RWANDA POLYTECHNIC

TVET LEVEL II

AGRICULTURE

Animal Diseases Prevention

TRAINEE MANUAL

RWANDA POLYTECHNIC

Approved by: Workforce Development Authority

USAID FROM THE AMERICAN PEOPLE

EDC Education Development Center

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ANIMAL DISEASES PREVENTION

Unit 1: Maintain safety and hygiene

Unit 2: Prevent ruminant diseases

Unit 3: Prevent pig diseases

Unit 4: Prevent poultry disease

Unit 5: Prevent rabbit diseases and predators

Unit 1: Maintain safety and hygiene

Topics

1.1 Clean workplace, material, and equipment

1.2 Disinfect workplace

1.3 Store material and equipment

1.4 Monitor physical parameters

Unit Summary:

This unit describes the skills, knowledge, and atittudes required to implement and monitor work health and safety procedures by cleaning, disinfecting, storing materials and equipment in the farm. You will identify types of disinfectants, their different uses and application methods, such as spraying and fumigation; and lastly, you will learn how to control physical, biological, and chemical parameters to optimize animal health.

Self-Assessment: Unit 1

1. Look at the illustration. What do you see? What do you think this unit will be about? What topics might be covered?

2. Fill in the self-assessment below.

There are no right or wrong ways to answer this survey. It is for your own use during this course. The trainer will read a skill that is listed in the left column. Think about yourself: Do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation. At the end of this unit, we'll take this survey again.

My experience **Knowledge, skills, and attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Identify cleaning tools and cleaning products.					
Explain use of cleaning tools and cleaning products.					
Explain the difference between detergents and disinfectants.					
Identify the various uses of disinfectants.					
Apply disinfectant in animal shelters.					
Recognize Personal Protective Equipment (PPE) during the disinfection process.					
Describe the storage procedures at the farm.					
Monitor storage facilities at farm.					

Topic 1.1: Cleaning workplace, material, and equipment

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify cleaning tools.	**1.** Select the appropriate cleaning tool.	**1.** Detail-oriented
2. Identify cleaning products.	**2.** Select the appropriate cleaning product.	**2.** Detail-oriented
3. Describe cleaning procedures with appropriate tools.	**3.** Clean a farm using different cleaning tools and products.	**3.** Safety-oriented; problem solver

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

Topic 1.1 Task 1:

1. Observe the presented photo or the items at the front of the room: What do you see? Can you identify each item?

2. Describe what you see to a partner.

   a. Identify all the items you recognize.

   b. Which kind of cleaning materials, equipment and cleaning products have you used or are you familiar with?

3. After the group discussion, share discussion your ideas with the rest of the class.

Problem Solving Activity

Topic 1.1 Task 2:

1. With a partner, discuss the following questions:
   a. How do farmers in your village maintain the hygiene and safety of their farms?

   b. Which tools do they use?

2. Now, form two larger groups. With your group, discuss:

a. Why is it dangerous to incorrectly use cleaning products?

b. What are some alternative solutions?

c. How can we use cleaning products without harming the environment?

3. Share your ideas with the rest of the class.

1.1 Key Facts

- **Cleaning Procedures**

1. Cleaning:

- To remove visible organic and inorganic matter (e.g. animal waste/faeces, soil, dirt, debris, salts, oils, blood) from objects or surfaces
- Eliminate a large percentage of microorganisms in the animal shelter
- Cleaning tools include broom, cleaning brush, squeegee
- Cleaning products include detergent, disinfectant

2. Washing:

- To scrub a surface with water and detergents
- One of the most overlooked steps in cleaning and disinfection process
- Helps to further reduce the number of microorganisms as well as removes any oil or grease that may inhibit the action of disinfection

3. Rinsing:

- To remove soap, detergent, and/or dirt by washing with clean water
- All surfaces should be thoroughly rinsed because residues from cleaners and detergents can inactivate certain chemical disinfectants

4. Drying:

- To free from moisture or liquid
- Surfaces should be allowed to dry completely (if possible, overnight) before application of a disinfectant
- Excess moisture, especially on porous surfaces, may dilute and reduce the impact of the disinfectant applied to the surface; it may also harm equipment
- Fans or blowers can be helpful to the drying process but should not be used if dealing with highly infectious or zoonotic pathogens

5. Disinfecting:

- To kill remaining germs and/or viruses

- Apply immediately after surface is dried
- Wear Personal Protective Equipment (PPE) before and during use
- Read manufacturer's label for instructions, such as dilution[1]

Guided Practice Activity

Topic 1.1 Task 3:

1. Match the pictures of cleaning materials with their name and their use in column C. **Broom** has been done as an example. Compare your answers with a partner.

Cleaning Equipment	Name	Use
	Broom	To scrub or wash a surface; to scrub the stains out of clothing or shoes.
	Cleaning brush	To sweep floors; to remove dust or other undesired matter by pushing it into a dustpan.
	Squeegee	To kill germs (microbes) and viruses (bacteria, fungi).

[1] U.S. Department of Agriculture, & Iowa State University of Science and Technology. (2014, July). *Nahems guidelines: Cleaning and disinfection*. Center for Food Security and Public Health. https://www.cfsph.iastate.edu/pdf/fad-prep-nahems-guidelines-cleaning-and-disinfection

Detergent — To remove or control liquid on a floor or flat surface.

Disinfectant — To remove dirt or grease from porous surfaces; made of soaps.

2. Imagine that a colleague on the farm wants to clean part of the workspace and wants your help. He/she shows you the chicken coop. There is waste on the floor and dirt on the walls.

a. What tools will you need to clean the chicken coop?

b. What products will you need?

c. Explain the processes you will follow to clean this space.

1.2 Key Facts

- **Cleaning Tools**
  - **Shovel or pitchfork:** Used to remove larger and wetter items such as waste/faeces, bedding
  - **Broom:** Used to sweep floors, to remove dust or other undesired matter by pushing it into a dustpan
  - **Cleaning Brush:** Used to scrub or wash a surface, to scrub the stains out of clothing or shoes
  - **Squeegee:** Used to remove or control liquid on a floor or flat surface

- **Cleaning Products**
  - **Detergent:** Used to remove dirt or grease from porous surfaces; made of soaps
  - **Disinfectant:** Used to kill germs (microbes) and viruses (bacteria, fungi)
  - **Detergent vs Disinfectant**
    - Both are cleaning products
    - Detergent is used to clean by removing dirt and other matter from the surface

- Disinfectant is used to eliminate microorganisms and create a non-hazardous surface
- **Important Note:** Always read the manufacturer's label with instructions on how to use the product properly

Application Activity

Topic 1.1 Task 4:

1. Visit the school farm or, with your peers, imagine that your classroom is a cow stable. You have been asked to help clean the workspace. You must select the appropriate cleaning materials and equipment and then carry out the cleaning process.

2. Observe your trainer demonstrate how to select and clean properly.

3. In your group, take turns selecting a cleaning material or piece of equipment and using it properly. Correct your peers when they use a cleaning material or equipment incorrectly.

4. Ask for help from your trainer as needed.

5. After all groups have finished, a group representative should share your group's decisions and compare them to the correct methods.

Points to Remember

- Always keep the workplace clean.
- Misuse of cleaning equipment can have negative consequences for the animals and the environment!
- Cleaning tools and products must be used according to the manufacturer's instructions to avoid dangerous or hazardous situations.
- The key difference between detergents and disinfectants is that detergents clean a surface, while disinfectants remove harmful microorganisms from the surface.

Formative Assessment

1. From the list below, circle cleaning tools and tick cleaning products:

- ❑ Broom
- ❑ Detergent
- ❑ Soap
- ❑ Disinfectant
- ❑ Water
- ❑ Squeegee

2. Explain the difference between detergents and disinfectants in your own words. Give an example of when you use each product.

3. Imagine you are working on a farm and must clean the floor of the cow shelter, where the cows sleep at night and are milked regularly.

a. What tools do you need to clean this space?

b. What products do you need to clean this space?

c. Explain the four stages of the cleaning process in this situation.

Topic 1.2: Disinfect workplace

Key Competencies:

Knowledge	Skills	Attitudes
1. Name Personal Protective Equipment (PPE) used during the disinfection process.	**1.** Choose the proper Personal Protective Equipment (PPE) and wear it during the disinfection process.	**1.** Proactive; attentive; safety-oriented
2. Identify disinfectants and detergents used in animal farms and interpret their uses.	**2.** Select the appropriate cleaning product to use and apply it to the workspace properly.	**2.** Forward-thinking; proactive
3. Identify the various uses of disinfectants.	**3.** Apply different techniques of disinfection, including application, spraying, and fumigation.	**3.** Detail-oriented

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

Topic 1.2 Task 1:

1. In a small group, discuss the daily activities done on your neighbouring farm to disinfect the farm and animal shelters.

   a. What do you already know about disinfecting animal shelters?

   b. Are there different ways disinfection products are used? If so, what are the different ways?

2. Share your ideas with the rest of the class.

Problem Solving Activity

Topic 1.2 Task 2:

1. Imagine you are cleaning a workspace using detergent or disinfectant products.
   a. What might happen if the product got in your eyes or touched your skin?

   b. What could you do to prevent or protect yourself from this situation?

   c. List three pieces of equipment you could use to protect your hands, eyes, and feet.

2. Imagine you are going to clean an animal shelter using disinfectant, but the disinfectant is too strong.
   a. What could you do to reduce the strength of the disinfectant?

3. Share your ideas with a partner.

4. Ask volunteers to share their ideas and compare them to the rest of the class.

5. Turn to **1.3 Key Facts** below. Take turns reading the sections out loud. Consider the important note sections and the most important areas to disinfect. As a class, discuss:
   a. Why do you think pre-vaccination surfaces, animal housing between occupants, and high contact surfaces are the most important areas to disinfect?

   b. Why is it important to be aware of carriers?

   c. How can you prevent yourself from being a carrier?

1.3 Key Facts

- **Personal Protection Equipment (PPE):**
  - Used to protect farmers and agricultural workers from health and safety hazards
  - Protection of the eyes, face, ears, hands, feet, and head
  - Cannot prevent accidents from happening, but it can reduce the negative effects
  - Types of equipment
    - Goggles or glasses: to protect the eyes
    - Gloves: to protect the hands
    - Close-toed and sturdy shoes: to protect the feet
    - Helmet: to protect the head

- **Disinfectant:**
  - Definition**:** Chemical agent which kills harmful microorganisms. Does not necessarily remove dirt or grease
  - Types: ammonia solution, Sodium Hypochlorite. Sodium Hydroxide, Phenols, Chloramines, Quaternary ammoniums, Chlorhexidine, Etc.
  - Stages
    - Pre-cleaning: Remove loose dirty and food waste by pre-rinsing
    - Main cleaning: Wash without water and detergent
    - Rinsing: Remove loose food waste, grease and detergent
    - Drying: Remove all moisture
    - Disinfection: Kill bacteria with disinfectants
    - Final rinse: Remove the disinfectants[2]

- **Choosing a disinfectant**
  - Disinfectants MUST be used at the correct concentration (see: Dilution)
  - Adequate time with contact on surface is required
  - Must be applied to a basically clean, non-porous surface, free of organic matter
  - Disinfectants and detergents can cancel each other's actions, and should not be mixed unless specifically directed by the manufacturer[3]

- **Most important areas to disinfect:**
  - **Pre-vaccination surfaces**: It is imperative that animals have contact with especially clean surfaces when they are first admitted and have no protection from vaccination. For example, animal transport vehicles, carriers, exam surfaces, clothing of intake staff
  - **Animal housing between occupants**: Pay special attention to sick animal areas
  - **High contact surfaces**: Doorknobs, bathroom sinks, locks, windows[4]

- **Important Note:**
  - **Carrier:** An animal which is infected and infectious to other animals but not currently showing signs of disease. What this means is that even healthy-looking animals can spread disease to other animals. This can occur in:
    - **Animals that are about to get sick:** Viruses can be shed a few days before signs develop

[2] Alpha WebAPPt. (2019, April 1). *Cleaning and disinfection generally consists of six steps*. Hygiene Plus. https://hygieneplusuae.com/2019/04/01/cleaning-and-disinfection-generally-consists-of-six-steps/

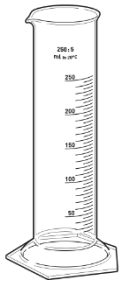
[3] Ontario SPCA and Humane Society. (2019, March 30). *Disinfectants currently used by Ontario SPCA*. https://ontariospca.ca/spca-professional/shelter-health-pro/infection-disease-control/cleaning-disinfection/disinfectants-currently-used-by-ontario-spca-animal-centres/

[4] Pals Peabody Animal Life Savers. (n.d.). *Cleaning and disinfecting in shelters*. https://members.petfinder.com/~MA199/resourcePages/volunteers/shelterCleaning.pdf

- **Yourself:** Remember, we move around shelters much more than animals do. Investing in keeping our hands, arms, clothing and feet clean (either by cleaning or by use of protective garments) will often go at least as far as environmental cleaning in preventing disease spread.

- **Dilution:**
  - To make a liquid weaker or less concentrated by adding another substance, such as water
  - Measure using a graduated cylinder
  - Used to make disinfectants the appropriate strength for the surface or workspace
  - Read the manufacturer's instructions to know the exact quantity of disinfectant to mix with a determined quantity of water and surface area

  - Calculate:
    Comparing ratio of dilution per quantity of water (from manufacturer's label) to the amount of water needed for a surface area.



$$\frac{\text{Given solution}}{\text{Given water}} = \frac{\text{Solution needed}}{\text{Water needed}}$$

Guided Practice Activity

Topic 1.2 Task 3:

1. Imagine you are at a farm and must decide how to disinfect the various surfaces around you. Complete the following tasks with a partner:

a. Write the steps you must go through before disinfecting:

1.

2.

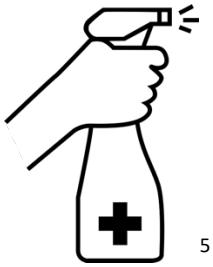
3.

4.

b. What are two factors to consider when choosing a disinfectant?

2. Using the products in the classroom and/or the photos below, decide which disinfectant should be used on each surface pictured below. Then, if possible, using the manufacturer's instructions, determine how this product should be applied.

Disinfectant Products:


5


6


7

Surfaces:


8


9


10

Use/Method of Disinfection:

Fumigate	**Apply**	**Spray**

[5] *Disinfectant*. (n.d.). Pixabay. https://pixabay.com/illustrations/disinfectant-cleaning-material-5251132/

[6] *Hand sanitizer* [Graphic]. (n.d.). Pixabay. https://pixabay.com/vectors/hand-sanitizer-wash-hygiene-clean-5295096/

[7] *Person with backpack sprayer illustration* [Illustration]. (n.d.). Png Wing. https://www.pngwing.com/en/free-png-nkhad

[8] Clker-Free-Vector-Images. (n.d.). *Hands clapping applause free photo* [Illustration]. NeedPix. https://www.needpix.com/photo/178628/hands-clapping-applause-african-american-black-male-suit-ethnic-human

[9] Huber, J. (2017, January 17). *People working in agriculture in Rwanda* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:People_working_in_agriculture_in_Rwanda.jpg

[10] Hancock, K. (n.d.). *Table transparent* [Photograph]. Pixabay. https://pixabay.com/illustrations/table-transparent-wooden-furniture-4900096/

3. Now, you need to disinfect a table that is 100 cm wide and 120 cm long by wiping the surface. The surface area requires 200 mL of water. The manufacturer's label says to dilute 10 mL of solution with every 50 mL of water. Calculate the amount of solution needed for 200 mL of water using the formula from **1.3 Key Facts.**

1.4 Key Facts

Disinfection Methods

- **Fumigation:**
  - Process of disinfecting an area by releasing a chemical/pesticide gas or vapor into the air to kill or eliminate pests
  - Some agricultural fumigants are also injected into the soil to reduce insects and other pests
  - Exposure to fumigants can be hazardous due to the chemicals and toxins in the gas

- **Application:**
  - Some disinfectants, such as hand sanitizer, can and should be applied regularly to maintain cleanliness in the workspace
  - Apply by wiping on the hands (sanitizer) and/or the cleaned surfaces

- **Spraying:**
  - Spreads disinfectant substances in the air and across wider surface areas than simple application
  - Essential to wear PPE to avoid accidental exposure to chemical substances
  - Always wash your hands with soap after spraying disinfectant

Application Activity

Topic 1.2 Task 4:

1. Before visiting a local farm, separate into small groups. With your group, create questions to ask the farmer about the following topics related to cleaning and disinfection. Be sure to form questions in a grammatically correct way.

Topic	Questions
Where	
How often	
Cleaning products	
Equipment and tools	
Disinfection method	

2. Upon arriving to the farm, complete the following tasks:

a. Representatives ask the farmer or another worker the questions created beforehand. Write the answers below:

Topic	Answers
Where	
How often	
Cleaning products	
Equipment and tools	
Disinfection method	

a. Identify the different types of disinfectants available.

b. After reading the manufacturer's label, determine which type of disinfectant is appropriate to use in the given workspace.

c. Determine if the chosen disinfectant needs to be diluted and, if so, calculate the amount of solution needed for a given workspace.

3. With the farmer's permission, apply the disinfectant to the farm surfaces and equipment properly, either by application, spraying, or fumigation. Refer to **1.4 Key Facts** for more information on the methods for applying disinfection.

4. Ask for assistance from the farm staff and trainer as needed.

Points to Remember

- Some surfaces do not need to be disinfected after every cleaning, such as floors and walls.
- Check the manufacturer's instructions and expiration date on disinfectants and detergents.
- Always wear the appropriate Personal Protection Equipment (PPE) in order to protect yourself from hazardous conditions in the workplace.

Formative Assessment

1. Explain the stages of workplace disinfection.

2. Choose **True** or **False** for the following statements:

a. Dilution is used to make a liquid product stronger and more intense.

b. It is important to disinfect pre-vaccination surfaces.

c. Some areas can be disinfected through fumigation, or the elimination of harmful insects with fumes.

d. It is not necessary to read the manufacturer's instructions when using disinfectants.

Topic 1.3: Store material and equipment

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify materials and equipment to be cleaned and stored properly.	**1.** Collect and clean materials and equipment to be stored.	**1.** Proactive; accurate
2. Describe the storage procedures on the farm.	**2.** Store material and equipment safely.	**2.** Detail-oriented
3. Describe how to monitor and repair stock in the workplace.	**3.** Monitor and repair cleaning materials safely; Take stock and restock items as needed.	**3.** Problem solving

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

Topic 1.3 Task 1:

1. Discuss your daily activities with a partner using the following questions:

a. What activities do you do at home to disinfect a surface?

b. What materials do you use?

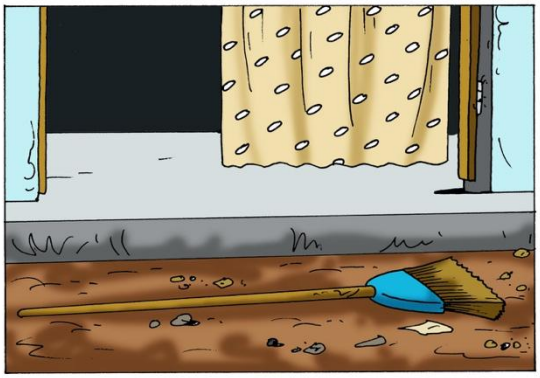
c. How do you handle these materials before and after using them?

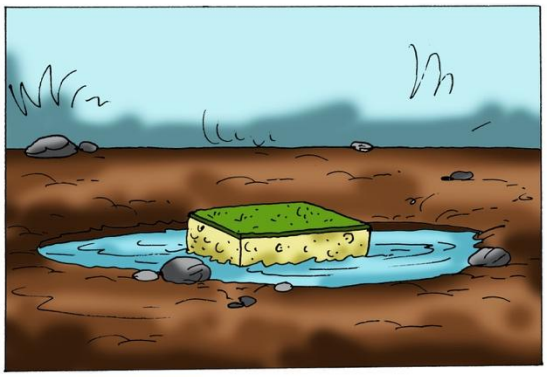
2. Share your ideas with the rest of the class.

Problem Solving Activity

Topic 1.3 Task 2:

1. Imagine you are at a farm site and you notice that it is very disorganized. A bottle of disinfectant is laying on the floor and the cap or top is not closed securely. A broom has fallen on the floor, in front of the entrance. A sponge is floating in a puddle of dirt.





2. Discuss the following questions in small groups:

a. Explain the danger behind the inappropriate storage of tools and cleaning materials on a farm. What could happen in the situation described?

b. How do you think we should store materials, equipment, and tools on the farm? Where should they be placed? How do we know where to place them?

c. Which precautions do we have to take while storing chemicals and dangerous equipment on the farm?

d. Reflect on the field visit from the previous topic. Where did the farmer store the materials, equipment, and tools? What suggestions would you make?

3. Refer to **1.5 Key Facts** below. Use this information to supplement and correct your responses to the questions above.

4. Share your responses and ideas with the rest of the class. Review **1.5 Key Facts** as needed.

1.5 Key Facts

- All cleaning materials and equipment, such as brooms, brushes, and mops must be regularly cleaned by removing any debris, manure, dirt, etc.

- **Storage**:
  - Use a holder to keep brooms stored off the floor and store with the bristles upright, as seen below.

 [11]

  - Chemicals must be stored in a place where there is no public access and where tipping or breaking can't happen, such as secure shelves inside a locked cupboard. The cupboard should be labelled with the type of materials it contains. The materials should be arranged in order of toxicity levels.
  - Cleaning products should be safely stored away from animal stables or areas where animals pass through frequently.
  - Daily monitoring of the handling and storage of cleaning materials and equipment is important to maintain safe and clean conditions.
  - Improper storage could result in accidents, such as workers tripping or falling on equipment left out in the workspace. Spilled or open disinfectants and detergents could also poison or harm workers and animals who encounter them. Unclean tools and equipment may manifest harmful microbes.

- **Stocktaking**
  - To review and assess the amount of remaining material and supplies
  - Necessary to be sure there are enough available supplies to complete daily cleaning and related tasks

[11] Loo, J. (2013, July 21). *Broom* [Photograph]. Flickr. https://www.flickr.com/photos/johnloo/9411391276 https://creativecommons.org/licenses/by/2.0/legalcode

- Can help predict how much supplies are needed each week, month, and season such that the amount can be purchased in advance to prevent an unexpected loss of stock

Guided Practice Activity

Topic 1.3 Task 3:

1. Separate into groups.

2. Your trainer will assign your group an area of the classroom or workplace to collect, clean, and store materials and equipment.

3. Working with your group members, start cleaning and arranging the space accordingly. Be sure to check if the chemicals are properly stored. Refer to the information in **1.5 Key Facts** to assist you.

4. Ask your trainer for assistance as needed.

5. After you have finished, discuss with your group members:
   a. Which materials were the most challenging to store? Why?

   b. Which materials or equipment took the longest amount of time to store?

6. Share your experience and ideas with the rest of the class.

7. What information are you missing about proper cleaning and storage of materials and equipment? Ask your trainer for this information.

Application Activity

Topic 1.3 Task 4:

1. Visit a farmer who needs to be assisted in storing new or recently purchased cleaning materials and equipment.

2. Separate into groups.

3. With your group, work closely with the farmer or other workers to perform the following activities:
   a. Wear the appropriate Personal Protection Equipment (PPE).
   b. Identify and collect cleaning material and equipment.
   c. Clean materials and equipment as needed.
   d. Safely store the cleaning materials and equipment.
      i. Read instructions to arrange disinfectants and detergents according to their toxicity levels.
      ii. For dangerous cleaning products, handle them safely and keep all containers tightly closed.

4. Estimate how often someone would need to restock the various materials.
   a. Ask the farmer if your estimation is accurate and note the correct response.

5. Ask the farmer any remaining questions you have about storing materials and equipment.

Points to Remember

- Cleaning materials and equipment should be stored in an area that is clean and free of debris.
- Any substance that cannot be readily identified must be treated as a hazardous chemical.
- Always monitor the storage and cleaning of materials and equipment by taking stock regularly.
- Check if there are instructions on storage procedures, such as temperature or exposure to sunlight, especially for toxic disinfectants.

Formative Assessment

1. List three reasons to keep cleaning material and equipment clean and in a separate room.
   1.

   2.

   3.

2. How and why should someone store potentially hazardous products, such as cleaning and sanitizing products?

3. Why is stocktaking necessary? What can it prevent?

Topic 1.4: Monitor physical parameters

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe physical, biological, and chemical parameters for animal health maintenance.	**1.** Identify and adjust physical, biological, and chemical parameters in the workplace.	**1.** Detail-oriented
2. Explain the importance of monitoring physical, biological, and chemical parameters for animal health.	**2.** Monitor physical, biological, and chemical parameters according to farming standards.	**2.** Forward-thinking; diligent
3. Describe regulation procedures for physical parameters.	**3.** Regulate physical parameters appropriately in the workplace.	**3.** Methodical

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

Topic 1.4 Task 1:

1. With a partner, discuss:
   a. What external or environmental factors are important to maintain good animal health?

   b. What actions are done in an animal shelter in both the morning and in the evening to help the animals maintain good health?

2. Discuss your responses with the rest of the class.

Problem Solving Activity

Topic 1.4 Task 2:

1. Imagine that at a local farm, some animals have been suffocated due to incorrect shelter construction.

2. Think about the following question individually:

a. What could be the causes of this accident?

b. Consider the different parameters which could cause this problem, such as ventilation, humidity, temperature, and lighting.

3. Compare your ideas with a partner.

4. With your partner, discuss:

a. How can someone measure these physical parameters—ventilation, humidity, temperature, and lighting?

b. Propose preventative measures and solutions to avoid this situation in the future.

5. Share your ideas with the rest of the class.

1.6 Key Facts

- **Physical Parameters**
  - **Overview:** Good housing and layout of the farm can reduce animal stress and be a main determinant of productivity. Animal environments need to be monitored to maintain balanced and harmonious environmental conditions.

  - **Temperature:**
    - The intensity of heat in the room or setting, measured in degrees Celsius
    - For most farm animals, a mean daily temperature in the range 10 to 20°C is referred to as the "**comfort zone."**
    - The best instrument for measuring temperature is a **thermometer**. You should also observe the animal itself when the animals are at rest, not when they are active or eating.
    - Low environmental temperatures can cause cold stress, which affects the immune system and thus animal health.
    - Very high temperatures also affect the function of vital organs especially respiratory system, cardiovascular system.
    - A very young animal is much more sensitive to its thermal environment and requires higher temperatures.[12]

[12] Food and Agriculture Organization of the United Nations (FAO), & Informartion Network on Post-Harvest Operations (INPhO). (1998). *Farm structures in tropical climates: Animal environmental requirements*. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/s1250e/s1250e10.htm

- **Ventilation:**
    - The circulation of fresh air in a room or building
    - Oxygen (O_2) is very important for aerobic living beings including animals
    - Poor ventilation leads to the accumulation of CO2, ammonia, and dust in the shelter, which reduces the concentration of oxygen. This can cause respiratory dysfunction, nervousness, and asphyxia.
    - Carbon dioxide (CO_2) content of the air is used to measure the effectiveness of ventilation.

- **Lighting**
    - The equipment in a room for producing light
    - Artificial lighting—such as incandescent, florescent, and LED lighting—should be chosen and adjusted according to what is perceived as natural to the animals. Animal vision is different from that of humans, so what we perceive as a yellow light might appear red to a pig or chicken.
    - Natural light makes animals calmer, less aggressive, and more likely to gain weight and/or produce more milk.
    - Factors to consider: Intensity of light, distribution of light, length of the day, colour of the light

- **Humidity**
    - The amount of water vapour or moisture in the air, measured in percentage
    - Optimum humidity for animals is 50%-80% to ensure optimum milk production and livestock health[13]
    - Measure using a **hygrometer**:
        - **Relative humidity** = the relationship between the moisture content of the air and the maximum moisture content at the current air temperature expressed in percentages.
        - **Ventilation** also helps in regulating relative humidity

[13] FilesThruTheAir. (2019, March 4). *Barn temperature and humidity monitoring in dairy farming*. https://www.filesthrutheair.com/article/barn-temperature-and-humidity-monitoring-in-dairy-farming

Guided Practice Activity

Topic 1.4 Task 3:

1. Match the physical parameter to its definition.

Temperature	The equipment in a room for producing light.
Ventilation	The amount of water vapour or moisture in the air, measured in percentage.
Lighting	The intensity of heat in a room or area, measured in degrees Celsius.
Humidity	The circulation of fresh air in a room or building.

2. Imagine that you are on an animal farm and one of the animals appears to be weak, uncomfortable, and generally suffering. Although its health has been good recently, it has not been productive. How can you monitor the physical parameters to check that these factors are not causing the animal's discomfort and lack of productivity? What questions should be asked?

3. After monitoring the physical parameters, you decide they are not causing the problem. Now, you think the problem could be caused by biological and/or chemical parameters.

a. Brainstorm some potential biological parameters—factors related to dangerous micro-organisms—and chemical parameters that could be affecting the animal's health using prior science knowledge.

4. Read through **1.7 Key Facts** as a class. Discuss the differences between microbes, parasites, insects, and predators, and how to identify them.

1.7 Key Facts

- **Biological Parameters**
  - **Microbes**:
    - Single-celled organisms, such as bacteria, fungi, and viruses
    - Can be both harmful and beneficial
    - Harmful in the form of pests that destroy crops and aggravate animals
    - Beneficial for crops in soil by decomposing organic matter

  - **Parasites**
    - An organism that lives in or on another organism (host) and sustains itself by taking nutrients from the host
    - Can reduce the appetite of animals, making them less productive; can transfer diseases from one animal to another
    - Identification: often visible themselves or produce visible consequences on animals; sometimes undetectable and should be investigated when there is a dramatic change in animals' health (given there has not been a drought or feed shortage)

  - **Insects**
    - Small bugs or invertebrate; often referred to as "pests"
    - Harmful effects on animals include annoyance, biting and stinging, and transmitting diseases
    - Can be expensive and time-consuming to remove and should therefore be addressed as soon as they are discovered
    - Common insects: flies, lice, ticks, mosquitoes, fleas
    - Identification: visible
    - Monitor and control by keeping areas clean and well-ventilated, using sprays, and properly managing manure

  - **Predators**
    - Animals that naturally prey on others
    - Examples: hawks, large snakes, dogs
    - Identification: footprints, missing animal carcasses
    - Monitor and control by keeping physical structures secured so that outside animals cannot enter

- **Chemical Parameters**
  - **Air pollution**
    - Presence of chemicals or compounds in the air which are unnatural and lower the quality of the air and/or affect quality of life

- Much like for humans, air pollution can cause respiratory problems in animals, particularly damage to lung tissue
- Identification: When animals have difficulty breathing, skin irritation, or neurological issues

- **Biosecurity Measures**
  - Set of measures to prevent or stop the spread of harmful organisms to human, animal, and plant life
  - Used to increase agricultural production and maintain strong animal health
  - **Prevention**: Keep all tools and equipment clean and disinfected; limit and keep a record of farm visitors; use separate equipment for healthy and sick animals; quarantine, or separate, new animals for two weeks
  - **Stop the Spread**: Report signs of disease immediately; be aware of sudden and unexplained death in the herd/flock, severe illness affecting a high percentage of animals, blisters on animals, nervous system disorders such as staggering or falling[14]

Application Activity

Topic 1.4 Task 4:

1. Visit a local farm and separate into four groups.

2. Your group will be assigned one physical parameter: ventilation, humidity, temperature, or lighting.

3. One representative from each group should ask the farmer what the farm standards are for your assigned physical parameter. Note the responses in the table below.

4. Working with your group, identify the status of your assigned physical parameter in the farm stable. Determine if the parameter meets the farm standards. Note your findings in the table.

[14] Illinois Department of Agriculture. (n.d.). *Biosecurity measures*. https://www2.illinois.gov/sites/agr/Animals/AnimalHealth/Pages/Biosecurity-Measures.aspx

Physical Parameter	Farm Standards	Meets Standards? Yes or No
Temperature		
Lighting		
Ventilation		
Humidity		

5. With your group, rotate to a different physical parameter. Repeat Step 4.

6. Rotate two more times until your group has assessed all four physical parameters on the farm.

7. Finally, check if the biosecurity system has been established to address biological and chemical parameters. Use the information from **1.7 Key Facts** to guide you. Note your answers below:

Biological Parameter	Biosecurity System
Microbes	
Insects	
Predators	
Parasites	
Air Pollution	

8. After the visit, present and compare your findings with your group to the rest of the class.

Points to Remember

- Good housing and layout of the farm can reduce animal stress.
- Check if lighting and ventilation are sufficient to reduce the air pollution.
- Check the biosecurity system, including doors and windows, ideally preventing the entrance of insects and predators.
- Handling animals during periods of high temperatures and humidity should be avoided, and good quality, cool drinking water should always be provided.

Formative Assessment

1. What are the different physical parameters used to control an animal shelter and how do we monitor them?

Parameter	How to monitor

2. Explain the importance of controlling chemical and biological parameters in an animal shelter? How can we avoid them?

Self-Reflection

1. You have come to the end of the unit. You are going to do the survey you did at the beginning of the unit again to help you do self-assessment of your knowledge, skills and attitudes.

Again, there are no right or wrong answers to this survey. It is for your own use to gauge your knowledge, skills, and attitudes after the unit. Read the Knowledge, Skill, or Attitude in the left column. Think about yourself: do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation.

My experience **Knowledge, skills, and attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Identify cleaning tools and cleaning products					
Explain use of cleaning tools and cleaning products					
Explain the difference between detergents and disinfectants					
Identify the various uses of disinfectants					
Apply disinfectants in animal shelters					
Recognize Personal Protective Equipment (PPE) during the disinfection process					
Describe the storage procedures on the farm					
Monitor storage facilities at farm					

2. Complete the table below by identifying areas from the unit where you have improved and where you need improvement along with the actions/strategies you will use to help you improve when receiving and interpreting information in the workplace.

Areas of strength	Areas for improvement	Actions to take to improve
1.	**1.**	**1.**
2.	**2.**	**2.**

Unit 2: Prevent ruminant diseases

Figure 1

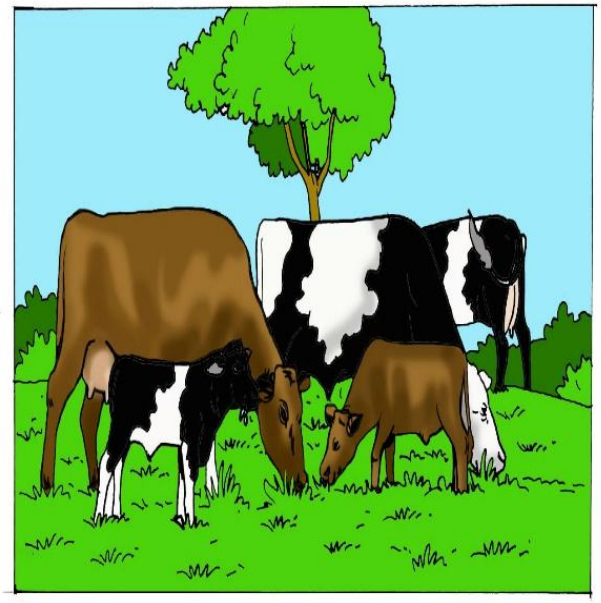


Figure 2

Figure 3

Figure 4

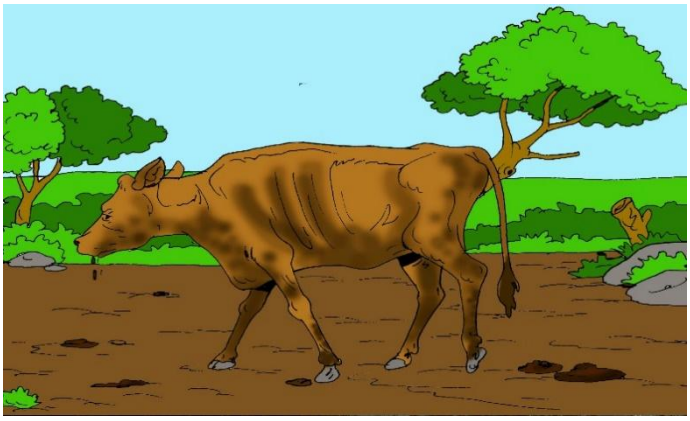


Figure 5

Figure 6

Figure 7

Figure 8

Topics

2.1 Assist in identification of diseases

2.2 Spray acaricides

2.3 Deworm cattle

Unit Summary:

This unit focuses on the identification of infectious, parasitic, metabolic and nutritional, and traumatic diseases of ruminants. Causes and signs of these diseases will be covered as well as preventative measures such as spraying acaricides and deworming.

Self-Assessment: Unit 2

1. Look at the illustrations. What do you see? What do you think this unit will be about? What topics might be covered?

2. Fill in the self-assessment below.

There are no right or wrong ways to answer this survey. It is for your own use during this course. The trainer will read a skill that is listed in the left column. Think about yourself: Do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation. At the end of this unit, we'll take this survey again.

My experience **Knowledge, skills, and attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Describe causes of ruminant diseases.					
Describe signs and symptoms of ruminant diseases.					
Apply preventive procedures to avoid ruminant diseases.					
Identify the different types of acaricides.					
Apply appropriate dilution and spraying techniques to acaricide use.					
Describe acaricide management and disposal procedures.					
Identify wormicides and their purpose.					

Select the appropriate technique and dosage for administering wormicide.					
Describe wormicide waste disposal procedures and their significance.					

Topic 2.1: Assist in identification of diseases

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe causes of ruminant diseases.	**1.** Identify ruminant diseases.	**1.** Detail-oriented
2. Describe signs and symptoms of ruminant diseases.	**2.** Differentiate signs and symptoms of ruminant diseases.	**2.** Safety-oriented
3. Outline preventive procedures of ruminant diseases.	**3.** Apply preventive procedures to avoid ruminant diseases.	**3.** Responsibility and teamwork

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

Topic 2.1 Task 1:

1. Look at the illustrations and identify all items which are detailed on the picture.

2. Then, discuss the following with a partner:
   a. Which animals in the illustrations look healthy and which look ill?

   b. What are the farm workers wearing? Why?

   c. What are ruminant animals?

   d. What do you already know about ruminant diseases?

3. Share your observations and ideas with the rest of the class.

Problem Solving Activity

Topics 2.1 Task: 2:

1. In small groups, discuss:
   a. What are common signs that an animal, specifically a ruminant, is sick?

2. Look at the unit illustrations from **Task 1** again.

a. How do you know which animals are ill? Consider the animals' skin, fur, mouths, and stomachs.

b. What are the workers doing to the animals? Do you think they are preventing illness or treating ill animals?

3. The four categories of ruminant diseases are infectious, parasitic, nutritional and metabolic, and traumatic. Infectious diseases involve harmful bacteria or viruses; parasitic diseases involve parasites, such as mites; nutritional and metabolic diseases involve insufficient nutrients; and traumatic diseases involve stress-related injuries.

a. Which of these diseases do you think apply to the photos above?

4. Share your observations and predictions with the rest of the group.

2.1 Key Facts

- **Infectious Diseases**
  - **Common:**
    - Bacterial: Anthrax (charbon bactéridien), contagious bovine pleuropneumonia (lung plague), mastitis, brucellosis
    - Viral: Lumpy skin disease, foot and mouth disease (Hoof and mouth disease), small ruminant pest
  - **Causes:**
    - Harmful bacteria living in animals, such as Bacillus anthracis (anthrax), Mycoplasma mycoides mycoides (Mmm), Staphylococcus aureus (staph infection), Escherichia coli (E. coli), Streptococcus agalactiae (Strep), and Brucella
    - Bacteria can infect open wounds
    - Harmful viruses
  - **Signs:**
    - Fever of up to 41.5 °C
    - Abnormal discharges, such as blood exudate, nasal discharge, and/or abnormalities in milk texture and thickness
    - Physical changes, such as difficulty breathing, profuse salivation, or swelling, redness, and heat in certain areas
    - Decreased productivity
  - **Prevention:**
    - Quarantine
    - Vaccination
    - Biosecurity measures, including effective cleaning and disinfection
    - Regular attention/testing

- Proper burial/disposal of dead carcasses

- **Parasitic Diseases:**
  - **Common:**
    - **Endoparasites (internal):** Roundworms (nematodes), tapeworms (cestodes), flukes (trematodes), protozoa
    - **Ectoparasites (external):** Scabies (Sarcoptic mange), mites (Psoroptic mange), flies, fleas
  - **Causes:**
    - Parasites live in or on the animal (its host) for long or short periods of time
    - Parasites sometimes pass diseases to the animal
  - **Signs:**
    - Loss of appetite, emaciation, weight loss and/or blood loss (anaemia)
    - Rough fur coat, lesions on the head, neck, and shoulders and intense itching
    - Diarrhoea, sometimes with blood clots
    - Decreased productivity
  - **Prevention:**
    - Check animals because most parasites are easy to see
    - Regular deworming, especially adult females after giving birth
    - Good hygiene practices
    - Pasture management (rotation, zero grazing)
    - Regular spraying of insecticides (acaricides)

- **Nutritional and Metabolic Diseases**
  - **Common:**
    - Milk fever (Parturient paresis) in cattle
  - **Causes:**
    - Low blood calcium level (hypocalcaemia)
    - Intensive animal production
  - **Signs:**
    - Usually occurs within 72 hours of giving birth
    - Restless, shuffling their rear feet and bellowing
    - Unable to stand or urinate
    - Loss of consciousness and coma
  - **Prevention**
    - Correcting the diet for cows during this crucial, post-birth period (lactation, pre- lactation)
    - Feed management
    - Regularly check blood calcium level

- **Traumatic Diseases**
  - **Common:** Traumatic reticuloperitonitis (TRP) in cattle
  - **Causes**
    - When pieces of wire, or other sharp metal objects, which have been eaten by the cow, along with its food, penetrate the reticulum (second stomach) wall
  - **Signs**
    - Arched back
    - Reluctance to move and a slow, careful gait
    - Groaning when lying down and getting up
    - Sharp fall in milk production
    - Loss of appetite
    - Pain while defecating
  - **Prevention**
    - Avoid using metallic objects which are not secured
    - Keep cattle away from construction sites
    - Completely remove old buildings and fences[15]

Guided Practice Activity

Topic 2.1 Task 3:

1. Observe the illustrations from **Task 1** again. Individually determine the following using **2.1 Key Facts**:

a. Which type of ruminant disease (infectious, parasitic, nutritional and metabolic, or traumatic) is each animal suffering from.

b. Which illustrations show preventative measures.

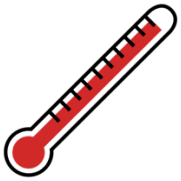
c. Compare your answers with a partner.

2. Now, determine which type of ruminant disease (infectious, parasitic, nutritional and metabolic, or traumatic) might be present in or associated with the photos below. Compare your answers with a partner.

[15] Turton, J. (2000). *Causes of disease in animals*. South Africa National Department of Agriculture. https://www.nda.agric.za/docs/Infopaks/diseases.htm

16

17



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3. Finally, observe the images provided by the trainer and determine if they indicate signs of infectious, parasitic, nutritional and metabolic, or traumatic diseases.

4. Verify your answers to all activities with your trainer. Ask for clarification as needed.

Application Activity

Topic 2.1 Task 4:

1. Read the scenario and complete the tasks in small groups:
   One farmer located in the surrounding area of the school has introduced new goats in his farm without first putting them into quarantine or vaccinating them.

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[16] Insight Pest Solutions. (2017, April 5). *Insight pest* [Illustration]. Flickr. https://www.flickr.com/photos/153628769@N03/33726575721
License: https://creativecommons.org/licenses/by-sa/2.0/legalcode; Credit to: https://insightpest.com/

[17] Philadelphia and London, W. B. Saunders Company. (1920). *Fig. 87 - Milk fever* [Photograph]. Flickr. https://www.flickr.com/photos/internetarchivebookimages/20547605819

[18] Ferreira, W. (2020, June 20). *Thermometer* [Illustration]. Pixabay. https://pixabay.com/illustrations/thermometer-temperature-fever-icon-5420066/

[19] Tarabara, S. (2017, October 27). *Barbed wire after rain* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Barbed_wire_after_rain.jpg
License: https://creativecommons.org/licenses/by-sa/4.0/legalcode

After a few days, 30% of the existing animals become sick, with very high temperatures, high mortality, discomfort, and lesions on the oral cavity. Their productivity has sharply dropped. The farmer calls for assistance.

In small groups, you must assist the farmer and work closely with the them to:

a. Identify the sick animals and signs of disease.

b. Identify the causes of the disease.

c. Differentiate it from other diseases.

d. Identify the preventive procedures to be taken.

2. Write a report addressing each of the points above. Elaborate and submit the report to your trainer. Remember to include preparation procedures.

Points to Remember

- Know the specific signs for each group of ruminant diseases.
- Avoid spreading diseases during diagnosis by wearing PPE and using disinfectant.
- Suspected animals shall be isolated immediately.
- Do not touch animals presenting signs of highly contagious diseases like Anthrax.
- It is prohibited to eat meat from sick animal.

Formative Assessment

1. Answer the following questions:

a. What are two examples of ruminant diseases caused by viruses?

1.

2.

b. What are two examples of ruminant diseases caused by bacteria?

1.

2.

c. What are the signs of parasitic diseases?

d. What are the signs of traumatic diseases?

2. Circle the right answer:

a. Brucellosis is a cattle parasitic disease.
b. Brucellosis is a metabolic and nutritional disease.
c. Brucellosis is a traumatic disease.
d. Brucellosis is an infectious disease.

3. Complete the following sentences:

a. Rough hair coat and diarrhoea are the main signs of ……. diseases.

b. Vaccination is one of the best measures to prevent …… diseases.

Topic 2.2: Spraying acaricides

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify the different types of acaricides.	**1.** Determine when and which acaricides to use.	**1.** Detail-oriented
2. Describe techniques of preparing and spraying acaricides.	**2.** Apply appropriate dilution and spraying techniques to acaricide use.	**2.** Methodical
3. Describe acaricide management and disposal procedures.	**3.** Perform acaricide waste disposal and storage tasks safely.	**3.** Forward-thinking

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

Topic 2.2 Task 1:

1. Start by brainstorming ideas on the following questions in small groups:
   a. What do you know about acaricides?

   b. How do farmers in your area apply acaricides?

   c. Which kind of acaricides do they use?

   d. How do you protect yourselves during acaricide application?

2. With the rest of the class, discuss:
   a. What is the relationship between acaricides and ruminant diseases?

3. Volunteer to share your responses with the rest of the class.

Problem Solving Activity

Topic 2.2 Task 2:

1. In small groups, consider the following questions:

a. When should acaricides be applied?

b. What are the dangers of using acaricides? What are the benefits?

c. What should we do if the concentration of a liquid acaricide is too strong?

d. What might happen if acaricide waste is not properly disposed of after use?

2. Share your group's discussion with the rest of the class.

2.2 Key Facts

- **Acaricides:** Pesticides that kill members of the arachnid subclass, Acari, which includes ticks and mites.
  - Ticks cause injuries to animals which leads to lower productivity and economic losses.
  - Acaricides are one part of a strategy for controlling ticks around homes and should be combined with measures to reduce tick habitats.[20]

- **Main Ingredients**: Permethrin, carbaryl, and pyrethrin
  - Pyrethroids are some of the safest and most effective

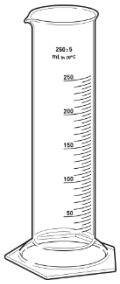
- **Common Types**:
  - Amitraz (Triatix 12.5%): Use against ticks, mange mites, and lice
  - Amitraz 12.5% (Norotraz 12.5%): Use against ticks and flies
  - Cypermethrin (Cypermethrin 30%): Use against lice, ticks, mites, and other ectoparasites
  - Cypermethrin 1% (Britz Dip): Use against ticks, lice, fleas, and flies
  - Carbaryl (Sevin Carbyl): Use against ticks, fleas, lice
  - Deltamethrin 5% (Decatix): Use against ticks, tsetse flies, and other pests resistant to organophosphates
  - Deltamethrin 1% (Spoton): Use against ticks, tsetse flies, nuisance flies, and cattle lice

- **Types:**
  - Liquid: May be sprayed or used as pour-on
    - Pour-on is applied along the back of an animal to treat ectoparasites, but may not reach lower surfaces of the animal's body
  - Powder: Mixed with feed or water

[20] Wikipedia. (n.d.). *Acaricide*. Retrieved 2019, from https://en.wikipedia.org/wiki/Acaricide

- **Application:**
  - Spraying: Most common application of acaricides
  - Age: Should not be applied to young animals
  - Physiological effect: Acaricides may negatively affect an animal's way of life, growth, and reproduction

- **Dilution:**
  - Use to adjust the concentration of solution according to the manufacturer's instructions
  - Strictly adhere to the recommended dose and new solution type
  - Use a graduated cylinder to measure the appropriate amounts of solution.



Formula: $C_1V_1 = C_2V_2$[21]

V_1 = Volume of stock solution needed to make the new solution

C_1 = Concentration of stock solution

V_2 = Final volume of new solution

C_2 = Final concentration of new solution

- **Environmental Impact and Precautions:**
  - Products are toxic and could harm the environment if not used properly
  - Do not use more than the recommended dose and pay attention to use on young animals, pregnant females, tired animals, and animals with skin lesions
  - Use with special attention and always read the manufacturer's instructions

- **Waste Disposal:**
  - After use, it is recommended to safely dispose of empty containers into the appropriate trash bin.
  - Avoid using empty containers for food or other purposes.

- **To ensure effectiveness:**
  - Apply at regular intervals
  - Use the recommended concentration, not too weak
  - Use the appropriate acaricides for the given species of tick or pest

[21] Quansys Biosciences. (n.d.). *Dilutions: Explanations and examples of common methods*. https://dilutions.quansysbio.com/dilutions-explanations-and-examples/#:~:text=To%20make%20a%20fixed%20amount,Final%20volume%20of%20new%20solution

Guided Practice Activity

Topic 2.2 Task 3:

1. Imagine that you have been tasked with spraying acaricides to prevent ticks from attaching to and transmitting diseases to the cattle on your farm. What steps do you take the prepare the acaricidal solution for application? Write these.

2. Verify your responses with the trainer.

3. For this application, you will need to dilute the acaricidal solution. The manufacturer's label says that 40 mL of solution should be used for every 500 mL of water. You need 4000 mL (or 4 litres) of water to treat the cattle. How much solution should you use? Recall and use the formula from **1.3 Key Facts**:

$$\frac{\text{Given solution}}{\text{Given water}} = \frac{\text{Solution needed}}{\text{Water needed}}$$

4. For this application, you will need to dilute the acaricidal solution. The manufacturer's label says to create 50 mL of solution at 10% concentration, using Deltamethrin 5% concentrate. How much Deltamethrin is required? Use the formula: $\mathbf{C_1V_1 = C_2V_2}$ from **2.2 Key Facts**.

5. After spraying, there isn't any acaricide solution remaining. What should you do?

6. Share you answers to 3, 4, and 5 with the class and verify your responses with the trainer.

Application Activity

Topic 2.2 Task 4:

1. Visit a ruminant farm with your class.

2. Identify the available acaricides at the farm:
   a. Are they powder or liquid?

   b. Read the label. Do the solutions need to be diluted before use?

3. Observe the farmer while he or she demonstrates how to properly apply acaricides.

4. If the farmer gives permission, take turns spraying the acaricides in small groups.
   a. Identify and wear Protective Personal Equipment (PPE), including gloves, protective eyewear (glasses or goggles), and close-toed shoes.

   b. Ask the farmer or another worker for help as needed.

5. Safely dispose of the waste after, if needed.

6. Ask the farmer any remaining questions you have about applying acaricides to ruminants.

7. After the visit, share your experiences by discussing the following questions:
   a. What did you learn?
   b. What surprised you?
   c. What information do you still need?

Points to Remember

- Acaricides can pose hazards to humans, animals, and the environment.
- Always wear PPE (gloves, eyewear, close-toed shoes) before handling chemical products.
- Before using acaricides, read the label and follow manufacturer's instructions.
- After use, be sure to safely dispose of empty containers.

Formative Assessment

1. Write the answers to the following questions:
   a. Why should you wear Personal Protective equipment (PPE) while handling acaricides?

   b. What PPE should you use?

   c. List three acaricides used in Rwanda.
      1.
      2.
      3.

   d. What is the most popular application method to control ticks?

2. Complete the following sentences:
   - Acaricidal products are toxic and could harm the ……. if not used properly.

   - You should use a …… …… to measure dilution quantities.

   - Ticks cause injuries to animals which leads to lower ……. and economic …….

Topic 2.3: Deworming ruminants

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify wormicides and their purpose.	**1.** Select wormicides for an appropriate purpose.	**1.** Decisive
2. Describe procedures for administrating wormicide.	**2.** Select the appropriate technique and dosage for administering wormicide.	**2.** Methodical
3. Describe wormicide waste disposal procedures and their significance.	**3.** Dispose wormicide waste safely.	**3.** Risk-aware

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

Topic 2.3 Task 1:

1. In small groups, brainstorm responses to the following questions:
   a. What do you know about deworming?

   b. Have you ever seen farmers in your area deworm their ruminant animals?

   c. What does this process look like?

   d. What tools, equipment, and materials do they use?

   e. Why do you think farmers deworm their animals? Consider the effects of parasitic diseases from **Topic 2.1**.

2. Share your responses with the rest of the class and discuss.

Problem Solving Activity

Topic 2.3 Task 2:

1. Individually reflect on the following questions:
   a. Think back to acaricides from **Learning Outcome 2.2**. What were the different types of acaricides?

   b. Do you think there could be different types of wormicides—drugs used to deworm ruminants—as well? What different types or forms of wormicides could there be?

   c. If you are given wormicides in the form of liquid, tablets, and powder, how might you use each of these to the animal? What are the actions you would take?

2. Share your answers in small groups.

3. With your group, consider the following:
   a. What might happen if an animal is not given the proper dosage, or amount, of a wormicide? Will the wormicide still work?

   b. What could happen if the wormicides are not stored or disposed of properly?

4. Present your group's predictions to the rest of the class.

5. Your trainer will assign your group a section of **2.3 Key Facts** (below) to read, discuss, and present to the rest of the class. After each presentation, identify if your predictions for questions 1 and 3 were correct. Discuss why or why not.

2.3 Key Facts

- **Deworm:** To treat an animal in order to remove endoparasitic worms
  - Worms cause parasitic diseases which threaten animal health and productivity and therefore result in economic losses
  - Use wormicides, which include anthelmintic drugs, to remove parasites without harming the animal (host) and prevent parasitic diseases.

- **Types and Administration of Wormicide:**
  - **Tablets**: Also called boluses; administered orally; must observe animal to be sure it has been swallowed

- **Liquid**: Can be administered orally by drenching with a syringe, poured on directly to the animal's skin, or injected subcutaneously (under the skin); measured with graduated cylinder
- **Powder**: Administered by adding to feed; easier than restraining each animal; ineffective if animal does not eat the full dose[22]

- **Wormicide Selection Criteria:**
  - Animal being treated (calf vs. cow, beef vs. dairy)
  - Product efficacy
  - Ease of application
  - Cost effectiveness
  - Slaughter/milk withdrawal time
  - Personal safety

- **Storage and Disposal:**
  - Store wormicides securely and away from direct sunlight, according to the manufacturer's instructions.
    - For example, refrigerated or at 4°C
  - Always check the 'use by' date, and once open, use within the time shown on the packaging.

- **Anthelmintic Drug Use/Dosage**
- Common Types: Antinematodals/Nematocides, Anticestodals/Cestocides, Antitrematodals/Trematocides
    - First class of antinematodals is Benzimidazoles, which includes Thiabendazole, Fenbendazole, Oxibendazole, Albendazole, Oxfenbendazole
- Read manufacturer's instructions for dosage
- Lower or incorrect dosages lead to anthelmintic resistance in the animal
- Be sure to convert measurements if necessary

- Calculating Dosage:
    - Liquid[23]

      (D / H) x Q = X

      D = Desired dose

      Q = Quantity of solution per strength on hand

[22] Morter, R. L., & Horstman, L. (n.d.). *Treating for internal parasites of cattle*. School of Veterinary Medicine - Purdue University. https://www.extension.purdue.edu/extmedia/VY/VY-51.html

[23] Toney-Butler, T. J., & Wilcox, L. (2020, January 6). *Dose calculation: Desired over have formula*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK493162/

H = Strength on Hand

X = Unknown quantity of drug

- Tablet[24]

  W / U = A / X

  W = Weight given

  Unit = Units given

  A = Actual weight of animal

  X = Number of units needed

Guided Practice Activity

Topic 2.3 Task 3:

1. Imagine you have been tasked with deworming the cattle at your farm. Due to supply constraints, you will use wormicide tablets for half of the cows and liquid wormicide for the other half. Work individually and use **2.3 Key Facts** to guide and inform your answers.

a. Tablet Dosage: Each cow weighs 600 kg. The manufacturer's instructions say that a cow should receive 1 tablet for every 150 kg of weight. How many tablets should you give to one cow? Use the formula from **2.3 Key Facts**.

b. Liquid Dosage: Each cow requires 50 mg of Anthelmintic drugs. You have a wormicide solution with 25 mg of anthelmintic drugs per 5 mL. How many mL of solution do you need for each cow?

2. How will you apply each of these types of wormicide?

a. Tablets:

b. Liquid solution:

[24] LA County Department of Public Health. (n.d.). *Study Guide*. https://publichealth.lacounty.gov/phn/docs/MCE%20Study%20Answer%20Sheetrevised6-10.pdf

3. Now that you have applied the wormicides appropriately, you must store the tablets and dispose of the liquid container. How should you do this?
   a. Tablets:

   b. Liquid solution:

4. Compare your answers with a partner. Then, review the correct answers with the trainer and ask for clarification as needed.

5. As a class discuss:
   a. Do you think deworming procedures are different for cattle than for sheep and goats?

   b. Why or why not?

6. With your class, read and review the **2.4 Key Facts** on the differences in deworming between cattle and sheep/goats.

2.4 Key Facts

- **Deworming Cattle**
  - Commonly infected by roundworms (nematodes), tapeworms (cestodes), and flukes (trematode).
  - Roundworms are considered the most economically devastating internal parasites.
  - Tapeworms, which are visible in the manure, can cause weight loss and death in extreme cases.
  - Tapeworms can be controlled by administering an anthelmintic drug from the benzimidazole family[25]

- **Deworming Sheep/Goats**
  - Sheep and goats are susceptible to worms due to their close grazing behaviour and slow-to-develop immunity.
  - Lambs should be dewormed at approximately 8 weeks of age, and again every 4-8 weeks until one year of age.
  - Ewes should be dewormed 2-4 weeks before lambing to reduce the passage of parasites to the lambs.
  - At least once per year, sheep/goats should be dewormed for tapeworms.[26]

[25] Ul Haq, S. (2013, December 14). *Deworming in animals: An overview of Anthemintics*. LinkedIn SlideShare. https://www.slideshare.net/ShifaUlHaq/deworming-in-animals
[26] Ul Haq, S. (2013, December 14). *Deworming in animals: An overview of Anthemintics*. LinkedIn SlideShare. https://www.slideshare.net/ShifaUlHaq/deworming-in-animals

Application Activity

Topic 2.3 Task 4:

1. You are going to visit a farm and interview a farmer with your class. Prepare 5 questions about the deworming process to ask the farmer.
   1.

   2.

   3.

   4.

   5.

2. In a small group, share your questions and select the 5 most important questions to ask the farmer about deworming ruminant animals. Write the selected questions below:
   1.

   2.

   3.

   4.

   5.

3. Now, visit the farm. Each group should interview the farmer using their 5 questions. Note the farmer's responses to each question. Do not ask a question that has already been asked.

Question	Answer

4. Observe while the farmer applies wormicide to an animal. Note your observations:

5. After the visit, discuss:

a. What did you observe?

b. What did you learn that was not covered in the **Key Facts**?

c. What information do you still need?

Points to Remember

- Always wear PPE before and while handling chemical products.
- Always read the wormicide manufacturer's instructions to determine the dosage and application method.
- Under-dosing can lead to poor efficacy and it can also reduce the duration of protection.
- Over-dosing can lead to a risk of toxicity, although most wormicides have a wide safety margin.

Formative Assessment

1. Write answers to the following questions:

a. What are three factors to be considered when selecting wormicide?

1.

2.

3.

b. What type of drug is used in wormicides?

c. Why is it necessary to avoid under-dosing during deworming?

2. Complete the following sentences:

a. Lambs should be wormed at approximately …… …… of age, and again every …… until one year of age.

b. At least …… per year, goats/sheep should be dewormed for tapeworms.

c. …….. are considered the most economically devastating internal parasites of livestock.

Self-Reflection

1. You have come to the end of the unit. You are going to do the survey you did at the beginning of the unit again to help you do self-assessment of your knowledge, skills and attitudes.

Again, there are no right or wrong answers to this survey. It is for your own use to gauge your knowledge, skills and attitudes after the unit. Read the Knowledge, Skill or Attitude in the left column. Think about yourself: do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation.

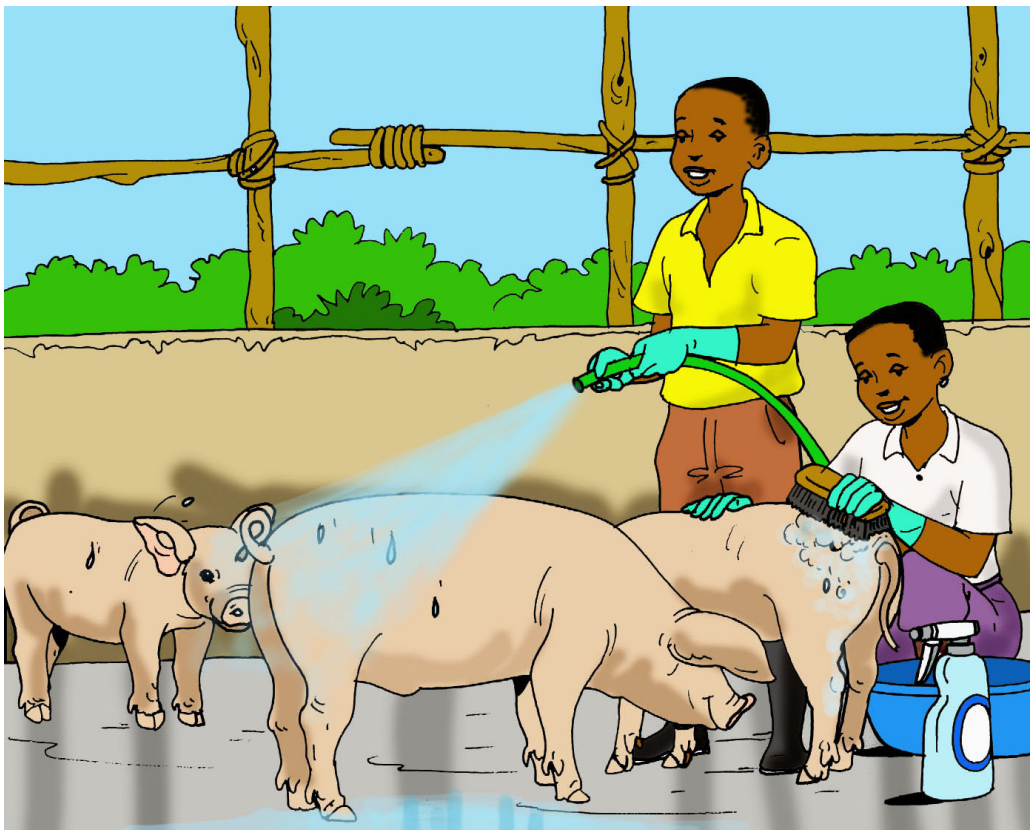
My experience Knowledge, skills, and attitudes	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Describe causes of ruminant diseases.					
Describe signs and symptoms of ruminant diseases.					
Apply preventive procedures to avoid ruminant diseases.					
Identify the different types of acaricides.					
Apply appropriate dilution and spraying techniques to acaricide use.					
Describe acaricide management and disposal procedures.					
Identify wormicides and their purpose.					
Select the appropriate technique and dosage for administering wormicide.					

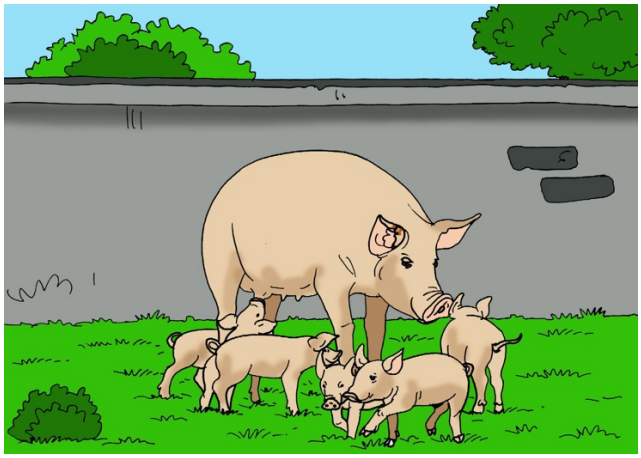
Describe wormicide waste disposal procedures and their significance.					

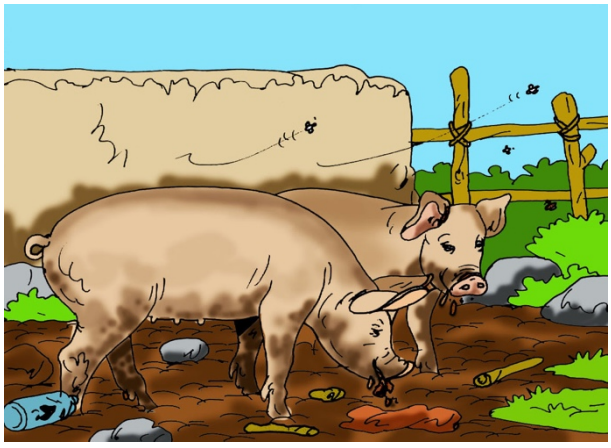
2. Complete the table below by identifying areas from the unit where you have improved and where you need improvement along with the actions/strategies you will use to help you improve when receiving and interpreting information in the workplace.

Areas of strength	Areas for improvement	Actions to take to improve
1.	**1.**	**1.**
2.	**2.**	**2.**

Unit 3: Prevent pig diseases







Topics

3.1 Assist in identification of diseases

3.2 Spray acaricides

3.3 Deworm pig

3.4 Wash pig

Unit Summary:

This unit is related to the identification of infectious, parasitic, metabolic and nutritional, and traumatic diseases of pigs. Causes and signs of these diseases will be covered as well as preventative measures such as spraying acaricides, deworming, and washing pigs. This unit will also cover wearing PPE and appropriate management of acaricide and wormicide waste.

Self-Assessment: Unit 3

1. Look at the illustration. What do you see? What do you think this unit will be about? What topics might be covered?

2. Fill in the self-assessment below.

There are no right or wrong ways to answer this survey. It is for your own use during this course. The trainer will read a skill that is listed in the left column. Think about yourself: Do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation. At the end of this unit, we'll take this survey again.

My experience **Knowledge, skills and, attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Describe the causes of pig diseases.					
Describe signs and symptoms of pig diseases.					
Differentiate between signs and symptoms of different pig diseases.					
Apply preventive procedures to pigs and their living spaces.					
Identify and interpret the different types and uses of acaricides.					
Describe techniques of spraying acaricides.					
Describe acaricide waste disposal procedures.					

Select appropriate wormicide to prevent pig disease.					
Describe techniques and procedures for deworming pigs.					
Manage proper safety and waste disposal procedures.					
Identify detergents to wash pigs and when to use them.					
Describe techniques for restraining pigs.					
Describe procedures for washing pigs.					

Topic 3.1: Assist in identification of diseases

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the causes of pig diseases.	**1.** Identify the causes of pig diseases in order to prevent them from occurring in the future.	**1.** Accurate
2. Describe signs and symptoms of pig diseases.	**2.** Differentiate between signs and symptoms of different pig diseases.	**2.** Detail-oriented
3. Explain preventive procedures of pig diseases and their significance.	**3.** Follow preventive procedures for pigs and their living spaces.	**3.** Forward-thinking

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

Topic 3.1 Task 1:

1. Look at the illustrations for learning unit 3.

a. What items do you see?

b. What kind of information do the illustrations provide?

c. Describe your observations to a partner.

2. With a partner, discuss:
   a. What pig diseases do you know?

   b. Which of the illustrations above show pig diseases? How do you know?

   c. What are other signs of pig diseases?

3. Share some of your ideas with the rest of the class.

Problem Solving Activity

Topic 3.1 Task 2:

1. In small groups, discuss:
   a. What similarities do you think there are between ruminant diseases and pig diseases?

   b. What differences do you think there are between them?

   c. Based on what you know about ruminant diseases from unit 2, what do you think we can do to prevent pig diseases?

   d. What is the difference between prevention and treatment? Which do you think is better for animal health?

2. Share and compare your group's ideas with the rest of the class.

3. With the class, read and review **3.1 Key Facts.**

4. Return to questions 1a, 1b, and 1c. Discuss the following questions:
   a. Discuss if their ideas and predictions were correct.
   b. How are ruminant diseases and pig diseases different?
   c. How are they the same?

3.1 Key Facts

- **Infectious Diseases**
  - **Common**
    - Bacterial: Anthrax (Bacillus anthracis), Brucellosis (Brucella species), Erysipelas (Erysipelothrix rhusiopathiae), Mastis, Greasy Pig Disease
    - Viral: Classical Swine Fever/RNA virus, African Swine Fever/Virus
  - **Causes**
    - Presence and spread of harmful bacteria and/or viruses in the body
  - **Signs**
    - Fever of up to 41.5^0 C
    - joint pain or physical trembling, arthritis
    - High or sudden mortality
    - Fatigue, lack of appetite
    - Dyspnoea (difficulty breathing), respiratory distress
  - **Prevention**
    - Early isolation/quarantine
    - Regular disinfection
    - Vaccination
    - Proper burial of disposed carcasses

- **Parasitic Diseases**
  - **Common:**
    - **Endoparasites (internal):** Roundworms (nematodes), tapeworms (cestodes),
    - **Ectoparasites (external):** Scabies (Sarcoptic mange), mites (Demodex phylloides mange)
  - **Causes**
    - Parasites live in or on the animal (its host) for long or short periods of time
    - Parasites are vectors, which mean they can pass diseases to the animal (host)
  - **Signs**
    - **Endoparasites (internal):** Weight loss, blood loss (anaemia), sudden death, emaciation, swollen belly
    - **Ectoparasites (external):** Thick and crusted skin, death, blood loss (anaemia), itchy skin with red spots, body discoloration
  - **Prevention**
    - Don't allow pigs to feed on faeces
    - Proper hygiene and sanitation
    - Deworming on arrival and before putting in fattening house, except for piglets younger than 3 weeks old

- Wash the sow at least twice once per week; boars at least four times per year

- **Nutritional and Metabolic Diseases**
  - **Common**
    - Nutritional anaemia
  - **Causes**
    - Protein deficiency
    - Fat deficiency
    - Mineral deficiency, especially iron
    - Vitamin deficiency
  - **Signs**
    - Pale skin
    - Jaundice
    - Blood in faeces
    - Early death
    - Weak piglets
  - **Prevention**
    - Provide additional iron to pigs via injection or iron paste
    - Feed pigs highly nutritious compost, including wood ash and other minerals

- **Traumatic Diseases**
  - **Common** Bush Foot, face necrosis, fractured limbs
  - **Causes**
    - Fighting
    - Housing defects
    - Stepping on hazardous items such as metal
    - Poor floor surfaces
  - **Signs**
    - Difficulty walking and/or moving naturally
    - Skin lesions
  - **Prevention**
    - Keep potentially hazardous materials, such as metal, secured or stored away
    - Stop pigs from fighting each other
    - Maintain proper housing standards
    - Check the procedures for removing nails and teeth[27]

[27] Food and Agriculture Organization of the United Nations. (2009). *Farmer's hand book on pig production: For the small holders at village level*. https://www.fao.org/ag/againfo/themes/documents/pigs/Handbook%20on%20Pig%20Production_English%20layout-Vietanm-Draft.pdf

Guided Practice Activity

Topic 3.1 Task 3:

1. Separate into 4 groups according to the trainer's instructions.

2. Look at the photos provided by the trainer. Use **3.1 Key Facts** to do the following:
   a. Determine if the photo depicts an infectious, parasitic, nutritional and metabolic, or traumatic disease.

3. Your trainer will assign your group one of the types of diseases. It is your group's objective to identify the exact disease displayed in the photos that fall under your category. Your group should do the following:
   a. Research, using available resources including manuals, books, internet, and local professionals.

   b. Determine the exact type of disease and the evidence.

   c. Present the findings/conclusion to the rest of the class. Cite the sources used.

4. Now, imagine you are at a farm and you notice that one of the pig's has skin that is much paler than the others. Blood has also been appearing in their faeces.
   a. What could be the problem?

   b. What might have caused this problem?

5. At a local farm, you notice that the conditions of the pig area is very dirty. The pigs are covered in dirt and haven't been washed in weeks. You see a few of them eating faeces from a pit latrine behind their living area.
   a. What should be done?

   b. What are the potential consequences of these circumstances?

6. Discuss your answers with the class. Use **3.1 Key Facts** for guidance and clarification.

Application Activity

Topic 3.1 Task 4:

1. Visit a local farm with your class.

2. Observe the pigs closely and note any unusual behaviour or activity below:

3. Compare your notes with a partner.
4. In small groups, discuss whether you think any of the animals are showing signs of infectious, parasitic, nutritional and metabolic, and/or traumatic diseases. Note your observations in the table below:

Disease	Present? Yes or No	Observed Signs
Infectious		
Parasitic		
Nutritional and Metabolic		
Traumatic		

5. Share your group's observations with the rest of the class and the farmer.
   a. Verify your observations with the farmer.

6. Ask the farmer what preventative measures he/she takes to avoid the spread of these diseases. What tools or products does he/she use?

Points to Remember

- Observe the behaviour of pigs, such as the status of their manure, normal temperatures, and normal breathing, to identify and prevent diseases
- Avoiding spreading diseases during diagnosis by wearing PPE and maintaining good hygiene
- Suspected animals should be isolated immediately
- Do not touch and open suspected animals presenting signs of highly contagious disease like Anthrax or Swine Fever

Formative Assessment

1. Answer the following questions:

a. What are two examples of pig diseases caused by a virus?

1.

2.

b. What are three examples of pig diseases caused by bacteria?

1.

2.

3.

c. What are the signs of nutritional disease in pigs?

d. What measures can be taken to prevent parasitic diseases in pigs?

Topic 3.2: Spraying acaricides

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify and interpret the different types and uses of acaricides.	**1.** Select the appropriate acaricides for the given situation.	**1.** Detail-oriented
2. Describe techniques of spraying acaricides.	**2.** Prepare acaricides by diluting as needed and use acaricides by spraying.	**2.** Detail-oriented
3. Describe acaricide waste disposal procedures.	**3.** Dispose acaricide waste safely.	**3.** Forward-thinking

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

Topic 3.2 Task 1:

1. As a class, brainstorm responses to the following questions:

- **a.** What do you know about spraying acaricides?
- **b.** What do you remember about acaricides from Learning Unit 2: Preventing ruminant diseases?
- **c.** Do you think acaricides can be applied to pigs in addition to ruminants?
- **d.** How can you protect yourself during acaricide spraying?

2. Volunteer your ideas and discuss.

Problem Solving Activity

Topic 3.2 Task 2:

1. In small groups, discuss the following questions:

- **a.** Why do we use acaricides? What do they prevent and treat?

b. What should you do if the concentration of an acaricide solution is too strong? Recalling from unit 2, what is the formula for calculating this process?

c. Why is it important to properly dispose of acaricide waste? What are the potential consequences?

2. Prepare to present your work to the rest of the class.

3. Read through **3.2 Key Facts** and complete the following tasks:

a. Identify additional types of acaricides for pigs.

b. Identify additional application methods for pigs.

4. Ask your trainer to clarify any information from **3.2 Key Facts** that is unclear.

3.2 Key Facts

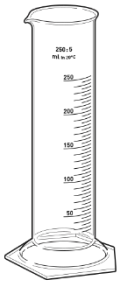
- **Acaricides:** Pesticides that control mites or ticks

- **Types**
  - **Ready to Use (RTU)**
    - Does not require mixing or combining with other ingredients or diluents
    - Usually comes in a container that serves as the application device, such as an aerosol can, pour-on bottle, roll-on, spot-on, or spray bottle
    - May include ointments or gels that help prevent fly bites
    - Very expensive
  - **Powders**
    - Concentrates in solid, powdered form
    - Mix with water before using
    - Can be sprayed after mixing
  - **Emulsifiable concentrates**
    - Liquids that must be mixed with water before application
    - Can be sprayed after mixing or sponged on the animal
  - **Shampoo**
    - A formulation of insecticide and other ingredients that is applied to an animal's wet hair coat and worked into lather.
  - **Feed additive or bolus**

- Formulations mixed into salt blocks with feed
- Bolus is fed directly to the animal

- **Application:** Depends on the target pest, the formulation chosen, and the number of animals or size of area to be treated
  - **Spraying:** To spread liquid in small drops over an area
  - **Wipes:** Used as direct applications to animals; cloths or sponges are saturated with the pesticide and used to wipe the animal.
  - **Pour-on:** High-concentrate, low-volume formulations applied directly to animals; quick and simple method of applying insecticides to livestock; typically applied by a veterinarian.

- **Dilution**
  - Must be done as recommended through manufacturer's instructions
  - Strictly adhere to the recommended dose and new solution type
  - Use a graduated cylinder to measure the appropriate amounts of solution.



Formula: $C_1V_1 = C_2V_2$[28]

V_1 = Volume of stock solution needed to make the new solution

C_1 = Concentration of stock solution

V_2 = Final volume of new solution

C_2 = Final concentration of new solution

- **Swine Pest Control Acaricides**
  - Taktic 12.5% (amitraz)
    - Controls lice
    - Spray
    - Mix 30 ml in 8 liters of water
  - Permethrin II (permethrin)
    - Controls mange mites
    - Pour-on
    - 3 mL per 45 kg of body weight
  - Ivomec 1%
    - Controls lice
    - Inject subcutaneously (below the skin)
    - 1 mL for 34 kg of body weight

[28] Quansys Biosciences. (n.d.). *Dilutions: Explanations and examples of common methods*. https://dilutions.quansysbio.com/dilutions-explanations-and-examples/#:~:text=To%20make%20a%20fixed%20amount,Final%20volume%20of%20new%20solution

Guided Practice Activity

Topic 3.2 Task 3:

1. Work with a partner to complete the following tasks. Refer to **3.2 Key Facts** for guidance.

2. Imagine you are going to use an acaricide solution on a pig at the farm. The pig is suffering from mange mites.

   a. Which type of acaricide should you use?

   b. How much of this solution do you need if the pig weighs 90 kg? Show your calculations below:

   c. You have a solution at a concentration of 0.50 per 1 mL. You want a concentration of 0.25. How much solution do you need to add to reach the total volume calculated above? Show your calculations below:

3. Using a sample acaricide provided by your trainer, read and interpret the label.
   a. What is the name of the solution?

   b. What is the recommended application type?

   c. Does the solution need to be diluted for a pig that weighs 50 kg? If so, calculate the final volume of the solution.

4. Your neighbour is planning to use acaricides with the pigs on his farm. Write down the precautions he should take before and after using acaricides?

Application Activity

Topic 3.2 Task 4:

1. Before visiting a local farm with your class, below, write down the procedure for using acaricides with a small group:
2. Visit a local farm with pigs.

3. Verify the written acaricides procedures with the farmer.

4. Identify the available acaricides.

5. Observe the farmer while he/she demonstrates how to apply the acaricides to a pig.

6. With permission from the farmer, take turns assisting the farmer with applying acaricides to the pigs. Be sure to wear Personal Protective Equipment (PPE).

7. Briefly discuss the experience with your small group and come up with any remaining questions you have about the process of applying acaricides. Ask these questions to the farmer or another worker before leaving the farm.

Points to Remember

- When applying insecticides do not contaminate feed or drinking water.
- Before using any pesticide, read the label for specific instructions and slaughter restrictions.
- Do not treat pigs less than 3 months old, or sows within 2 weeks before farrowing or 3 weeks after farrowing.
- To minimise acaricide resistance, do not apply the same acaricide, or acaricide within the same chemical class (particularly pyrethroids), repeatedly throughout an entire season. See product labels for use rates.
- Insecticides can pose hazards to humans, animals, and the environment.
- Always adorn PPE before manipulating chemical products.
- New animals added to the herd should be treated before coming into contact with other animals.

Formative Assessment

1. Answer the following questions:

a. What are the advantages and disadvantages of using Ready-to-Use acaricides?

b. List three acaricides used in Rwanda to control pig diseases:

1.

2.

3.

c. List two techniques of applying acaricides in pig disease prevention.

1.

2.

Topic 3.3: Deworm pigs

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify wormicides and their purposes.	**1.** Select appropriate wormicide to prevent pig disease.	**1.** Detail-oriented
2. Describe techniques and procedures for deworming pigs.	**2.** Administer wormicide to pigs by following the correct procedures.	**2.** Methodical
3. Describe wormicide safety and waste disposal procedures.	**3.** Manage proper safety and waste disposal procedures.	**3.** Risk-aware

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

Topic 3.3 Task 1:

1. Brainstorm responses to the following questions with a partner. Think back to Unit 2: Prevent ruminant diseases.

a. What do you know about deworming?

b. What is the role of deworming?

c. What type of pig disease does deworming prevent?

d. How do farmers in your area deworm their pigs?

e. What tools, equipment, and products do they use? If you aren't sure, what do you suspect they use?

f. Do you think deworming pigs is the same process as deworming ruminants? Explain why or why not.

2. Share your responses and discuss with the class.

Problem Solving Activity

Topic 3.3 Task 2:

1. Consider the following questions individually:
   a. Why is it important to deworm pigs?

   b. What would happen if pigs were not dewormed?

   c. What is the role of wormicide in disease prevention?

   d. What precautions need to be taken while using wormicides? Why?

2. Share your ideas with a partner. Did you come to the same conclusions?

3. Discuss your ideas with the rest of the class.

4. Read through **3.3 Key Facts** with your class. As you are reading do the following:
   - ✔ Check or tick which aspects of deworming pigs are the same as deworming ruminants.
   - ○ Circle which aspects of deworming pigs are different from deworming ruminants.
   - ❖ Star any new information.

5. Compare your checks, circles, and stars with a partner.

3.3 Key Facts

- **Deworming**
  - Endoparasites can be controlled by administering an Anthelmintics from the benzimidazole family.
  - Always check the 'use by' date, and once open, use within the time shown on the packaging.

- **Pig Worms**
  - **Ascaris suum:** large roundworm
  - **Hyostrongylus rubidus:** stomach worm, particularly in sows kept outdoors

- **Oesophagostomum dentatum:** nodular worm, associated with "thin sow syndrome"
- **Trichuris suis:** whipworm; resides in the colon (large intestine) and produces colitis in growing pigs
- **Metastrongylus apri**: pig lungworm; earthworm is an intermediate host

- **Wormicide Types:** Powder, tablets, liquid

- **Administration of Wormicide**
  - **Equipment:** Syringe, Personal Protective Equipment (PPE)
  - **Orally:** Insert tablets or liquid directly into animal's mouth
  - **Feed mixing:** Mix powder with animal's feed; be certain it is consumed
  - **Injection:** Subcutaneous (below the skin) or intramuscular (deep into the muscle)

- **Dosage**
  - Amount of wormicide administered to an animal
  - Might need to be adjusted according to the animal's weight
  - Read the manufacturer's label for specific instructions
  - Tools: Graduated cylinder (liquid), scale (powder)

- **Pig Wormicides**
  - **Avermectins** (Ivermectin and Doramectin)
    - **Type**: Liquid or tablets
    - **Administration**: Injection or oral
    - **Dosage**: 1 mL per 33kg bodyweight (injection); 100 µg/kg bodyweight/day for 7 days (oral feeding)
    - **Notes**:
      - Injected doses tend to have prolonged activity in the body so developing larvae will also be killed as they mature, but not eggs
      - Highly effective in preventing infection in young piglets

  - **Fenbendazole:**
    - **Types**: Tablets or powder
    - **Administration**: orally
    - **Dosage**: 5 mg per 1 kg bodyweight
    - **Notes**: Effective at controlling all the major roundworms (nematode parasites) of the pig

  - **Flubendazole**
    - **Types:** Powder
    - **Administration:** Feed mixing

- **Dosage:** 30 mg / kg of feed; fed for 10 days to sows or 5 days to growing pigs
- **Notes:** May require repeated dosing, dependent upon the pig-keeping system and challenge of infection

- **Specifications**
  - **Replacement Stock:** Newly introduced animals should be de-wormed on arrival
  - **Backyard Pigs**: Any pigs that are kept on permanently occupied ground that has a long history of pig occupation should be de-wormed regularly
  - **Breeding Pigs:** Should be wormed every three months
  - **Environment:** When worm presences become extreme, the ground should be abandoned for pig keeping; there is no environmentally acceptable way of sterilizing soil if Ascaris or Trichuris eggs are present.[29]

- **Deworming Schedule**
  - **Boars:** Every 6 months
  - **Sows:** 2 weeks before farrowing and after weaning
  - **Piglets:** 1 week after weaning[30]

Guided Practice Activity

Topic 3.3 Task 3:

1. A local farmer needs technical assistance. He has ten pigs and three of them have the following signs: poor growth, rough grey hair coat, swollen belly, and emaciation.

2. Outline the steps the farmer should take to address this problem. Include preparation and disposal steps. Use **3.3 Key Facts** for guidance if needed.
Step 1:

Step 2:

Step 3:

Step 4:

[29] Responsible Use of Medicines in Agriculture Alliance (RUMA). (2015, September 22). *Anthelmintics in pigs*. https://www.ruma.org.uk/pigs/anthelmintics-pigs/

[30] Towers, L. (2016, January 8). *How to farm pigs: Health issues*. The Pig Site. https://thepigsite.com/articles/how-to-farm-pigs-health-issues

Step 5:

Step 6:

Step 7:

3. Verify your responses with the trainer.

4. You have chosen to administer Ivermectin to the pigs. Each pig weighs 99 kg.

a. What tools do you need to measure dosage?

b. What dosage should each pig receive?

c. What is the total amount of Ivermectin needed for this treatment?

5. Verify your responses with the trainer.

Application Activity

Topic 3.3 Task 4:

1. Visit a local farm with pigs. With the guidance of the farmer, identify the available wormicides on the farm.

2. Ask the farmer the following questions and add two of your own. Write his responses in the table:

Questions	Answers
Which wormicide do you prefer or use most often? Why?	
How often do you deworm the pigs?	
Which parasites are most common on your farm?	

3. Observe the farmer as he demonstrates how to properly deworm a pig.

4. If permitted by the farmer, take turns administering wormicide to a pig.

5. In small groups, create a manual for deworming pigs. Be sure to address these points in your manual:

a. How do you know when it is necessary to deworm a pig?

b. What are the steps to deworming a pig?

c. What precautions must be taken to ensure environmental and personal safety?

6. Submit your manual to the trainer for review.

Points to Remember

- Before choosing a worming product, it is good practice to determine the pig's approximate weight.
- Don't forget to adjust the dosage depending on the size of the pig and the manufacturer's instructions.
- Under-dosing can lead to poor efficacy and over-dosing can lead to a risk of toxicity.

Formative Assessment

1. Answer the questions below:

a. What equipment is necessary to deworm pigs?

b. Explain how to adjust the dosage for a given animal.

c. At what point should the ground be abandoned for pig keeping?

d.

2. Select **True** or **False** for the following statements:

- ❑ It is not necessary to deworm new animals that have just arrived on the farm.
- ❑ The main drugs used in wormicides are anthelmintics.
- ❑ Breeding pigs should be dewormed once per year.
- ❑ Avermectins are highly effective in preventing infection in young piglets.

Topic 3.4: Wash pig

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify detergents to wash pigs and when to use them.	**1.** Select appropriate time and detergent to wash pigs.	**1.** Detail-oriented
2. Describe techniques for restraining pigs.	**2.** Apply techniques for restraining pigs.	**2.** Persistent
3. Describe procedures for washing pigs.	**3.** Perform washing procedures.	**3.** Methodical

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

Topic 3.4 Task 1:

1. Brainstorm responses to the following questions individually:
   a. What do you know about preventing pig diseases?

   b. What is the most common and regular method of preventing pig diseases?

   c. People say that pigs are dirty animals. Is it true in your opinion? Why or why not?

2. Share your ideas with a partner and then the rest of the class.

3. Discuss with the rest of the class why it is recommended to wash pigs.

4. What do you expect to know and be able to do at the end of this learning topic?

Problem Solving Activity

Topic 3.4 Task 2:

1. In small groups, discuss the following questions:
   a. Based on your knowledge from Learning Topic 1: Maintain safety and hygiene, what materials do you think are needed to wash a pig?

b. Pigs are active animals and easily frightened. You need to restrain one at a time in order to clean it. How could you do this? What strategies could you try?

c. What do you think is the ideal temperature for washing a pig? Why?

2. Compile your answers and prepare to present them to the rest of the class. Use the flipchart to present your points.

3. After all groups have presented, discuss the various ideas as a class.

4. Now look at **3.4 Key Facts.** Read through the facts as a class. Confirm or correct your responses to question 1.

3.4 Key Facts

- **Washing Pigs**
  - To control internal and external parasites and other pig diseases
  - Wash boars (males) four times per year
  - Wash sows (females) before they enter farrowing (gestation) pens[31]

- **Materials**
  - Clean water
  - Bucket or basin
  - Body brush
  - Washing brush
  - Laundry soap can be used as detergent
    - Don't use dish soap or anything harsh that can burn the pig's eyes
  - Select the acaricides to be sprayed
    - Depend on the targeted parasite or microorganism
    - Read manufacturer's label

- **Temperature and Humidity**
  - Desired deep body temperature is 38°C
  - Disinfectants' dilution rates depend on outdoor air/ordinary temperature
  - Some viruses and parasites can survive in cold temperatures, so it is important to wash during these periods[32]

[31] Towers, L. (2016, January 8). *How to farm pigs: Health issues*. The Pig Site. https://thepigsite.com/articles/how-to-farm-pigs-health-issues
[32] 5m Editor. (2012, November 14). *Cleaning and disinfection*. The Pig Site. https://thepigsite.com/articles/cleaning-and-disinfection

- **Restraining Techniques**
  - Snare/Snubbing Rope
    - Used for older pigs
    - Attach the rope around upper jaw
    - Hold snare/rope and stand in front of pig
    - As the pig pulls back, it becomes restrained

  - Boards/Hurdling:
    - Used for pigs of any age
    - Trap the pigs between solid barriers to restrict their movement and/or move through corridors
    - Individual pigs may be driven into confinement and restrained using rope
    - Handle young ones with care to prevent dislocation of the bones.
    - Cover a large pig's head with a bucket and move it in the reverse direction[33]

Guided Practice Activity

Topic 3.4 Task 3:

1. Watch videos and/or observe pictures of pigs being restrained for cleaning and other purposes. Discuss the following with a partner, referring to the terms and concepts from **3.4 Key Facts**:

a. What techniques are the farmers using?

b. What tools are they using?

c. What are the biggest challenges?

2. You are working on a farm and half of the pigs have mange mites. Based on what you have learned in previous topics and this one, describe the steps for washing the pigs. Work in small groups. Keep in mind:
- Materials
- Restraining techniques
- Waste disposal and/or product storage

[33] Animal Biosciences. (n.d.). *Handling and restraining pigs*. https://animalbiosciences.uoguelph.ca/~gking/Ag_2350/handling.htm

3. Present your group's procedures to the rest of the class. Compare your answers. Did you forget a step? Are the steps in the correct order?

4. Verify your responses with the trainer.

3.5 Key Facts

- **Pig Washing Procedures**
  1. Collect materials.
  2. Wear Personal Protective Equipment (PPE).
  3. Select a small confined area to wash the pig.
  4. Fill 4 large buckets with warm (not hot) water. Take materials to the selected area.
  5. Restrain the animal.
  6. Start washing: Start with the feet and work your way up; wash with the brush after applying soap
  7. Rinse it frequently in the warm water.
  8. Avoid getting water in the pig's ears and try to avoid the face altogether.
  9. After washing, spray disinfectant/acaricides over pigs to reduce the risk of infection.
  10. Return pigs to their living areas.
  11. Clean washing area.
  12. Return materials to their storage area. Dispose of product waste in a separate, securely closed trash bin.

- **Detergents vs. Acaricides**
  - Detergents are used for washing, i.e. removing organic matter from the surface of the animal
  - Acaricides are used for disinfecting, i.e. removing harmful microorganisms from the animal; involves chemicals and toxins

Application Activity

Topic 3.4 Task 4:

1. Before visiting the pig farm, work with your groups from **Task 3** to create 3 questions to ask the farmer about restraining and washing pigs:

Questions	Answers

2. Upon arriving on the farm, rotate, asking the farmer or another worker your questions. Be sure to note the answers in the table above.

3. Now, analyse the status of the pigs. Note your findings:

a. What is their individual hygiene of the pigs as well as the hygiene of the living area?

b. Are any of the pigs suffering from a disease? If so, which one?

4. Observe the farmer as he or she demonstrates how to restrain and wash a pig.

5. With the farmer's permission, each group will have the opportunity to correctly restrain and wash a pig. Remember to:

- Wear PPE.
- Select the detergent and use the correct dilution.
- Select a washing area and restraining technique.
- Store materials and/or dispose of waste after use.

6. After the field visit, participate in a group discussion:

a. What did you learn?

b. What surprised you?

c. How did your experiences compare to the information in **3.4 and 3.5 Key Facts**?

Points to Remember

- Remember excessive bathing will likely cause the skin to become dry.
- Avoid getting water in the ears and try to avoid the face altogether. Don't use dish soap or anything harsh that can burn the pig's eyes.
- The desired deep body temperature for pigs is 38°C.

- Detergents are used for washing while acaricides are used for disinfecting.

Formative Assessment

1. Explain the two restraining methods used to catch pigs.

1.

2.

3. What is the desirable body temperature of a pig?

4. List the materials needed to wash pigs.

5. Explain the difference between detergents and acaricides.

Self-Reflection

1. You have come to the end of the unit. You are going to do the survey you did at the beginning of the unit again to help you do self-assessment of your knowledge, skills and attitudes.

Again, there are no right or wrong answers to this survey. It is for your own use to gauge your knowledge, skills and attitudes after the unit. Read the Knowledge, Skill or Attitude in the left column. Think about yourself: do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation.

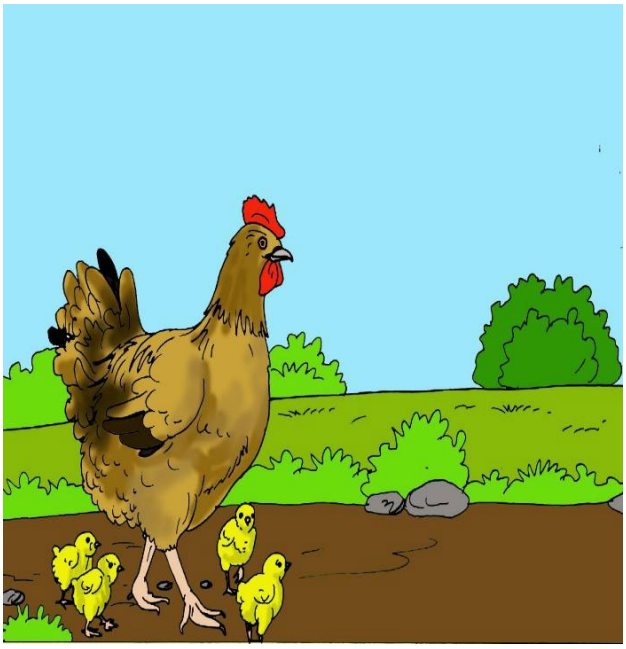
My experience **Knowledge, skills and, attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Describe the causes of pig diseases.					
Describe signs and symptoms of pig diseases.					
Differentiate between signs and symptoms of different pig diseases.					
Apply preventive procedures to pigs and their living spaces.					
Identify and interpret the different types and uses of acaricides.					
Describe techniques of spraying acaricides.					
Describe acaricide waste disposal procedures.					

Select appropriate wormicide to prevent pig disease.					
Describe techniques and procedures for deworming pigs.					
Manage proper safety and waste disposal procedures.					
Identify detergents to wash pigs and when to use them.					
Describe techniques for restraining pigs.					
Describe procedures for washing pigs.					

2. Complete the table below by identifying areas from the unit where you have improved and where you need improvement along with the actions/strategies you will use to help you improve when receiving and interpreting information in the workplace.

Areas of strength	Areas for improvement	Actions to take to improve
1. **2.**	**1.** **2.**	**1.** **2.**

Unit 4: Prevent poultry disease



Topics

4.1 Assist in identification of diseases

4.2 Deworm poultry

4.3 Apply preventive measures

Unit Summary:

This unit describes the knowledge, skills, and attitudes required to identify poultry diseases according to their causes and signs, including infectious, parasitic, nutritional and metabolic, and traumatic diseases; follow deworming procedures; and apply preventative measures against poultry diseases.

Self-Assessment: Unit 4

1. Look at the unit illustrations. What do you see? What do you think this unit will be about? What topics might be covered?

2. Fill in the self-assessment below.

There are no right or wrong ways to answer this assessment. It is for your own use during this course. The trainer will read a skill that is listed in the left column. Think about yourself: Do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation. At the end of this unit, we'll take this survey again.

My experience **Knowledge, skills, and attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Describe different poultry diseases.					
Differentiate signs and symptoms of poultry disease.					
Implement preventive procedures for poultry diseases.					
Identify different wormicides and their uses.					
Calculate the needed dosage of wormicide and administer it properly.					
Follow safety procedures while administering wormicide.					
Implement prevention measures in poultry houses.					

Plan and perform vaccination procedures.					
Select and employ vaccine administration methods.					

Topic 4.1: Assist in identification of disease

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the causes of different types of poultry diseases.	**1.** Identify the different causes of poultry diseases.	**1.** Detail-oriented
2. Describe the signs and symptoms of different poultry diseases.	**2.** Diagnose different poultry diseases based on their signs and symptoms.	**2.** Adaptive
3. Explain preventive procedures for poultry diseases.	**3.** Implement preventive measures for poultry diseases.	**3.** Methodical

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

Topic 4.1 Task 1:

1. Reflect on and recall the knowledge, skills, and attitudes gained in units 2 and 3.
   a. What are the four types of diseases that affect animal health?

   b. What are the general causes of each disease?

   c. What attitudes are necessary to address animal diseases?

2. Compare your responses with a partner.

3. Individually brainstorm responses to the following questions:
   a. Which poultry-specific diseases are you familiar with?

b. Do you think poultry diseases—their causes, signs, and prevention methods—are like ruminants and pig diseases? Why or why not?

4. Discuss your ideas and experiences with the rest of the class.

Problem Solving Activity

Topic 4.1 Task 2:

1. In small groups, discuss the following topics:

a. You notice that several of your chickens have fallen ill and you believe they have a poultry disease. You want to determine which type of disease it is. Based on your knowledge from units 2 and 3, which factors and/or behaviours should you observe to determine the disease?

b. Why should preventative measures be taken to avoid poultry diseases on the farm? What are the consequences of poultry disease on animal health and farm production?

2. Share your ideas with the rest of the class and verify your responses with the trainer.

3. Then, read through **4.1 Key Facts**.

4. Compare the prevention measures for each type of poultry disease to the prevention measures for ruminant and pig diseases.

a. Which measures are the same?

b. Which measures are different?

4.1 Key Facts

- **Infectious Diseases**
  - **Common:**
    - **Bacteria**: Chronic respiratory disease, Infectious coryza, Pullorum disease, Fowl typhoid, Fowl cholera (Pasteurellosis)
    - **Viruses**: Newcastle Disease, Avian influenza (bird flu), Infectious bronchitis, Avian pox (fowl pox), Gumboro disease (infectious bursal disease), Marek's disease
  - **Causes:**
    - Presence and spread of harmful bacteria and/or viruses in the body

- **Signs:**
    - Respiratory problems
    - Drop in egg production
    - Diarrhoea
    - High mortality
    - Scabs and/or tumours

- **Prevention:**
    - Vaccination
    - Biosecurity measures

- **Parasitic Diseases**
    - **Common:**
        - **Endoparasites (internal):** Coccidiosis, worms (Helminths)
        - **Ectoparasites (external):** Lice, mites
    - **Causes:**
        - Parasites enter and live off the nutrients provided by the animal (host)
        - Can act as vectors, spreading diseases to the host
    - **Signs:**
        - Bloody diarrhoea
        - Poor growth
        - Appetite and weight loss
        - Dull combs, wattles, and eyes
        - Low production
    - **Prevention:**
        - Biosecurity measures: clean coops at least once per week
        - Quarantine new birds for at least two weeks
        - Avoid feeding on the ground/ground pecking
        - Do not overcrowd the birds
        - Keep birds away from freshly tilled ground[34]

- **Nutritional and Metabolic Diseases**
    - **Common:** Fatty liver syndrome (FLS), Perosis (slipped tendon), Rickets, Caged layer fatigue (CLF)
    - **Causes:**
        - Deficiency or imbalance of vitamins and nutrients, particularly calcium
        - Genetic defects
        - Lack of nutrient absorption

[34] DBC Ag Products. (2017, May 24). *9 ways to prevent parasites in your flock*. Morning Ag Clips. https://www.morningagclips.com/9-ways-to-prevent-parasites-in-your-flock/;
Poultry Hub. (2016, April 12). *Types of disease*. https://www.poultryhub.org/health/disease/types-of-disease/

- **Signs:**
  - Inability to stand or walk
  - Loss of control of legs
  - Soft or broken bones
  - High mortality

- **Prevention:**
  - Alter diet to provide sufficient nutrients
  - Feeding regularly, without delays
  - Monitor body weight[35]

- **Traumatic Diseases**
  - **Common**: Cannibalism (aggressive pecking)
  - **Causes:**
    - Injuries from abnormal or erratic behaviours, such as one bird pecking another to death
    - Triggered by stressors, such as over-crowding, intense bright light, high temperatures, poor ventilation, high humidity, nervousness, boredom and idleness
  - **Signs:**
    - Feather pulling
    - Pecking injuries
  - **Prevention:**
    - Minimize or eliminate stressors
    - Control of physical parameters: lighting, humidity, temperature, ventilation
    - Beak trimming
    - Identify and remove aggressive birds[36]

Guided Practice Activity

Topic 4.1 Task 3:

1. Observe the pictures displayed by the trainer. With a partner, discuss the following for each picture:

a. Describe what you see.

[35] 5m Editor. (2009, December 22). *Important nutritional diseases that affect laying hens*. The Poultry Site. https://thepoultrysite.com/articles/important-nutritional-diseases-that-affect-laying-hens

[36] Poultry Hub. (n.d.). *Cannibalism (or aggressive pecking)*. https://www.poultryhub.org/health/disease/types-of-disease/cannibalism-or-aggressive-pecking/

b. What are the signs of poultry disease?

c. According to the signs, which type of poultry disease do you think it is?

d. What are the possible causes of this disease?

e. How can this disease be prevented in the future?

2. Share your observations with the rest of the class.

3. Verify the correct diagnoses, causes, and prevention methods with the trainer.

4. Consider the picture below.

a. What is the chicken doing?

b. What are the potential consequences of this behaviour?

c. What steps should the farmer take?

 [37]

Application Activity

Topic 4.1 Task 4:

1. Before visiting a local poultry farm, brainstorm five questions to ask the farmer about common poultry diseases from his/her experience. Write them below:

[37] Pexels. (n.d.). *Agriculture animal beak bird* [Photograph]. Pixabay. https://pixabay.com/photos/agriculture-animal-beak-bird-1868521/

Questions	Answers

2. Upon arriving, interview the farmer using the questions you brainstormed earlier. Note the responses. Do not ask the same question twice. Feel free to note additional information below:

3. Next, analyse the poultry on the farm.

a. Do any have signs of disease? If so, what are the signs and which disease do they indicate? Use **4.1 Key Facts** to assist you.

b. Confirm your observations with the farmer.

4. Ask the farmer and/or your trainer any remaining questions regarding the types of poultry diseases.

Points to Remember

- Change the litter regularly. Never raise chickens on old litter used by a previous flock of birds.
- Use quality feed and always use feeders. Don't feed from the ground.

Formative Assessment

1. Answer the following:

a. Name two of the common nutritional and metabolic poultry diseases.

1.

2.

b. What are three signs of infectious poultry diseases?

1.

2.

3.

c. How can someone prevent traumatic poultry diseases from occurring? Be specific.

2. Circle the correct answers:

1. Which of the following is NOT a sign of parasitic poultry diseases?

a. Low production
b. Inability to stand or walk
c. Appetite and weight loss
d. Bloody diarrhoea

2. What is the cause of infectious diseases?

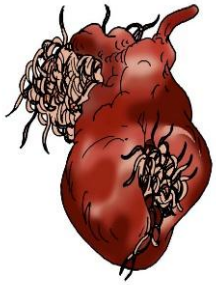
a. Abnormal or aggressive poultry behaviour
b. Insufficient nutrient absorption
c. Harmful bacteria or viruses entering the body
d. Worms

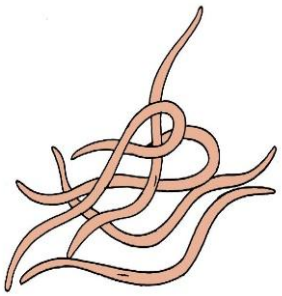
Topic 4.2: Deworm poultry

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the different types of wormicide.	**1.** Identify different wormicides and their uses.	**1.** Detail-oriented
2. Explain the procedures for preparing and administering wormicide.	**2.** Calculate the needed dosage of wormicide and administer it properly.	**2.** Methodical
3. Recognize the importance of safety procedures and precautions.	**3.** Follow safety procedures while administering wormicide.	**3.** Risk-aware

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





Topic 4.2 Task 1:

1. With a partner, discuss the following:

a. Describe what you see in the above photos to your partner.

b. What type of poultry disease is likely to affect or is already affecting the animals in these photos?

c. Based on your knowledge from **Topic 4.1**, what are the signs that indicate this type of disease?

2. Discuss your ideas with the rest of the class.

Problem Solving Activity

Topic 4.2 Task 2:

1. Brainstorm the following questions individually:
   a. What are some of the hazards of using wormicide?

   b. What can we do to prevent and/or control the hazards of wormicide?

2. Share your ideas with a small group.

3. With your small group, discuss a scenario in which you would want to administer wormicide to your flock of chickens, but you don't know how much wormicide is needed.
   a. What should you do?

   b. What are the consequences of over- or under-dosing?

4. Compare your group's responses with the rest of the class.

5. Read through **4.2 Key Facts** with your group.

6. Your group will be assigned a section: Safety, Dosage, or Methods of Administration.
   a. Discuss the similarities and differences between your section and the corresponding information for ruminants (Unit 2) and pigs (Unit 3).

   b. Use additional/outside resources (books, internet, etc.) to supplement your discussion.

   c. Present your section, research, and conclusions on the similarities and differences to the rest of the class.

   d. Answer any questions from the other trainees.

4.2 Key Facts

- **Safety Precautions**
  - **Personal Protective Equipment (PPE):** Should be worn at all times while administering wormicides or any other chemical solutions. Includes gloves, eyewear, and close-toed shoes.
  - **Storage**: Store wormicides in a separate room, where they cannot come into contact with other humans or animals. Make sure the top or lid is securely closed.
  - **Waste Disposal:** Dispose of any empty wormicide waste in a separate trash bin that can be securely closed. Keep away from animals and other humans.

- **Dosage:**
  - The amount of wormicide administered must be adjusted according to desired strength or the size of the animal.
  - Read the manufacturer's label for dosage instructions.
  - Measure liquids using graduated cylinder.
  - Liquid[38]
    (D / H) x Q = X

    D = Desired dose
    Q = Quantity of solution per strength on hand
    H = Strength on Hand
    X = Unknown quantity of drug

  - Tablet[39]
    W / U = A / X

    W = Weight given
    U = Units given
    A = Actual weight of animal
    X = Number of units needed

- **Methods of Administration**
  - **Oral (liquid, powder, tablets)**

[38] Toney-Butler, T. J., & Wilcox, L. (2020, January 6). *Dose calculation: Desired over have formula*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK493162/
License: https://creativecommons.org/licenses/by/4.0/
[39] LA County Department of Public Health. (n.d.). *Study Guide*. https://publichealth.lacounty.gov/phn/docs/MCE%20Study%20Answer%20Sheetrevised6-10.pdf

- In Feed:
  - Often used in preventive or long-term medication.
  - Requires planning so that delivery and storage on the farm does not delay treatment.
  - Requires no additional work on the farm.
- In Drinking Water:
  - Must be done on the farm and requires supervision.
  - No delay in administration or withdrawal, prompt absorption, and convenient to use.

- **Injection (liquid)**
  - Must apply to each, individual bird
  - Expensive, labor-intensive, and time-consuming
  - Sometimes necessary in severe cases or when drug of choice is non-absorbable (e.g. antibiotics)
  - Using a syringe

Guided Practice Activity

Topic 4.2 Task 3:

Discuss the following with a partner, using **4.2 Key Facts**:

1. Imagine you are working at a poultry farm and you identify that 3 of your chickens have endoparasites. The cases are severe, and you want to act quickly.
   a. Which method of wormicide administration should you use? Why?

   b. What tools and equipment will you need?

2. You want to mix wormicide powder into the feed of your 60 chickens to prevent parasitic disease. The dosage is 60 g for 20 chickens.
   a. How many grams of wormicide powder will you need?

   b. What will you do with the wormicide waste after use?

3. Review the different names and types of wormicides in **4.3 Key Facts**. Note: You do not need to memorize the names of wormicides, but you should be familiar with the different types and know how to use them.

4.3 Key Facts

- **Common Wormicides:**
  - **Flubendazole** (Flubenvet): only licensed treatment for worms in poultry; mixed with feed
    - Flubenvet 1% Medicated Premixture: 60 g pack for 20 chickens for backyard users
    - Flubenvet 2.5% Medicated Premixture: 2.4kg bag or 240g tub for larger flocks
  - **Apple Cider Vinegar** (ACV) and **fresh crushed garlic,** mixed with water
  - **Medicinal plants:** Dill, carrots, chicory, cucumber, garlic, hyssop, mint, nasturtium, plantains, pumpkin, squash, watermelon

Application Activity

Topic 4.2 Task 4:

1. Visit a local poultry farm.

2. Identify the available wormicides on the farm.
   a. What type are they (liquid, tablets, or powder)?

   b. What is the dosage?

   c. What tools and equipment are needed to administer them?

3. Observe as the farmer demonstrates how to administer wormicide to one or more of the chickens.

4. With permission from the farmer, take turns administering wormicide to the chickens.

5. Clarify any remaining questions about the deworming process with the farmer and your trainer.

Points to Remember

- Always read the manufacturer's instructions for the dosage, application method, and safety precautions.
- Under-dosing can lead to resistance to wormicides, eventually making them ineffective. Over-dosing can introduce too many chemicals into the animals' bodies.
- The best way to deal with worms is to encourage healthy chickens that resist infection through prevention efforts. Make sure they have good nutrition, especially vitamin A, B, and animal proteins.
- Keep coops, runs, feeders, and waterers clean. Rotate your birds on pasture if possible, and make sure not to keep too many birds in one area.

Formative Assessment

1. Complete the following sentences:

a. …….. administration of wormicides is often used in preventive or long-term medication.

b. You must use a …… to apply wormicides using the injection technique.

c. Administering wormicides by mixing them in …… requires direct supervision and must be done on the farm.

2. Answer the following questions:

a. What safety precautions must be taken when using wormicides?

b. How do you calculate dosage using tablets?

Topic 4.3: Apply of preventative methods

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe prevention principles.	**1.** Implement prevention measures.	**1.** Detail-oriented
2. Describe vaccination planning and procedures.	**2.** Plan and perform vaccination procedures.	**2.** Forward-thinking
3. Explain different methods of vaccine administration.	**3.** Select and employ vaccine administration methods.	**3.** Methodical

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

Topic 4.3 Task 1:

1. Describe what you see in the photo above to a partner.

a. What tools are being used?

b. What are the workers wearing? Why?

c. What is the purpose of this process?

2. Share your responses with the rest of the class.

Problem Solving Activity

Topic 4.3 Task 2:

1. Brainstorm responses to the following questions individually:

a. Vaccination is one part of a disease prevention plan.

- What are other methods of infectious disease prevention?

- What are the potential consequences if a disease is not prevented or treated?

b. What are some of the challenges of obtaining and administering vaccines?

2. Share your ideas with a partner and then discuss with the rest of the class.

3. With your partner, read and review **4.4 Key Facts**.

a. Discuss with your partner how the information compares to your responses in question 1.

4. Discuss your ideas with the rest of the class.

4.4 Key Facts

- **Disease Prevention Plan**
  - Hygiene and disinfection: Cleaning and disinfection of animal shelters; biosecurity measures
  - Vaccination: Prevents and controls infectious diseases
  - Chemoprevention: Use of chemical agents to prevent or slow disease development
    - Can be applied to individual birds or full flocks
    - Includes injection, wing-web puncture, feather follicle inoculation, eye drops, spraying, water mixing
  - Quarantine and isolation of new birds
  - Disposal of dead animals: burning, deep burying with quick lime or disposal pit

- **Vaccine Logistics**
  - **Transport**:
    - Not recommended, especially if vaccines must be kept at a certain temperature

    - Risk of temperature loss, which makes the vaccines ineffective
    - Best to have a refrigerated, temperature-controlled truck or vehicle
    - Do not allow vaccines to be exposed to direct sunlight[40]

- **Storage**:
    - Read manufacturer's instructions for required storage temperatures
    - Keep vaccines in a cool, insulated container and remove them only when needed.
    - Once opened, a bottle of modified live vaccine should be used within an hour and a bottle of killed vaccine should be used the same day.

- **Timing:** Vaccine usage needs to be planned according to time limitations

- **Vaccine Administration Methods**
    - **Oral**
        - Mix with feed that has sufficient grains
        - Vaccine must be given more often with this method
        - More expensive
        - Most effective when administered in the morning
        - Liquids measures with a syringe
        - Dosage: 7-10 grams of food per bird mixed with corresponding dose

    - **Injection**
        - Use needles: consider size, based on the age of the animal, weight of the animal, the route of product administration, and the thickness of the product.
        - Can be intramuscular (deep into the pectoral muscles) or subcutaneous (below the skin)

- **Other Precautions**
    - **Mixing Water Quality:**
        - Must be free of sanitizer
        - Container with plastic bottom or glass container is best
        - Withhold water one hour in hot weather or longer in cold weather
        - Administer vaccine in cold water
        - Provide enough drinking space so that 2/3rds of the flock can drink at one time.

[40] SmartSense. (2017, June 28). *Best practices for transporting vaccines*. https://blog.smartsense.co/best-practices-for-transporting-vaccines

- **Checking Animals:** Check animals regularly to ensure vaccine effectiveness[41]

Guided Practice Activity

Topic 4.3 Task 3:

1. Imagine you are visiting a farm and you need to administer vaccines to the chickens. Only a few birds have been affected and you have a low budget for vaccination. In small groups, discuss the following questions, using **4.4 Key Facts** for help as needed:
   a. What are the differences between oral and injection methods?

   b. Which administration method is the best option for this situation?

   c. What steps will you need to take to organize and administer this method?

2. Imagine you are organizing poultry vaccinations for your farm as well as your neighbours' farms.
   a. How should you arrange the transportation of the vaccines from Kigali to your farm?

   b. Once the vaccines have arrived, how should they be stored?

   c. What other precautions should be taken?

Application Activity

Topic 4.3 Task 4:

1. Upon arriving to a local poultry farm, ask the farmer the following questions and note the responses below each question:
   a. How often do they vaccinate the poultry on the farm?

   b. Which method of vaccination do they use and why?

   c. How do they transport and store the vaccines?

[41] Alexander, D. J., Bell, J. G., & Alders, R. A. (2004). *A technology review: Newcastle disease - with special emphasis on its effects on village chickens: Chapter 3: Vaccination*. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/y5162e/y5162e04.htm

d. What are the challenges of vaccination?

e. What are the benefits of vaccination?

f. What other disease prevention measures does the farmer take?

g. Any other questions you have about vaccinating poultry and preventing poultry diseases.

2. Observe the farmer as she/he demonstrates how to vaccinate poultry.

3. With the farmer's permission, volunteers may vaccinate some of the poultry as well.

4. In small groups, write a report about your experience, including the challenges and benefits of poultry vaccination. Submit the report to your trainer for review.

Points to Remember

- Establish biosecurity measures: Wash, scrub, and disinfect your poultry house between flocks and at least once per year.
- Read the manufacturer's label for the vaccine dosage and storage instructions.
- Keep vaccines in a cool, insulated container and remove them only when needed.

Formative Assessment

1. Write responses to the following questions:

a. What precautions must be taken while transporting and storing vaccines?

b. What are three measures that contribute to disease prevention?

1.

2.

3.

c. What are the differences between oral and injection administration of vaccines?

2. You are tasked with transporting poultry vaccines from Kigali to the Karongi District. Explain the logistics of transporting the vaccines.
   a. How will you transport them?

   b. How will you store them?

   c. How long will it take to transport them? Why is this important?

Self-Reflection

1. You have come to the end of the unit. You are going to do the survey you did at the beginning of the unit again to help you do self-assessment of your knowledge, skills and attitudes.

Again, there are no right or wrong answers to this survey. It is for your own use to gauge your knowledge, skills and attitudes after the unit. Read the Knowledge, Skill or Attitude in the left column. Think about yourself: do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation.

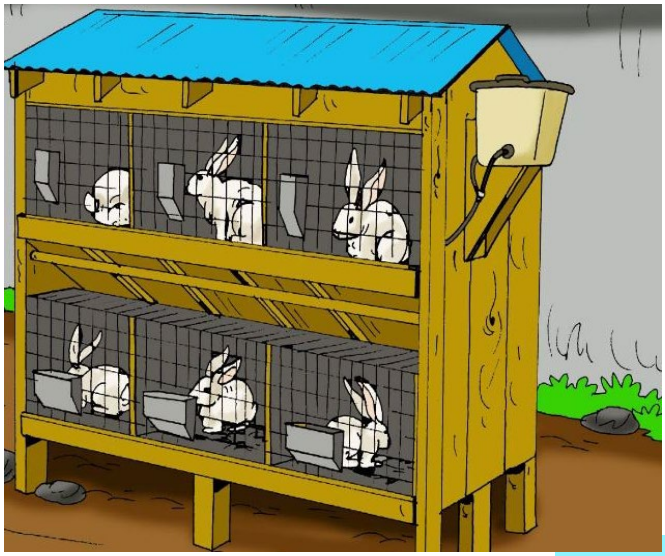
My experience Knowledge, skills, and attitudes	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Describe different poultry diseases.					
Differentiate signs and symptoms of poultry diseases.					
Implement preventive procedures for poultry diseases.					
Identify different wormicides and their uses.					
Calculate the needed dosage of wormicide and administer it properly.					

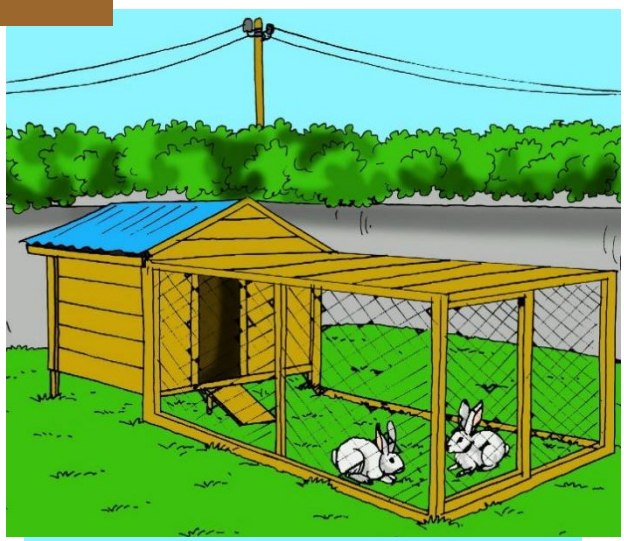
Follow safety procedures while administering wormicide.					
Implement prevention measures in poultry houses.					
Plan and perform vaccination procedures.					
Select and employ vaccine administration methods.					

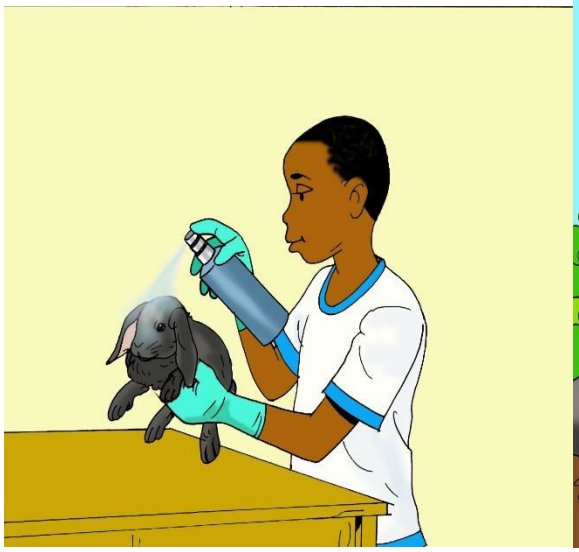
2. Complete the table below by identifying areas from the unit where you have improved and where you need improvement along with the actions/strategies you will use to help you improve when receiving and interpreting information in the workplace.

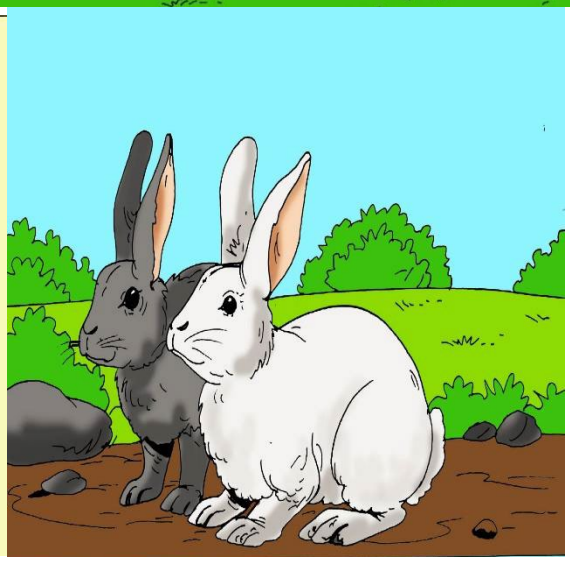
Areas of strength	Areas for improvement	Actions to take to improve
1. **2.**	**1.** **2.**	**1.** **2.**

Unit 5: Prevent rabbit diseases









Topics

5.1 Assist to identify diseases

5.2 Control diseases

5.3 Deworm rabbits

5.4 Control predators

Unit Summary:

This unit identifies the types of diseases in rabbits according to their causes and signs, including infectious, parasitic, nutritional and metabolic diseases, and traumatic diseases. It will also cover methods to control, treat, and prevent diseases, all of which contributes to animal health maintenance.

Self-Assessment: Unit 5

1. Look at the unit illustrations. What do you see? What do you think this unit will be about? What topics might be covered?

2. Fill in the self-assessment below.

There are no right or wrong ways to answer this assessment. It is for your own use during this course. The trainer will read a skill that is listed in the left column. Think about yourself: Do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation. At the end of this unit, we'll take this survey again.

My experience **Knowledge, skills, and attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Describe different rabbit diseases.					
Differentiate signs and symptoms of rabbit diseases.					
Apply preventative measures in rabbit farming.					
Follow proper hygiene maintenance in the rabbit spaces.					
Describe disease prevention procedures.					
Treat and isolate diseased rabbits.					
Select the appropriate type of wormicide.					
Measure correct wormicide dosage and administer it properly.					

Differentiate between carnivore, insect, and rodent predators.					
Implement predator protection procedures.					
Maintain an effective hutch to protect against predators.					

Topic 5.1: Assist to identify diseases

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe causes of rabbit diseases.	**1.** Identify rabbit diseases and their causes.	**1.** Observational
2. Describe signs and symptoms of rabbit diseases.	**2.** Differentiate signs and symptoms of rabbit diseases.	**2.** Detail-oriented
3. Explain preventives procedures and their importance.	**3.** Apply preventives measures.	**3.** Risk-aware

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

Topic 5.1 Task 1:

1. Recall the four types of animal diseases covered in units 2, 3, and 4.

1.

2.

3.

4.

2. Do you think rabbits suffer from the same types of diseases? Why or why not?

Problem Solving Activity

Topic 5.1 Task 2:

1. Using what you know about animal diseases, match the type of disease to its cause. Then, try to predict the signs of this disease in a rabbit.

Type of Disease	Causes	Signs
Nutritional and Metabolic		Rapid breathing, paralysis, nervous behaviour
	Parasites live in or on the animal (its host) and pass diseases to the animal	
Infectious		Weight loss; lesions; rough fur coat
	Stressors or poor physical parameters in living area	
Traumatic		Difficulty eating; uneven teeth
	Harmful bacteria and viruses living in animals	
Parasitic		Sudden death; nasal discharge; fever

Deficiency or imbalance of
vitamins and nutrients

2. Read through **5.1 Key Facts** and compare your responses to question 1 to the information given.

3. Discuss with the class: Are the prevention measures similar to or different from those for other animals in previous units? Explain using evidence from **5.1 Key Facts** and previous units.

5.1 Key Facts

- **Infectious Diseases**
  - **Common:**
    - **Bacterial**: Pasteurellosis, Mastitis (Blue breast), Treponematosis (Vent Disease, Rabbit Syphilis)
    - **Viral:** Haemorrhagic disease
  - **Causes:**
    - Harmful bacteria and viruses living in animals
    - Bacteria can infect open wounds
  - **Signs**
    - Sudden death
    - Appetite loss
    - Fever
    - Fatigue and collapse
    - Sniffles/Difficulty breathing
    - Nasal discharge
  - **Prevention**
    - Vaccination
    - Quarantine and isolation of new rabbits[42]

- **Parasitic Diseases**
  - **Common**:
    - **Endoparasites (internal):** Coccidiosis, Ear and skin mange, Tapeworm larvae, Encephalitozoonosis, Pinworms
    - **Ectoparasites (external):** Ear and fur mites

[42] Hess, L., & Axelson, R. (n.d.). *Infectious diseases in rabbits*. VCA Hospitals. https://vcahospitals.com/know-your-pet/rabbits-diseases

- **Causes:**
  - Parasites live in or on the animal (its host) for long or short periods of time
  - Parasites are vectors, which mean they can pass diseases to the animal (host)
  - Poor immune system
  - Contaminated feed or water
- **General Signs:**
  - Difficult to diagnose, usually discovered after death
  - Rough coat
  - Weight loss
  - Lesions
- **Signs of flea/mite infestations:**
  - Scratching
  - Self-chewing
  - Visible 'dandruff' in cases of mites
  - Visible fleas
  - Flea dirt (spots of dried blood)
  - Hair loss
  - Pale gums (caused by anaemia, as a result of large flea infestations)
  - Scaling of the skin
- **Signs of disease caused by internal parasites**
  - An increased appetite
  - Diarrhoea (blood/mucus can also be present)
  - Weight loss
  - Dull coat
- **Prevention**
  - Biosecurity measures
  - Do not allow faeces to contaminate feeding and drinking areas[43]

- **Nutritional and Metabolic Diseases**
  - **Common:**
    - Dental diseases
  - **Causes:**
    - Deficiency or imbalance of vitamins and nutrients, particularly calcium and Vitamin D
    - Genetic defects
    - Incorrect diet
  - **Signs:**
    - Difficulty eating

[43] Mayer, J. (2015, October). *Parasitic diseases of rabbits*. MSD Veterinary Manual. https://www.msdvetmanual.com/exotic-and-laboratory-animals/rabbits/parasitic-diseases-of-rabbits

    - Uneven teeth size
  - **Prevention:**
    - High fibre diet: hay, grass, leafy green plants and vegetables
    - High levels of calcium and vitamin D[44]

- **Traumatic Diseases**
  - **Common**:
    - Heat exhaustion, cannibalism, broken back
  - **Causes:**
    - Heat exhaustion: hot/humid weather, poor ventilation
    - Cannibalism: nervousness, neglect, severe cold
    - Broken back: compressed spinal cord
  - **Signs:**
    - Heat exhaustion: stretched out position and rapid breathing
    - Cannibalism: aggressive behaviour, dead animals in nesting area will likely be eaten in order to clean the space
    - Broken back: paralysis, lack of urinary and faecal control
  - **Prevention:**
    - Heat exhaustion: ventilated hut construction, access to cool water
    - Cannibalism: keep dogs and predators away to prevent nervousness
    - Broken back: careful handling and restraint by farm workers[45]

Guided Practice Activity

Topic 5.1 Task 3:

1. Diagnose the type of rabbit disease and give the preventative measures in each of the following situations:

a. Some rabbits on your farm have recently lost a lot of weight and their fur coats are unusually rough.

Disease Type:

[44] Harcourt-Brown, F. (2010). *Diseases related to calcium metabolism in rabbits*. Veterinary Information Network. https://www.vin.com/apputil/content/defaultadv1.aspx?pId=11310&meta=generic&catId=33767&id=4516322

[45] Mayer, J. (2015, October). *Noninfectious diseases of rabbits*. MSD Veterinary Manual. https://www.msdvetmanual.com/exotic-and-laboratory-animals/rabbits/noninfectious-diseases-of-rabbits

Prevention:

b. Several rabbits died suddenly this week. You take the temperature of one rabbit and see that it has a fever.

Disease Type:

Prevention:

c. You notice that one of the rabbits you handled yesterday can no longer control its urination. It is peeing at unusual times and in unusual places.

Disease Type:

Prevention:

d. A few rabbits have stopped eating. You examine one of their mouths and discover the size and shape of his/her teeth is very uneven.

Disease Type:

Prevention:

Application Activity

Topic 5.1 Task 4:

1. Visit a local farm with rabbits. Separate into four groups. Each group should be assigned to one of the four types of diseases: infectious, parasitic, nutritional and metabolic, traumatic.

2. Within your group, observe the rabbits and do the following.
   a. Determine if any are suffering from your assigned type of disease.

   b. Confirm your observations with the farmer.

3. Analyse the rabbits' living environment.
   a. Are there prevention measures in place? If so, which ones?

4. Ask the farmer any remaining questions you have about rabbit diseases and their prevention.

Points to Remember

- Parasitic diseases in rabbits can be difficult to diagnose, so animals should be checked regularly.
- Preventing diseases saves time and money in the long-term, as treatment can be expensive and labor-intensive.
- Strong biosecurity measures are essential to preventing rabbit diseases.

Formative Assessment

1. Circle the correct answers:

1. Which of the following is NOT a sign of an infectious rabbit diseases?
   a. Fever
   b. Nasal discharge
   c. Difficulty eating
   d. Sniffles

2. Which of the following types of diseases is difficult to diagnose in rabbits?
   a. Infectious
   b. Parasitic
   c. Nutritional and Metabolic
   d. Traumatic

3. Which of these is a proper preventative measure for nutritional and metabolic diseases?
   a. Adequate ventilation
   b. Keep dogs and predators away
   c. Quarantine
   d. High fibre diet

2. Write answers to the following questions:

1. Name the causes of infectious diseases.

2. Name two common traumatic diseases in rabbits.

1.

2.

3. Explain the benefits of following preventative measures.

Topic 5.2: Control diseases

Key Competencies:

Knowledge	Skills	Attitudes
1. Explain the principles and importance of hygiene maintenance.	**1.** Follow proper hygiene maintenance in the rabbit spaces.	**1.** Forward-thinking
2. Describe disease prevention procedures.	**2.** Implement disease prevention measures to control environmental factors.	**2.** Diligent
3. Identify different types of rabbit diseases.	**3.** Treat and isolate diseased rabbits.	**3.** Attentive

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

Topic 5.2 Task 1:

1. Look at the illustrations from the beginning of this unit again. Individually brainstorm responses to the following questions:

a. Which pictures are related to disease control?

b. What is being done to the rabbit?

c. What do you think is the relationship between good shelter maintenance and disease control?

2. Share your ideas with a partner.

Problem Solving Activity

Topic 5.2 Task 2:

1. Form small groups and discuss rabbit diseases:

a. What environmental factors contribute to rabbit diseases?

b. How could we address these factors?

c. What prevention measures can be implemented for rabbit diseases?

2. Based on the activity above, present your group's ideas to the rest of the class and discuss:

a. Did the groups have similar ideas?

b. Was there an idea your group did not consider?

3. With your group, read through **5.2 Key Facts** and do the following:

✔ Check or tick facts that confirm an idea from question 1.

○ Circle facts where you need more clarification.

❖ Star facts that relate to previous topics and units.

5.2 Key Facts

- **Maintenance of General Hygiene**
  - Disinfection and sanitization of rabbit hutch should be a routine
  - Sanitary isolation is sometimes necessary
  - Proper cleaning: the wall of the rabbit hutch should be smooth, and corners rounded which will help facilitate cleaning and disinfection.
  - Bio-security measures in place

- **Cage/Hutch Hygiene and Inspection**
  - Proper lighting and adequate ventilation
    - Sunlight is a priceless disinfectant if the surfaces are exposed to it for a certain duration due to ultraviolet rays.
    - Cool off hutches by putting buckets with cold water inside
    - Good ventilation will remove excess moisture, heat, and odours
  - Waste management
    - Adequate drainage: Rabbit manure, feed waste, and other excreta should be disposed twice daily.
    - Proper disposal of dead animals: Burial is most realistic for small operations.
  - Feed and water
    - Water is most important nutrient to rabbits and is consumed 2-4 times as much as feed

    - Both can carry numerous agents of rabbit diseases (e.g. coccidiosis and worms)
    - Feed should be stored out of the reach of domestic animals.

- Nest
    - Cage must be removed and cleaned after each birthing
    - Straw litter must be replaced often

- **Grass Moisture**
    - Excess exposure to grass moisture threatens rabbits' health
    - Control of temperature and humidity prevents heat exhaustion
        - Keep humidity below 60% and temperature between 4°C and 26°C
    - Good ventilation removes moisture

- **Mould**
    - Mould is the growth of fungi that occurs in moist and warm conditions, especially on food
    - Rabbits will not eat food with mould
    - Replace hay and litter regularly to prevent mould
    - Provide ventilation
    - Keep it in a cool area because mould growth increases when exposed to warmth[46]

- **Poisonous Plants and Foods**
    - Eggplants
    - Potato and sweet potato plants
    - Tomato plants
    - Root of mustard plants
    - Avocado fruit, seeds, leaves, and bark
        - Contain toxic compound called 'Persin' that is harmful and sometimes even fatal
    - Coffee/caffeine
    - Alcohol
    - Nuts
    - Onions, garlics, and the chive family
    - Large amounts of salt

[46] The Rabbit Hole Hay Team. (2015, May 1). *How to keep your bunny food fresh for your little bun?* Rabbit Hole Hay. https://www.rabbitholehay.com/blogs/rabbit-hole-hay-blog/how-to-keep-your-bunny-food-fresh-for-your-little-bun

Guided Practice Activity

Topic 5.2 Task 3:

1. In small groups, design a rabbit hutch and living space. Draw and label your design. Consider the following physical parameters and the information from **5.2 Key Facts**:
   a. Temperature

   b. Humidity

   c. Lighting

   d. Ventilation

2. What other preventative measures can you include on your rabbit farm? List them.

3. With your group, present your designed rabbit farm to the rest of the class using the flip chart. Answer any questions classmates have about your design and procedures.

4. After the presentations, read and review **5.3 Key Facts**. Acknowledge which facts were addressed or omitted in the presentations.

5.3 Key Facts

- **Other Prevention Measures**
  - Eradication of the pathogenic microbe by using of disinfectants
  - Vaccination: Prevent/protect against myxomatosis and Rabbit (Viral) Haemorrhagic
  - Location and design of the rabbit hutch/cage
  - Preventive hygiene
  - Keep rabbits calm because their excitability contributes to illness
  - Visitors should be prohibited because they are vectors of diseases from other rabbit farms (including feed suppliers, rabbit buyers and other breeders)

  Protection against dogs, cats, and small wild carnivores[47]

- **Isolation and Quarantine**
  - Apply animal quarantine measures

[47] Beaphar. (n.d.). *Rabbit vaccinations: Protection from myxomatosis and VHD*. https://www.beaphar.com/en-gb/pet-care-tips-advice/rabbit-vaccinations-protecting-your-rabbits-from-myxomatosis-and-vhd

- Restricted animal movements
- Isolation of infected or suspected animals
- When new animals are introduced on a farm, isolate them for a minimum of 1 month.

- **Disease Treatment**
  - Skin (external) diseases: Mites, fleas, alopecia (fur loss)
    - Injectable or oral ivermectin
    - Clean and disinfect living environment
    - Proper ventilation and removal of moisture
  - Internal diseases: Endoparasites, such as ringworm)
    - Wormicide

Application Activity

Topic 5.2 Task 4:

1. Visit a farm with rabbits with your class. Compare your designs and ideas from the previous activity to the layout of the rabbit space on the farm. Discuss:
   a. What aspects are similar?

   b. What aspects are different? In what ways?

2. Ask the farmer the following questions and write the answers below:
   a. How often does she/he inspect the rabbit cages? Why?

   b. How often does she/he isolate sick animals?

   c. Which poisonous plants are present in the region?

   d. How does she/he prevent diseases on this farm?

3. After the field visit, discuss as a class:
   a. What did you learn?
   b. What surprised you?
   c. How did your experience compare with the information in **5.2 and 5.3 Key Facts**?

Points to Remember

- Harmful food products can cause diarrhoea, decreased coordination, central nervous system problems, breathing difficulties, tremors, coma and death.
- Excess moisture is a threat to rabbit health and should be monitored closely.
- New and sick animals should be isolated and quarantined to prevent the spread of rabbit diseases.

Formative Assessment

1. Complete the following sentences:

a. Mould is the growth of fungi that occurs in …….. and …….. conditions, especially on food.

b. Good ……. removes excess moisture and heat from rabbit hutches.

c. ……, such as rabbit manure and leftover feed, should be disposed of twice per day.

2. Write answers to the following:

a. Name three general rabbit hygiene measures:

1.

2.

3.

b. Why should new and sick animals be isolated/quarantined?

c. Name three poisonous plants or foods:

1.

2.

3.

Topic 5.3. Deworm rabbit

Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the different types of wormicides.	**1.** Select the appropriate type of wormicide.	**1.** Detail-oriented
2. Explain how to measure the dosage for and administer wormicides.	**2.** Measure correct dosage and administer wormicide properly.	**2.** Methodical
3. Explain the importance of storage and disposing of wormicide waste.	**3.** Store and dispose of wormicide waste safely.	**3.** Risk-aware

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

Topic 5.3 Task 1:

1. Think back to units 2, 3, and 4. Brainstorm answers to the following:
   a. What do you already know about deworming farm animals?

   b. What products and equipment do you use?

   c. Do you think deworming rabbits is similar or different from deworming ruminants, pigs, and poultry? Why?

2. Share your ideas with the rest of the class.

Problem Solving Activity

Topic 5.3 Task 2:

1. In small groups, imagine this situation: A farmer hands you two types of wormicide to remove worms from your rabbits. One is a liquid and one is a powder.
   a. How do you administer the liquid?

   b. What tools do you need?

c. How do you administer the powder?

d. What tools do you need?

2. In addition to deworming, what other measures can we take to care for the health of rabbits? Describe what you see in the picture below to a partner.

3. Read through **5.4 Key Facts** as a class, with particular focus on **Other Rabbit Care Measures** because that is the newest information. The other facts should reflect and reinforce what has been covered in units 2-4. Ask your trainer to review and clarify any confusion regarding the Key Facts.

5.4 Key Facts

- **Deworming Rabbits**
  - To remove or kill parasites, such as pinworms, tapeworms, liver flukes, protozoa coccidia
  - Use wormicide, which includes anthelmintic drugs
  - An effective worm control program will reduce risk of infection
- **Wormicide Types**
  - Powder: Mixed with water or feed for rabbit consumption; administered orally
  - Liquid: Administered by injection
  - Tools: Water and bucket for mixing, syringe for injection

- **Dosage**
  - Always read the manufacturer's instructions for the dosage amounts
  - Calculating

    W / U = A / X

W = Weight given
Unit = Units given
A = Actual weight of animal
X = Number of units needed

- Tools: graduated cylinder to measure liquid amounts

- **Additional Notes/Precautions**
  - Using flea treatment regularly will help prevent tapeworms as fleas can carry tapeworm eggs
  - Disinfect housing, bedding, and food and water bowls regularly, using a safe disinfectant
  - Place rabbit housing so that exposure to wild rabbits and rodents is minimized
  - Wash your hands thoroughly before you eat
  - Clean up after your pet and dispose of faeces carefully

- **Common Wormicides**
  - Piperazine: removes pinworms
  - Praziquantel: kills tapeworm and liver flukes

- **Other Rabbit Care Measures**
  - Cut rabbits' nails
    - Nails that are too long may cause toe or foot injuries
    - Check nails once per week
  - Grooming
    - To brush a rabbit's fur coat
    - Reveals the presence of external parasites, such as mites, ticks, or fleas
    - Need to be brushed once every three days or more[48]

- **Safety Precautions**
  - Wear Personal Protective Equipment (PPE)
    - To prevent and control contact with chemical substances, such as wormicides
  - Storage
    - Read the manufacturer's instructions for storage temperature
    - Keep in separate room and out of reach of animals to prevent them from accidentally consuming these toxic substances
  - Waste Disposal
    - Dispose in separate trash bin with a securely closed lid
    - Keep away from animals and humans

[48] The Rabbit Haven. (n.d.). *Rabbit grooming basics*. https://therabbithaven.org/rabbit-grooming-basics

Guided Practice Activity

Topic 5.3 Task 3:

1. In partners, act out the following roleplay. Assign Person A to one person and Person B to the other.
   a. Person A is an agriculture trainee who has discovered that their rabbits have tapeworms.

   b. Person B is a farmer with 10 years of experience with rabbits.

2. Person A is asking Person B about the process and procedures for deworming their rabbits. Person B will provide accurate and complete information to Person A. Refer to **5.2-5.4 Key Facts** as needed.

3. Be sure to discuss: Safety measures, tools and equipment needed, the different types of wormicide, administration methods, waste disposal, storage, and any other advice.

4. The trainer will observe you and your partner and provide feedback on your questions and responses.

Application Activity

Topic 5.3 Task 4:

1. Visit a local farm with rabbits and identify the available wormicides.
   a. Read the manufacturer's label.

   b. What is the dosage amount? And how do you calculate it?

2. Ask the farmer to identify their process for deworming the rabbits. Take notes.

3. With permission and assistance from the farmer, work in groups to administer wormicides to the rabbits.

4. With your group, write a manual for deworming rabbits. Include each step of the procedure and the necessary tools, equipment, and products. Submit it to the trainer for review.

Points to Remember

- Rabbits need to be dewormed every three months.
- Always read the manufacturer's label for dosage, storage, and administration instructions.
- Disinfect housing, bedding, and food & water bowls regularly, using a safe disinfectant

Formative Assessment

1. Select **True** or **False** for the following statement:

- ❑ Parasites do not pose a significant threat to rabbit health.
- ❑ Rabbits need to be brushed at least three days per week.
- ❑ PPE is optional and not necessary when applying wormicides to rabbits.
- ❑ Liquid is the only type of wormicide.

2. Complete the following sentences:

a. Rabbits need to be dewormed every …… months.

b. You should read the manufacturer's instructions for wormicide …… temperature

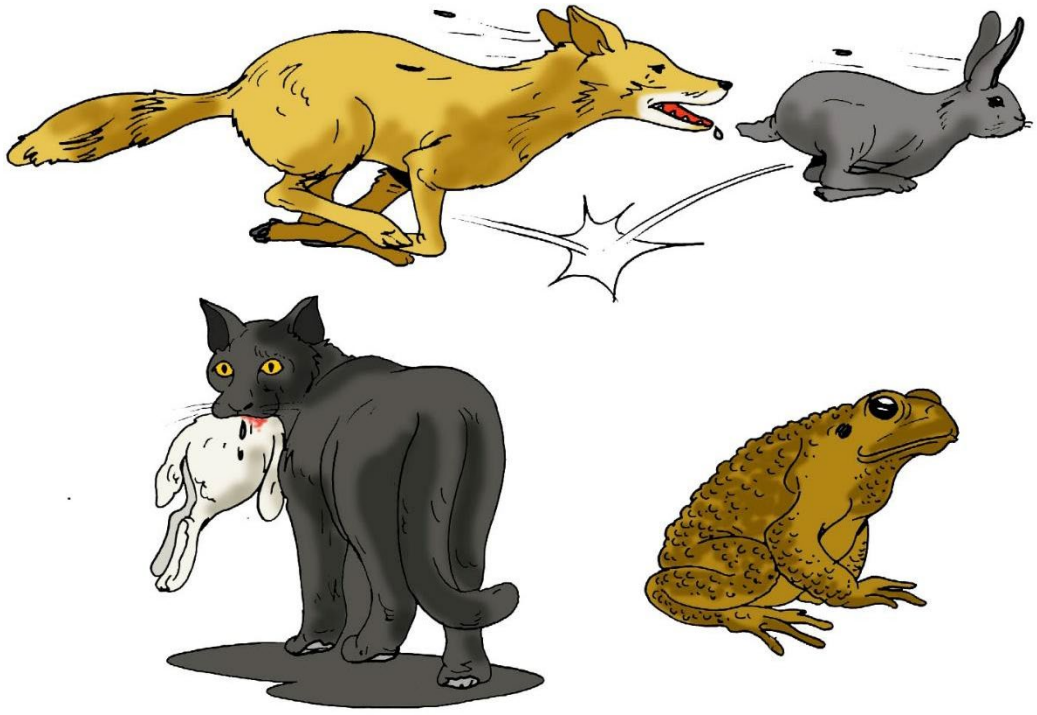
c. Cutting nails and …… are two other ways to care for rabbit health and prevent disease.

Topic 5.4: Control predators

Key Competencies:

Knowledge	Skills	Attitudes
1. Identify different predators.	**1.** Differentiate between carnivore, insect, and rodent predators.	**1.** Detail-oriented
2. Explain the importance of protection procedures.	**2.** Implement predator protection procedures.	**2.** Forward-thinking
3. Explain hutch hygiene and maintenance measures.	**3.** Maintain effective hutch to protect against predators.	**3.** Methodical

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



Topic 5.4 Task 1:

1. Describe the photos above to a partner.

a. What do you see?

b. What relationship is there between the rabbits and the other animals (predators)?

c. How can we prevent predators from killing rabbits and affecting production?

2. Share your ideas with the rest of the class.

Problem Solving Activity

Topic 5.4 Task 2:

1. Rabbits need to be protected against other animals who will kill them, which are called predators. In small groups, discuss:

a. What predators do you know of in Rwanda and/or your region?

b. How can predators be prevented from killing rabbits?

c. What might happen if there are no prevention methods against predators?

2. Direct the trainees' attention to **5.5 Key Facts**. They should then:

✔ The predators and controls you identified during the previous discussion.

○ Circle the predators and controls you had not considered for question 1.

\+ Add predators that are not included in the Key Facts, but that you are familiar with.

5.5 Key Facts

- **Most Common Rabbit Predators:**
  - **Carnivores**
    - **Cats**: Can hunt at night or during the day
      - Bobcat/lynx, servals, house pets
    - **Dogs**: Can hunt at any time; opportunistic
    - **Birds of prey**: Some are nocturnal whereas others are diurnal (active in the day).
      - Hawks, falcons, kestrels, and owls
    - **Large snakes:** May hunt at any time of day

- **Rodents:** Rats

- **Insects:** Ectoparasites, such as fleas and mites, can transmit diseases that kill rabbits

- **Other**: Toads can be poisonous.

- **Hutch Construction**
  - The only way to keep your rabbit completely safe is to house rabbits indoors
  - Some predators can fly, and others can dig, so make sure that the hutch is protected from the side, above, and underneath.
  - Use: solid wood, chain link or wire mesh, sturdy bolts

 [49]

Wire Mesh

 [50]

Bolt

- Build fences around rabbit living area and cover hutch using chain link

 [51]

[49] Fursa, R. (2019, February 13). *A roll of crimped wire mesh* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:A_roll_of_crimped_wire_mesh.jpg License: https://creativecommons.org/licenses/by-sa/4.0/legalcode
[50] User: Obviously. (2009, March 6). *Bolt nut* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Bolt_nut.jpg License: https://creativecommons.org/licenses/by-sa/4.0/legalcode
[51] User:Dmharvey. (2005). *Wallpaper group-p2-4* [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Wallpaper_group-p2-4.jpg

Chain Link Fence

- Raise off the ground on wooden legs to further repel predators
- Give rabbits at least one secluded area with solid wood walls so that they can hide
- Add a floor (using wooden boards, wire mesh, or concrete) to prevent predators from digging underneath
- Repair as needed and quickly, keeping in mind that predators are smart and hungry
- Clean regularly to prevent and eliminate insects/parasites[52]

- **Other Controls**
  - Rat traps
    - Be cautious not to harm or kill rabbits by accident
    - Set mechanical traps on outskirts of hutch
    - Chemical solution: mix two spoons of detergent, two cups of ammonia, and a small glass of water
    - Natural rat deterrents: crushed pepper and onions
  - Ash and lime[53]

Guided Practice Activity

Topic 5.4 Task 3:

1. Imagine you have been tasked with building a rabbit hutch to protect the rabbits from predators. Specifically, the rabbits have been killed by hawks and rats.

a. Separate into small groups. Address the following questions using **5.5 Key Facts**.

b. Identify the method that the predators are using to kill the rabbits. How are they entering the hutch?

c. What construction measures are needed to stop these predators?

d. How can you prevent other predators from also attacking the animals?

[52] Carter, L. (2020, July 13). *How to protect rabbits from predators: Rabbit care tips*. Rabbit Care Tips. https://www.rabbitcaretips.com/protect-rabbits-from-predators/

[53] Pogue, P. (2017, May 5). *How to get rid of rats naturally*. Angie's List. https://www.angieslist.com/articles/how-get-rid-rats-naturally.htm

2. With your group, present your hutch construction plans to the rest of the class using the flip chart.

3. Compare your plans to other groups.
   a. What did you do differently?

   b. What did you do the same?

Application Activity

Topic 5.4 Task 4:

1. With your group, prepare interview questions for a farmer with rabbits. Include questions that address:
   a. Different rabbit predators and how to identify them

   b. Most common predators in this area

   c. How to control or prevent predators

   d. Hutch construction and maintenance

Questions	Answers

2. Interview the farmer using the questions previously created. Note the answers in the table above.

3. Tour the rabbit hutch and observe the construction as well as the materials used.

Points to Remember

- The only way to keep rabbits completely safe from predators is to keep them indoors.
- Cleaning hutches regularly prevents and eliminates harmful insects/parasites.
- Some predators can fly, and others can dig, so make sure that the hutch is protected from the side, above, and underneath.

Formative Assessment

1. Select which of the following are predators of rabbits:

- ❑ Dogs
- ❑ Goats
- ❑ Rats
- ❑ Hawks
- ❑ Pigs
- ❑ Large snakes

2. Name three aspects of hutch construction that keep predators away from rabbits.

1.

2.

3.

Self-Reflection

1. You have come to the end of the unit. You are going to do the survey you did at the beginning of the unit again to help you do self-assessment of your knowledge, skills and attitudes.

Again, there are no right or wrong answers to this survey. It is for your own use to gauge your knowledge, skills and attitudes after the unit. Read the Knowledge, Skill or Attitude in the left column. Think about yourself: do you think you can do this? How well? Read the statements across the top. Put a check in column that best represents your situation.

My experience **Knowledge, skills, and attitudes**	**I don't have any experience doing this.**	**I know a little about this.**	**I have some experience doing this.**	**I have a lot of experience with this.**	**I am confident in my ability to do this.**
Describe different rabbit diseases.					
Differentiate signs and symptoms of rabbit diseases.					
Apply preventative measures in rabbit farming.					
Follow proper hygiene maintenance in the rabbit spaces.					
Describe disease prevention procedures.					
Treat and isolate diseased rabbits.					
Select the appropriate type of wormicide.					
Measure correct wormicide dosage and administer it properly.					

Differentiate between carnivore, insect, and rodent predators.					
Implement predator protection procedures.					
Maintain effective hutch to protect against predators.					

2. Complete the table below by identifying areas from the unit where you have improved and where you need improvement along with the actions/strategies you will use to help you improve when receiving and interpreting information in the workplace.

Areas of strength	**Areas for improvement**	**Actions to take to improve**
1.	**1.**	**1.**
2.	**2.**	**2.**

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