on task

6. Ask trainee pairs to each read aloud one benefit and one disadvantage. Other groups should mark of their papers to identify if they listed the same benefits and/or disadvantages. Repeat until there are no more benefits or disadvantages to add.
7. Ask trainees to count the number of benefits or disadvantages. Congratulate the winning pair. Consider awarding a small prize to the winning pair.



Guided Practice Activity

1. Explain to trainees that different dairies have different structures for their forms, but that they should all include key information. Read the following (**Topic 2.4 Task 3**):

Mr. Ngabo knew that the previous dairy that he had worked in had different forms to what was used in Impact Dairies. He also knew that the forms being used by Impact Dairies were from almost 20 years ago and production techniques had changed. So, the forms may not be as relevant or useful as they initially were.

2. Tell trainees in pairs to review the 2 different forms and do the following:
 - a. Write down the positive points about the forms.

Possible Answer: The positive points include: each form is short and easy to follow, clearly laid out, shows all the basic information, and the person responsible. Daisy Dairies includes information on the different steps in the process. The Impact Dairy form has a space for further comments. Welcome additional points.

- b. Write down the points that you do not like about the forms

Possible Answer: The IMPACT DAIRIES form is so short that it overlooks important information about the actual process that occurs; there is also no information about ingredients that are added. Although the Daisy Dairy form shows the different steps in the process, it is unclear as to what information is required here. Welcome additional points.

- c. What suggestions do you have for any changes?

Form presently used by Impact Dairies

Impact Dairies			
Date and Time:			
Name of dairy person:			
What is the process being undertaken?			
What time did the process			
a) Start:			
b) End:			
Any other comments:			

Form used in a previous dairy Mr. Ngabo worked in

Daisy Dairies			
Date and Time:			
Name of dairy person (s):			
Position of dairy person (s):			
Name of process:	cheese making	fermented milk	yoghurt ice cream
Amount of milk:			
Amount of other ingredients:			
Step 1:			
Step 2:			
Step 3:			
Process complete: yes/no			
Time finished:			
Temperature:			



Application Activity

1. Explain that different dairies/milk processing areas may use different forms for recording information, but there are always common things the forms should include.
2. Tell trainees in groups of 3-4 that they should (**Topic 2.4 Task 4**):
 - a. Develop a form/document for recording information for when milk is processed to make cheddar cheese.
3. Ask each group to display their form/document for recording information.
4. Invite other groups to move around to review the different forms. Recommend that trainees write down any suggestions for improvements to the form.
5. Ask trainees to vote for the best form.
6. Ask trainees to provide evidence: Each group should give 3 reasons as to why they consider this form to be the best.
7. Explain:
 - a. Records are kept to ensure that the correct processes are followed when creating a milk product. Examples of items that should be included are: the date, the time, what product is being made, who the worker(s) are, the quantity of product, the volume of ingredients that are added, and the length of time that the process takes (e.g. how long the pasteurization process should take).
 - b. Forms should be legible and easy to fill in.
 - i. Identified appropriate record design of dairy products
 - ii. Explained record techniques of dairy products
 - iii. Used appropriate record design of dairy products
 - iv. Took various records of dairy products



Points to Remember

- A successful dairy enterprise needs to keep good records, as the saying goes: “When you fail to plan, you are planning to fail.”
- Accurate records are essential if you are to maintain control of your business affairs.



Formative Assessment

Read the following questions and select the correct answer.

1. The main purpose of record-keeping and reporting is:

- a. To determine the production process
- b. To avoid theft
- c. To predict production output
- d. To ensure proper production management

Answer: d - to ensure proper production management

2. Which of the following is the easiest way to store data and keep records?

- a. Computer Filing
- b. Horizontal Filing
- c. Lateral Filing
- d. Vertical Filing

Answer: a - Computer filing

3. What type of information should be included on a dairy record form?

Possible Answers: Name of person responsible for a specific duty, how the duty was performed, when the duty is performed



Further Information for the Trainer

- 1. Milk Processing Guide Series Volume 2, FAO/TCP/KEN/ 6611Project; Training Program for Small Scale Dairy Sector. Dairy Training Institute, Naivasha.
- 2. Code of Hygienic Practice for Production, Handling and Distribution of Milk and Milk Products. Kenya Bureau of Standards, Nairobi.
- 3. Rural Dairy Technology, ILRI Manual No. 1. International Livestock Research Institute, Nairobi.
- 4. Milk Producer Group Resource Book - a practical guide for establishing milk producer groups. FAO, 2002.
- 5. Milk Payment Resource Book - a practical guide for using incentives to improve milk quality. FAO, 2004



Self-Reflection

1. Ask the trainees to re-take the self-assessment from the beginning of Unit 2. They should then fill in the table in the Trainee's Manual to identify their areas of strength, areas for improvement, and actions needed to improve.
2. Discuss the trainees' results with them. Identify any areas that are giving many trainees difficulty and plan to give additional support as needed (ex. use class time before you begin the next learning outcome to review commonly identified difficult concepts).

Summative Assessment

Integrated situation	Resources
Mrs. Kayitesi is an agri-businesswoman who is involved with milk production and processing in Rutsiro District. Her company, Milk for All, is the only one in the district that can process milk products such as fermented milk, ice cream, yoghurt, and pasteurized milk. However, demand for her dairy products remains low because of the poor quality of products. Her customers are not satisfied. To overcome this challenge, Mrs. Katitesi has hired you as an assistant in milk processing. As a skilled milk processing worker, she requests that you assist the production manager with checking and weighing incoming ingredients, perform packaging, and assist with processing operations. Mrs Kaytesi has received an order for 5 dozen packages of pasteurized milk, 4 dozen of yoghurt, 3 dozen of fermented milk and 2 dozen of ice cream in 2 days. The client has said that if the products are poor quality, she will not pay for anything. Mrs Kaytesi believes that you can produce high-quality products with limited supervision. She promises a bonus of free milk for you and your family should you succeed in the task.	Equipment: Lactometer, Brushes, sprayers, Buckets, Serviettes, basins, P.P.E (Personal Protective Equipment, thermometer, cotton wool, cooling tanks, balance, pH meters, operational manual, pasteurizer, homogenizer, Cock, packaging materials, Labels, Standard manuals, refrigerator, Packaging machine, ice cream maker, filler, sealer, incubator, record forms. Materials: Milk, Starter culture, Fresh produce, fruits flavours, sugar, emulsifiers Cleaning products: NaOH, Liquid soaps, Nitrite acid, Boiled water, Hydrogen peroxide, Alcohol; Chlorine, HCl

Working in pairs, complete the following:

1. Clean the milk processing area. Clearly document what you do.
2. Make a tester of yoghurt, ice-cream, and pasteurized milk, remember to record what you do.
3. Develop a report showing what you have done from the cleaning of the milk area to the development of the product.

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: Equipment is properly identified according to end-product requirements		
Ice cream maker		
Pasteurizer		
Freezer		
Filler		
Sealer		
Incubator		
Indicator 2: Workplace and equipment are adequately cleaned and sanitized according to standards		
Source of contaminants is adequately identified (biological, physical, and/or chemical)		
Cleaning and sanitizing products are properly selected		
Cleaning and sanitizing products are properly applied		
Cleaning and sanitizing techniques adequately applied		
Indicator 3: Equipment is properly adjusted according to the requirements		
Equipment is properly adjusted		
Indicator 4: Raw milk is adequately controlled according to the standards		
Platform tests are adequately conducted		
Rejection/refusal of milk is appropriately done		
Indicator 5: Raw milk is properly filtrated and weighed in accordance with requirements		
Filtration are properly conducted		
Weighing is well done		
Indicator 6: Records are properly kept according to the requirements		

Records are properly kept		
Indicator 7: Milk is properly graded according to fat content		
Milk is properly graded by fat content		
Indicator 8: Milk is properly graded according to total bacteria count		
Milk is properly graded by total bacteria count		
Indicator 9: Milk is properly graded according to protein content		
Milk properly graded by protein content		
Indicator 10: Milk is properly graded according to density		
Milk is properly graded by density		
Indicator 11: Milk is properly cooled according to optimum temperature		
Milk is properly cooled at optimum temperature		
Indicator 12: Cleaning products are properly selected according to the workplace requirements		
Proper determination of cleaning method		
Selection of types of cleaning products is well carried out		
Accurate dosage is successfully done		
Mixing of cleaning products is well done		
Indicator 13: Workplace is adequately cleaned and sanitized according to standards		
Instructions and guidelines are successfully followed		
Cleaning agents are well applied		
Sanitizing of workplace is successfully performed		
Recovery of product residues by scraping, drainage and expulsion with water		
Pre rinsing with water		
Cleaning with detergent		
Rinsing with clean water		
Disinfection by heating or with chemicals		
Indicator 14: Equipment is adequately identified according to dairy product specifications		
The workplace is successfully rearranged		
Selection of equipment is well done		
Adjustment of equipment and testing is done		
Indicator 15: Equipment is correctly adjusted and calibrated according to processing standards		
Adjustment of equipment and testing is done		
Calibration of equipment is well done		
Weighing equipment		
Testing materials		
Temperature and pressure regulators		

Indicator 16: Milk products such as ice cream, yoghurt, fermented and fermented milk are identified according to workplace requirements		
Raw materials and ingredients are well selected		
Raw materials and ingredients are well quantity measured		
The quality of raw milk and ingredients is well checked		
Indicator 17: Processing techniques are properly identified in reference with protocol		
Processing equipment is well selected		
Preparation workplace is successfully performed		
Instructions and guidelines are successfully reviewed		
Equipment condition is well inspected to identify any signs of contamination		
Appropriate settings and/or related parameters are well selected		
Indicator 18: Processing techniques are applied according to protocol		
Personal protective clothing and/or equipment are well selected, fitted and used		
Weighing or measuring materials, ingredients, are well done		
Cleaning and/or filtration of raw materials and ingredients is well performed		
Standardization of milk is well performed		
Pasteurization of milk is successfully done		
Strained of milk is well done		
Inoculation is well done		
Fermentation is successfully done		
Blending of milk is well done		
Aging is well done		
Hardening is well done		
Skimming of milk is successfully done		
Monitor equipment to identify variation in operating conditions		
Incubation is successfully done		
Monitor the process techniques to confirm that specifications are met		
Product labelling and storage are relevant		
Maintain workplace records		
Indicator 19: Packaging materials are appropriately identified according to standards and product specifications		
Paper and paper-based products are identified		
Glass and tin plate are identified		
Aluminium foil packages are identified		
Plastics and laminated (tetra pack) are identifies		
Timbers are identified		
Indicator 20: Product is properly packaged and labelled		

Checking the quality of packaging materials is well done		
Accurate filling is effectively performed		
Sealing is well performed		
Labelling is well done		
Indicator 21: Dairy products are adequately stored		
Storage cold room and refrigerators are well cleaned		
Storage capacity is well checked		
Storage facilities are well arranged		
Completing receipt document is well done		
Monitoring temperature of the refrigerator or cold room is well done		
Rotation of dairy products is well done		
Dairy products are not mixed with other products		
FIFO system is well followed		
Indicator 22: Correct identification of results in accordance with the protocol		
Measurement of production volume is well done		
Wastage % at different stages of the process		
Recipe formulation is well recorded		
Calibration checks is well recorded		
Batch numbers and product code numbers are recorded		
Costs of all process inputs are well recorded		
Indicator 23: Proper recording according to requirements		
Report form is well formulated		
Non-conforming products and ingredients are reported		
Recipe formulation is reported		
Hazards identified are reported		
Production results are reported		
Protocol and instructions deviations are reported		
Dairy equipment repairing and maintenance are reported		
Waste management is reported		
Observations		

Assessment Criterion 2: Quality of product

Checklist	Score	
	Yes	No
Indicator 1: Quality and acceptability of yoghurt		
Appearance		
Colour		
Firmness		
Smoothness		
Sweetness		
Sourness		
Flavour		
Acidity		
Viable cell counts		
Packaging		
Indicator 2: Quality and acceptability of ice cream		
Melting resistance of ice cream		
Creaminess of ice cream		
Ability to withstand heat shock		
Acidity		
Viable cell counts		
Packaging		
Appearance		
Colour		
Firmness		
Smoothness		
Sweetness		
Sourness		
Flavour		
Ph		
Indicator 3: Quality and acceptability of pasteurized milk		
Appearance		
Colour		
Texture		
Flavour		
Sweetness		
Viable cell counts		
Packaging		

Indicator 4: Quality and acceptability of Fermented milk		
Appearance		
Colour		
Firmness		
Smoothness		
Sweetness		
Sourness		
Flavour		
Acidity		
Viable cell counts		
Packaging		
Observation		

Assessment Criterion 3: Relevance

Checklist	Score	
	Yes	No
Indicator 1: Ingredients are selected based on end product specification and standards		
Adequate ingredients are selected		
The quality and quantity of ingredients are checked		
Additives are selected		
The quality and quantity of additives are checked		
Indicator 2: Appropriate processing techniques based on product standards are applied		
Processing equipment is well selected		
Preparation workplace is successfully performed		
Personal protective clothing and/or equipment is well selected, fitted and used		
Cleaning and/or filtration of raw materials and ingredients is well performed		
Weighing and mixing raw materials and ingredients, are well done		
Mixing is done using appropriate ratios		
Instructions and guidelines are successfully reviewed and followed		
Appropriate packaging and labelling of processed product is well done		
Indicator 3: Deviations are controlled		
Required outputs are produced		
Processing operations time is respected		

Processing equipment and workplace are maintained		
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Observation

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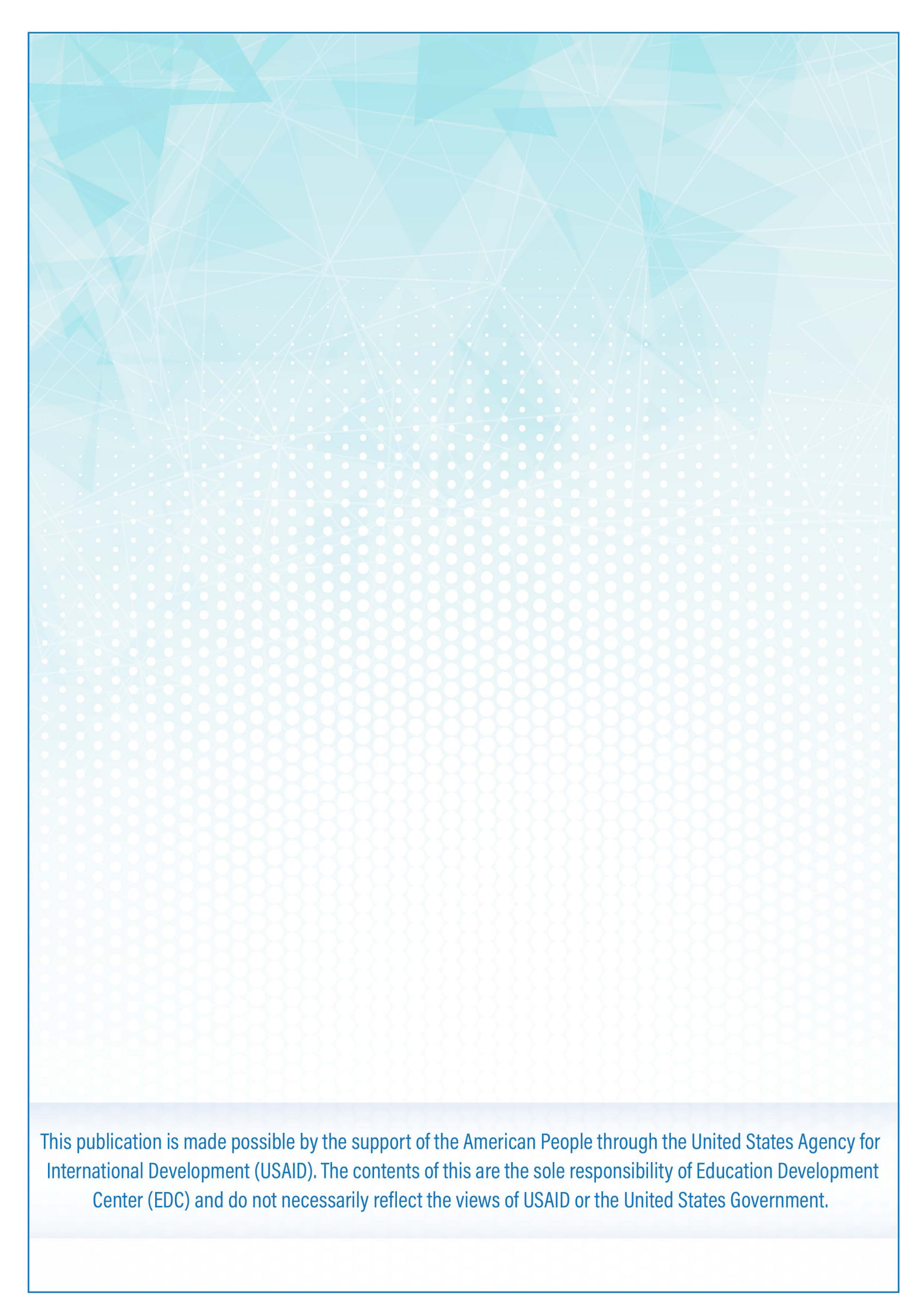
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