Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

BEEKEEPING OPERATIONS

ANHBK503

Conduct beekeeping operations

Competence

RQF Level: 5

Learning Hours
50 Hrs

Credits: 5

Sector: AGRICULTURE AND FOOD PROCESSING

Trade: ANIMAL HEALTH

Module Type: Specific

Curriculum: TVET Certificate V in Animal Health

2024-25

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<table>
<tr><td>Purpose statement</td><td colspan="6">This module describes the skills, knowledge and attitudes required to perform beekeeping. At the end of this module, trainees will be able to install apiary, to keep honey bees, to harvest honey and honey bee products and to control honey bee diseases, pests, and predators.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="6">N.A</td></tr>
<tr><td rowspan="6">Delivery modality</td><td colspan="2">Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>• Group work and presentation</td><td>30%</td></tr>
<tr><td>• Individual work</td><td>40%</td></tr>
<tr><td colspan="2"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
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Elements of Competence and Performance Criteria

Elements of competency	Performance criteria
1. INSTALL APIARY	1.1. Bee keeping materials, tools and equipment are properly selected according to their uses.
	1.2. Apiary site is properly selected according to the environmental characteristics
	1.3. Beehives are adequately installed in apiary according to their types and farming system
2. KEEP HONEY BEES	2.1. The source of honey bee starter colony is properly selected according to their availability
	2.2. Honey bee colony is properly installed according to the techniques
	2.3. Apiary is efficiently managed according to the production system
	2.4. Colony activities and biophysical parameters are properly monitored according to honey bee behaviors

3. HARVEST HONEY AND HONEY BEE PRODUCTS	3.1. Honey is properly harvested according to the techniques
	3.2. Honey is adequately refined according to techniques
	3.3. Honey bee products are properly harvested according to their types
4. CONTROL HONEY BEES DISEASES, PESTS AND PREDATORS	4.1. Honey bee diseases are properly identified according to causative agents
	4.2. Honey bee pests and predators are properly identified according to their types
	4.3. Control measures of honey bee diseases, pests and predators are properly applied according to the protocol

Knowledge, Skills, and Attitude

Essential Knowledge	Essential Skills	Attitudes
✓ Description of basic honey bee anatomy and physiology ✓ Identification of honey properties ✓ Identification of honey bee products ✓ Explanation of honey and honey bee products importance ✓ Explanation of honey bee drugs and their usage ✓ Identification of apiary site characteristics ✓ Identification of beehive types ✓ Identification of honey bee behaviors	✓ Select beekeeping tools, materials and equipment ✓ Install beehive ✓ Catch swarm ✓ Install bee colony/hiving ✓ Feed bees ✓ Clean beehive ✓ Harvest honey ✓ Harvest honey bee products ✓ Monitor honey bee behaviors ✓ Assess beehive parameters ✓ Keep records	✓ Being honest ✓ Being polite ✓ Being self-motivated ✓ Being decisive ✓ Being punctual ✓ Being creative ✓ Being patient ✓ Being responsible ✓ Being flexible

✓ Identification of honey bee diseases, predators and pests ✓ Identification of materials, tools and equipment used in beekeeping ✓ Identification of different records information in beekeeping		

Course content

Learning outcomes:	At the end of this module the learner will be able to: 1. Install apiary 2. Keep honey bees 3. Harvest honey and honey bee products 4. Control honey bee diseases, pests and predators
Learning outcome 1: Install apiary	**Learning hours: 15 Hrs**
Indicative content	
• **Identification of materials, tools and equipment used in apiary** ✓ Materials used in apiary - Construction materials - Feeds and water - Cleaning and maintenance materials - Materials for health and welfare ✓ Tools used in apiary - Colony manipulation tools - Honey harvesting and refining tools	

- Honey bee products harvesting tools

✓ Equipment used in apiary

- Beehive components
- Protective gear
- Honey extraction and refining equipment
- Queen rearing equipment
- Nucleus hive/Box

- **Criteria of apiary site selection**

✓ Source of water

✓ Climatic conditions:

- Sun/shade
- Rain and humidity
- Wind breaks

✓ Site dimension

✓ Altitude

✓ Distance from people residence

✓ Source of nectar and pollen (Melliferous plants)

✓ Distance from agricultural chemical use (Absence of pesticides)

✓ Accessibility

- **Installation of beehives**

✓ Types of beehives

✓ Preparation of beehives

✓ Preparation of area

- Necessary clearing
- Installation of supports/stands

✓ Putting beehives in place

Resources required for the learning outcome	
Equipment	▪ Projector, Computer, Printers

	▪ PPE ▪ Beehives
Materials	▪ Pictures, Audio-visual equipment, Makers, Flipchart, Internet ▪ Melliferous plants, Construction materials
Tools	▪ Books, GPS, Measuring tapes ▪ Weather vane, Thermometer, Hygrometer, Meteorological data
Facilitation techniques	Brainstorming, group activities, presentation, practical works, field visit. **Group activity** ▪ Trainer forms small groups of trainees and asks them to discuss on: ✓ Materials, tools and equipment used in beekeeping, ✓ Characteristics of a good apiary site ✓ Activities considered in installation of beehives. ▪ Trainer monitors the discussions in each group and provides supports where needed ▪ Trainer the trainees are asked to present what they discussed in group, Trainer provides the feedback and additional inputs before closing the session **Practical activity/Field visit** ▪ Trainer requests every trainee to put on (wear) the appropriate protective equipment ▪ Trainer brings the them to the apiary and they make small groups. ▪ Trainer requests every group to install a beehive ▪ Trainer monitors the activities of all groups and provides all necessary assistance. ▪ At the end, Trainer reassembles the trainees and provides general comments.
Formative assessment methods /(CAT)	**Oral assessment** ▪ Interviews

	▪ Questionnaires **Written assessment** ▪ Matching ▪ True or false ▪ Multiple choice questions ▪ Written report ▪ Sequencing ▪ Essay (short responses / extended responses) **Performance assessment** ▪ Simulation ▪ Observation checklist ▪ Practical task ▪ Demonstration activities ▪ Photographs/drawings interpretation/analysis ▪ Videos interpretation/analysis

Learning outcome 2: Keep Honey bees	**Learning hours: 15 Hrs**
Indicative content	
• **Selection of starter bee colony** ✓ Available honey bee breeds ✓ Description of a colony Composition of colony Characteristics of colony members ✓ Functions of colony members Queen Drones	

- Workers
- Young honey bees

✓ Selection criteria of the starter bee colony

- Size
- Health status (disease resistance)
- Behavior (temperament)
- Productivity
- Origin of initial colony

- **Installation of bee colony**

✓ Application of hiving techniques

✓ Post hiving follow up

- **Management of apiary**

✓ Main types of honey bee production system

- Traditional beekeeping
- Intensive / conventional beekeeping
- Organic beekeeping

✓ Apiary production parameters

- Profitability of apiary
- Productivity of apiary (calculation per beehive or colony or surface unity)
- Sustainability

✓ Feeding bee colony

- Natural feeds (planting Melliferous plants)
- Artificial feeds
- Watering

- **Monitoring of honey bee colony activities**

✓ Monitoring of behaviors

- Inspection of beehive
- Swarming and absconding control
- Colony splitting

- Colony merging or strengthening
- Replacement of the queen or Requeening

✓ Expanding brood net and supering

- **Monitoring of biophysical parameters**
  - ✓ Temperature
  - ✓ Humidity
  - ✓ Weight
  - ✓ Flight activity

Resources required for the learning outcome	
Equipment	▪ Projector, Computer, Printers, Audiovisual equipment ▪ PPE ▪ Beehives, Apiary, Smoker, Veil, Queen box, Hiver tool, Brush, Foundation sheets, Spur embedder, Spirit flame, Bees Specimen
Materials	▪ Pictures, Video, Makers, Flipchart, Internet, Books ▪ Melliferous plants, water ▪ Construction materials
Tools	▪ Wire, Papers for colony merging, Bees Specimen, Queen screen (Grille à rèine) ▪ Books ▪ GPS, Weather vane, Thermometer, Hygrometer, Meteorological data, Measuring tapes, Feeders, Drinkers, Stands, Fixed comb hives, Movable comb hives with top bars, Movable comb hives with frames
Facilitation techniques	Brainstorming, group activities, presentations, practical works / field visit **Group discussion** ▪ Trainer makes introduction on selection of starter colony and installation of bee colony ▪ The Trainer forms small groups of students and asks them to discuss in detail on the following topics: ➢ Characteristics of a good starter colony

	➢ Activities to install bee colony ➢ Management of apiary ➢ Normal colony activities and biophysical parameters. ▪ The trainees are then asked to present what they have discussed in groups ▪ Trainer provides the additional inputs / expert view and makes a summary. **Practical activity** ▪ Trainer plans a field visit in a well-organized apiary ▪ Before entering in apiary, the trainer and trainees wear personal protective equipment ▪ Arriving in apiary, the trainer introduces the activities ▪ Trainer makes small groups of trainees and assigns the tasks to each group. Tasks: ➢ Transfer a bee colony from an old hive to a new hive, ➢ Observe colony activities ➢ Observe biophysical parameters ▪ Trainer monitors those practical works, providing guidance and support where clarification is needed ▪ After returning back in class, the trainees produce the report about the activities done and findings from their observation ▪ Trainees present the report to discuss the effectiveness of the works, ▪ Trainer provides feedback on presentations to close the session.
Formative assessment methods /(CAT)	Oral assessment ▪ Interviews ▪ Questionnaires Written assessment ▪ Matching

	▪ True or false ▪ Multiple choice questions ▪ Written report ▪ Sequencing ▪ Problem solving ▪ Essay (short responses / extended responses) Performance assessment ▪ Simulation ▪ Observation checklist ▪ Practical task ▪ Demonstration activities ▪ Photographs/drawings interpretation/analysis ▪ Videos interpretation/analysis

Learning outcome 3: Harvest honey and honey bee products	**Learning hours: 10 Hrs**
Indicative content	
• **Harvesting methods of honey** ✓ Techniques of honey collection ✓ Techniques of honey extraction Floating Pressing Centrifuging	

- **Refining of honey**
  - ✓ Procedures of honey refining
    - Preheating
    - Straining
    - Heating
    - Filtering
    - Cooling
    - Bottling
    - Labeling
- **Harvesting techniques of honey bee products**
  - ✓ Identification of honey bee products and their use
    - Propolis
    - Beewax
    - Bee pollen
    - Venom
    - Royal jelly
    - Brood
  - ✓ Collecting beewax
  - ✓ Harvesting Propolis
  - ✓ Harvesting bee pollen

Resources required for the learning outcome	
Equipment	▪ Appropriate PPE (veil, overall, gloves, boots, mask, appropriate hat) ▪ Populated beehives, Stands cage, Queen box, Uncapping fork, Wire, Honey extractor
Materials	▪ Pen, Notes book, Internet, Papers, Pens, Chalk ▪ Gloves, Water, Detergent, smoke, Boiling water ▪ Honey, Propolis, Beewax, Bee pollen
Tools	▪ Queen excluder, Smoker, Brush, Spur embedder, Spirit flame, Hiver tools, Uncapping Knife, stainless steel recipient/ container

Facilitation techniques	Brainstorming, group activities, presentation, practical works / field visit **Practical activity** ▪ Trainer and trainees wear personal protective equipment ▪ Arriving in apiary, the trainer introduces the activities ▪ Trainer makes small groups of trainees and asks each group to harvest honey and honey bee products ▪ Trainer monitors those practical works, providing guidance and support where needed ▪ After returning back at school, the trainer asks the trainees to refine honey ▪ Trainees package honey and put labelling ▪ Trainees process and store each honey product in its separate container ▪ All activities are monitored by Trainer in order to provide any necessary assistance ▪ Trainees develop the report of all activities in their respective groups and they make a presentation in class. ▪ Trainer provides feedback on presentations and closes the session.
Formative assessment methods /(CAT)	**Oral assessment** ▪ Interviews ▪ Questionnaires **Written assessment** ▪ Matching ▪ True or false ▪ Multiple choice questions ▪ Written report ▪ Sequencing ▪ Essay (short responses / extended responses) **Performance assessment**

	▪ Simulation ▪ Observation checklist ▪ Practical task ▪ Demonstration activities ▪ Photographs/analysis ▪ Videos interpretation/analysis

Learning outcome 4: Control honey bee diseases, pests and predators	**Learning hours: 10 Hrs**
Indicative content	

- **Identification of honey bee diseases**
  - ✓ Common parasitic diseases
    - Acariosis
    - Varroa mite
    - Nosema
  - ✓ Common infectious diseases
    - Bacterial diseases (American foulbrood, European foulbrood,
    - Viral diseases (Sac brood virus, Cloudy wing virus, Black queen cell virus, Deformed wing virus, Tobacco ring spot virus,
    - Fungal diseases (Chalk brood, Stone brood)
- **Identification of honey bee pests, predators and other enemies**
  - ✓ Pests
    - Wax moth
    - Ants and termites
  - ✓ Predators
    - Birds
    - Bear

- Skunk
- Raccoon

✓ Other Enemies

- Ants
- Wasps
- Games and cattle
- Human being
- Robbers
- Pesticides poisoning

- **Application of control measures of honey bee diseases, pests, predators and other enemies**
  - ✓ Treatment and prevention of parasitic diseases
  - ✓ Treatment and prevention of infectious diseases
  - ✓ Control of honey bee pests, predators and other enemies

Resources required for the learning outcome	
Equipment	▪ Beehives
Materials	▪ Pens, Markers, ▪ Drugs, Water, Graduated syringes
Tools	▪ Books ▪ Recipient for drugs distribution
Facilitation techniques	Brainstorming, group activities, presentations, practical works **Group activities** ▪ Trainer forms small groups of trainees and asks them to discuss on the following topics: ➢ Diagnosis, treatment and prevention of honey bee diseases; ➢ Control of pests, predators and enemies of honey bees. ▪ The trainees are asked to present what they discussed in group ▪ Trainer provides the additional inputs/expert view, using pictures and videos

	▪ Trainer summaries the topic and closes the session.
Formative assessment methods /(CAT)	**Oral assessment** ▪ Interviews ▪ Questionnaires **Written assessment** ▪ Matching ▪ True or false ▪ Multiple choice questions ▪ Written report ▪ Sequencing ▪ Essay (short responses / extended responses) **Performance assessment** ▪ Simulation ▪ Observation checklist ▪ Practical task ▪ Demonstration activities ▪ Photographs/drawings interpretation/analysis ▪ Videos interpretation/analysis

Integrated/Summative assessment

Integrated situation

The beekeepers around Nyungwe national park associated in ABAKUNDANZUKI cooperative have traditional hives whose honey production is low and they are challenged with regular management of their beehives. The general assembly meeting held took decision of modernizing production system by increasing the number of modern beehives (as they already have 2 Langstroth beehives) and installation of a small apiary to be used for demonstration. Thus, the cooperative needs to hire a professional beekeeper and their consultant has prepared the entry exam.

As veterinary technician whose needs that job, you are required to perform the following tasks:

- Install a new small apiary of 3 beehives in two (2) hours

- Install honey bee colony in one beehive in one (1) hour

- Assess colony activities and biophysical parameters in one (1) one

- Harvest honey and honey products from one existing beehive in one (1) hour

- Calculate the profit and productivity existing apiary in 30 minutes

- Apply control measures for honey bee diseases, pests, predators and other enemies of bees in one (1) hour

The cooperative has all material, tools and equipment required for these tasks.

Resources

Tools	▪ Queen excluder, Smoker, Brush, Spur embedder, Spirit flame, Hiver tools, Uncapping Knife ▪ GPS, Weather vane, Thermometer, Hygrometer, Meteorological data, Measuring tapes, calculator,
Equipment	▪ Appropriate PPE (veil, overall, gloves, boots, mask, appropriate hat)

	▪ Langstroth hive, populated traditional hives, Kenyan beeehive, Easter African long hives, Stands cage, Queen box, Boiling water, Uncapping fork, Populated tradition hives-Wire, Queen box
Materials/ Consumables	▪ Papers, Pens, ▪ Gloves, Water, Detergent

Assessable outcomes	**Assessment criteria (Based on performance criteria)**	**Indicator**	**Observation**		**Marks allocation**
			Yes	**No**	
1. Install apiary	1.1. Bee keeping materials, tools and equipment are properly selected according to their uses.	Materials, Equipment to be used in apiary are identified			3
		Tools be used in apiary are identified			3
		Equipment to be used in apiary are identified			3
	1.2. Apiary site is properly selected according to the environmental characteristics	Source of water is checked			3
		Climatic condition are considered			3
		Site dimension is checked			3
		Altitude is considered			3
		Distance from people residence is considered			3
		Source of nectar and pollen are checked			3
		Distance from agricultural chemical use is considered			3
		Accessibility is checked			3

	1.3. Beehives are adequately installed in apiary according to their types and farming system	Beehive is prepared			4
		Area is prepared			3
		Beehive is put in place			3
2. Keep honey bees	2.1. The source of honey bee starter colony is properly selected according to their availability	starter bee colony is selected			3
	2.2. Honey bee colony is properly installed according to the techniques	Hiving technique is applied			4
	2.3. Apiary is efficiently managed according to the production system	Profit is calculated			3
		Productivity calculated			3
	2.4. Colony activities and biophysical parameters are properly monitored according to honey bee behaviors	Honey bee behaviors are checked/monitored			4
		Biophysical parameters are checked/monitored			3
3. Harvest honey bee products	3.1. Honey are properly harvested according to the techniques	Honey is harvested			4
		Honey is extracted			3
	3.2. Honey is adequately refined according to techniques	Honey is refined			3
	Honey bee products are properly harvested according to their types	Honey bee products are harvested			3

4. Control honey bee pests, predators and other enemies	4.1. Honey bee diseases are properly identified according to causative agents	Honey bee diseases are identified			3
	4.2. Honey bee pests, predators and other enemies are properly identified according to their types	Honey bee pests are identified			3
		Honey bee predators are identified			3
		Other honey bee enemies are identified			3
	4.2. Control measures of honey bee diseases, pests, predators and other bee enemies are properly applied according to the protocol	Control of measures for bee diseases are applied			3
		Control of measures for bee pests are applied			3
		Control of measures for bee predators are applied			3
		Control of measures for bee enemies are applied			3
Total marks					100
Percentage Weightage					100%
Minimum Passing line % (Aggregate):					70%

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