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# GEAVET TRAINING PROGRAMME FOR CLIMATE SMART AGRICULTURE

Lawal, B.O., Omotosho, A.O., and Omotoso, S.O.

OBAFEMI AWOLOWO UNIVERSITY

APRIL 20, 2026

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# HOW MODULES WERE IDENTIFIED

- Research Informed Modules
- Topics for developing the module were selected through a systematic needs analysis using the Borich Needs Assessment model
- Borich model identified priority competency gaps based on the discrepancy between perceived importance and perceived level of competence.

# OVERVIEW OF THE MODULES

- **Aim:** To strengthen the practical, climate-smart agricultural competencies of VET learners in crop and livestock production for resilient and sustainable food systems in Nigeria.
- Emphasis on two practical modules with six learning units.

## ◆ Crop

- Drip irrigation installation and maintenance
- Soil testing and interpretation
- Use of climate data for farm planning and decision-making

## ◆ Livestock

- Livestock feed and feeding management
- Silage production
- Water quality management for fish production.

**Total duration:** 31 hours 35 minutes



# MODULE ONE

# MODULE ONE -OVERVIEW

This module is designed to enhance learners' abilities to implement integrated, climate-smart production practices through hands-on training in drip irrigation installation and maintenance, soil testing, and the application of climate data for informed farm decision-making.

# MODULE TWO

# MODULE TWO- OVERVIEW

This module equips learners with vital knowledge, practical skills and attitude for managing livestock feed and feeding systems effectively, promoting sustainable animal production and ensuring water quality for aquaculture practices.

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# MODULE ONE



## UNIT I.I : INSTALLATION/MAINTENANCE OF DRIP IRRIGATION

- As the demand for sustainable food production grows, there is an urgent need to adopt modern irrigation technologies that optimize water use and enhance crop yield.
- Drip irrigation is an efficient system that delivers water directly to the root zone of plants, offering a viable solution for improving water management, reducing wastage, and increasing farm profitability.
- Climate-Smart Agriculture aims to sustainably increase agricultural productivity, enhance resilience to climate change, and reduce greenhouse gas emissions where possible.



# LEARNING OBJECTIVES

*Students should be able to gain the following knowledge:*

- Explain the components of a drip irrigation system.
- Understand water requirements of different crops and how drip irrigation meets these needs.
- Describe site preparation, water quality considerations, and layout design for drip systems.
- Identify common causes of emitter clogging, leakages, and system inefficiencies.
- State safety measures and environmental considerations in drip irrigation installation and maintenance.

## **Skills**

- Select appropriate tools, pipes, and fittings for system assembly.
- Measure and mark field layouts for drip irrigation installation.
- Assemble and install mainlines, sub-mains, laterals, emitters, and filters correctly.
- Perform flushing, backwashing, and cleaning operations to maintain system efficiency.
- Detect and repair faults such as leaks, blockages, or broken emitters.
- Conduct system performance checks.
- Document installation and maintenance activities.

## **Attitudes**

- Demonstrate teamwork and cooperation during group installation exercises.
- Show responsibility in handling tools, equipment, and water resources.
- Develop a culture of preventive maintenance rather than reactive repairs.
- Cultivate environmental awareness by promoting water-use efficiency and sustainability.

# OTHER SKILLS

## Transversal Skills

- Communication Skills
- Teamwork and Collaboration
- Problem-Solving and Critical Thinking
- Numeracy and Measurement Skills etc.

## Digital Skills Associated with Drip Irrigation Installation and Maintenance Practices

- Basic ICT Competence
- Digital Measurement and Mapping Tools
- Data Collection and Analysis
- Digital Communication and Collaboration etc.

## Green Skills Associated with Drip Irrigation Installation and Maintenance Practices

- Sustainable Water Management
- Resource Efficiency
- Waste Reduction and Recycling
- Soil and Ecosystem Protection etc.

# IMPLEMENTATION PLAN OF PEDAGOGICAL ACTIVITIES

Duration: 3 hours 15 mins

No of Activity	Timing	Training Methods/Activity	What do trainers do	What do participants do
1	50 min	Orientation, Safety Briefing & Identification of Irrigation Components	<ul style="list-style-type: none"> <li>• Present overview of drip systems</li> <li>• Demonstrate safe handling of tools/materials</li> <li>• Demonstrate each component</li> <li>• Explain function and selection criteria</li> </ul>	<ul style="list-style-type: none"> <li>• Students participate actively and ask questions</li> </ul>
2	35 min	Demonstration on Field Layout Design & Measurement	<ul style="list-style-type: none"> <li>• Guide students in measuring plots</li> <li>• Marking pipe routes</li> </ul>	<ul style="list-style-type: none"> <li>• Students participate actively and ask questions</li> </ul>
3	55 min	Installation of drip facility (Mainline, Sub-mains, Laterals, Emitters, Filter and Valve Assembly)	<ul style="list-style-type: none"> <li>• Demonstrate cutting, joining, and laying of pipes</li> <li>• Demonstrate assembling filters and valves</li> <li>• Explain flushing system</li> </ul>	<ul style="list-style-type: none"> <li>• Students participate actively and ask questions</li> </ul>
4	20 min	System Testing and Performance Check (flow rate, pressure, uniformity)	<ul style="list-style-type: none"> <li>• Demonstrate water flow tests</li> <li>• Guide on reading results</li> </ul>	<ul style="list-style-type: none"> <li>• Students participate actively and ask questions</li> </ul>
5	50 min	Maintenance Practices (flushing, backwashing, clogging prevention, leak detection), Troubleshooting & Fault Repair Simulation.	<ul style="list-style-type: none"> <li>• Demonstrate flushing/backwashing techniques</li> <li>• Show repair of leaks</li> <li>• Present common faults (leakage, clogging, breakages) and repair steps</li> </ul>	<ul style="list-style-type: none"> <li>• Students participate actively and ask questions</li> </ul>

# Materials (What trainers need to have prepared)

## Teaching and Learning Aids

- Training manual/handouts with diagrams of drip irrigation components.
- Multimedia resources (PowerPoint slides, videos, posters).
- Whiteboard/flip chart and markers for sketches. etc

## Tools and Equipment

- Pipe cutters or hacksaws.
- Punch tools for emitter insertion.
- Pliers, wrenches, screwdrivers. etc

## Drip Irrigation Components (for practical exercises)

- Mainline pipes (PVC/HDPE).
- Sub-main pipes.
- Lateral pipes (LDPE). etc

## Maintenance and Repair Materials

- Sealants and Teflon tape.
- Spare emitters and fittings. etc

## Field Setup and Support Materials

- Demonstration plot (farm/garden site for installation).
- Water source (tank, borehole, or reservoir). etc

# DESCRIPTION OF ACTIVITIES

## Activity 1: Orientation, Safety Briefing & Identification of Irrigation Components

**Aim of the activity:** To introduce safety practices and enable correct identification and understanding of key drip irrigation components

**Duration:** 50 min

### **Step-by-step instruction of the task/practical exercise/case study:**

- **Orientation Session:** The facilitator welcomes learners, explains the objectives of the training, and outlines the importance of drip irrigation in water efficiency, crop productivity, and climate-smart agriculture.
- **Safety Briefing:** Learners are introduced to basic workshop and field safety rules. The facilitator explains common risks associated with irrigation work, such as sharp tools, pressurized water, and exposure to dirt or chemicals.
- **Introduction to Drip Irrigation Systems:** Using charts or diagrams, the facilitator explains how a drip irrigation system works, highlighting water flow from the source through filters, pipes, and emitters to the crop root zone.
- **Identification of Irrigation Components:** Learners observe real irrigation components laid out on a table or floor.
- **Component Grouping and Labelling:** Learners work individually or in small groups to match components with their correct names and functions using labels or tags.
- **Review and Reflection:** The session concludes with a brief question-and-answer discussion to assess understanding.

# DESCRIPTION OF ACTIVITIES (CONT'D)

## Activity 2: Demonstration on Field Layout Design & Measurement

**Aim of the activity:** To develop learners' skills in accurate field layout design and measurement for drip irrigation.

**Duration:** 35 min

### **Step-by-step instruction of the task/practical exercise/case study:**

- **Introduction and Explanation:** The facilitator explains the purpose of field layout design and its role in effective drip irrigation installation, highlighting accuracy and efficiency.
- **Site Observation and Assessment:** Learners observe the field to identify boundaries, slope direction, water source location, and obstacles such as trees or pathways.
- **Selection of Measurement Tools:** Measuring tapes, ropes, pegs, and markers are introduced, and their correct use is demonstrated.
- **Taking Field Measurements:** The facilitator demonstrates how to measure field length and width accurately, while learners observe and record measurements.
- **Marking Field Boundaries:** Learners place pegs at corners and along boundaries, using ropes or lines to ensure straight alignment.
- **Designing the Layout:** Mainline, sub-main, and lateral positions are marked based on crop spacing, field shape, and water flow direction.
- **Learner Practice:** Learners repeat the measurement and marking process in small groups under supervision.
- **Review and Feedback:** The facilitator reviews the layout with learners, corrects mistakes, and discusses improvements.

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 3: Installation of Drip Facility (Mainline, Sub-mains, Laterals, Emitters, Filter and Valve Assembly)

**Aim of the activity:** To equip learners with practical skills for installing complete drip irrigation systems.

**Duration:** 55 min

#### **Step-by-step instruction of the task/practical exercise/case study:**

- **Preparation and Safety Check:** Learners wear appropriate PPE and review the installation plan, field layout, and safety guidelines.
- **Installation of Filter and Valve Assembly:** The facilitator demonstrates how to install the filter near the water source, followed by control valves, ensuring correct flow direction.
- **Laying the Mainline:** The mainline pipe is laid along the marked route, cut to required lengths, joined with fittings, and secured properly.
- **Installation of Sub-mains:** Sub-mains are connected to the mainline using tees or connectors and aligned according to the layout design.
- **Laying Laterals:** Laterals are laid across crop rows, fixed at correct spacing, and secured to prevent movement.
- **Installing Emitters:** Emitters are fixed on laterals at specified intervals, ensuring firm attachment and correct orientation.
- **End Caps and Flushing:** End caps are installed, and the system is flushed to remove dirt before final closure.
- **System Testing and Adjustment:** Water is released gradually to check for leaks, pressure balance, and uniform emitter discharge.
- **Review and Reflection:** The facilitator inspects the installation with learners and discusses improvements and maintenance tips.

# DESCRIPTION OF ACTIVITIES (CONT'D)

## Activity 4: System Testing and Performance Check (flow rate, pressure, uniformity)

**Aim of the activity:** To assess and optimize drip irrigation system performance through systematic testing procedures.

**Duration:** 35 min

### **Step-by-step instruction of the task/practical exercise/case study:**

- **Preparation and Safety Check:** Learners wear PPE and ensure the system is properly installed and flushed before testing begins.
- **System Start-Up:** Water is gradually released into the system, allowing pressure to stabilize before measurements are taken.
- **Pressure Measurement:** Pressure gauges are checked at the filter, mainline, and selected laterals to confirm operating pressure levels.
- **Flow Rate Measurement:** Learners collect water from selected emitters into measuring containers over a timed period to calculate flow rates.
- **Uniformity Check:** Flow measurements from different points in the field are compared to assess uniform water distribution.
- **Identification of Problems:** Learners inspect the system for leaks, blocked emitters, or pressure drops and note observations.
- **Adjustment and Correction:** Valves are adjusted, lines flushed, or faulty components replaced to improve performance.
- **Re-testing and Confirmation:** Measurements are repeated to confirm improvements after adjustments.
- **Documentation and Review:** Results are recorded, discussed, and reviewed with the facilitator to reinforce learning.

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 5: Maintenance Practices (flushing, backwashing, clogging prevention, leak detection), Troubleshooting & Fault Repair Simulation

**Aim of the activity:** To develop practical skills for maintaining, troubleshooting, and repairing drip irrigation systems.

**Duration:** 50 min

#### **Step-by-step instruction of the task/practical exercise/case study:**

- **Orientation and Safety Briefing:** The facilitator explains the importance of maintenance and reviews safety precautions before starting work.
- **System Inspection:** Learners visually inspect the system to identify signs of leaks, blockages, or damaged components.
- **Flushing of Lines:** End caps are opened, and water is allowed to flow to remove sediments from mainlines, sub-mains, and laterals.
- **Filter Backwashing:** Learners observe and practice proper backwashing of filters to remove trapped debris.
- **Clogging Prevention Practices:** The facilitator demonstrates correct filtration checks and basic preventive measures to reduce emitter blockage.
- **Leak Detection:** Learners check joints, fittings, and pipelines for leaks and pressure drops.
- **Troubleshooting Simulation:** Common faults are intentionally introduced, and learners diagnose the problems using observed symptoms.
- **Fault Repair and Correction:** Learners repair leaks, clean or replace blocked emitters, and adjust valves as needed.
- **System Restart and Verification:** The system is restarted to confirm faults have been corrected.
- **Review and Reflection:** Learners discuss lessons learned and maintenance schedules with the facilitator.

# UNIT 1.2 : SOIL TESTING, ANALYSIS AND INTERPRETATION

- Healthy soils are the foundation of sustainable agriculture and food security in Nigeria, Issues such as declining soil fertility, nutrient depletion, and poor fertilizer application continue to limit crop productivity and threaten environmental balance.
- Soil testing is the scientific process of analyzing soil samples to determine their physical, chemical, and biological properties, such as pH, nutrient content, texture, organic matter, and salinity levels.
- Proper interpretation of soil testing results ensures that fertilizer types, quantities, and timing are optimized, thus minimizing waste and maximizing crop response.



# LEARNING OBJECTIVES

*Students should be able to gain the following knowledge:*

- Explain the principles and purpose of soil testing in agriculture.
- Identify major soil parameters commonly tested (pH, texture, organic matter, nutrients, salinity).
- Describe procedures for sample collection, preparation, and analysis.
- Understand how soil test results are used for decision-making in soil fertility and land management.

## **Skills**

- Collect representative soil samples from the field using correct tools and procedures.
- Prepare soil samples (drying, sieving, labeling, storing) for laboratory testing.
- Conduct basic laboratory analyses:
  - Soil pH (potentiometric method)
  - Soil texture (mechanical method or feel method).
  - Organic matter (loss-on-ignition or Walkley-Black method)
  - Electrical conductivity (salinity).
  - Macronutrients (N, P, K) using simple rapid test kits or standard procedures.
- Record and organize soil test results in tabular format.
- Interpret laboratory results to make practical soil management recommendations.
- installation and maintenance activities.

## **Attitudes**

- Accuracy, neatness, and consistency in conducting soil tests.
- Demonstrate responsibility and safety awareness in handling laboratory equipment and chemicals.
- Cultivate teamwork and cooperation during field and lab activities.

# OTHER SKILLS

## Transversal Skills

- Communication Skills
- Teamwork and Collaboration
- Problem-Solving and Critical Thinking
- Numeracy and Measurement Skills etc.

## Digital Skills

- Data entry
- Data analysis and visualization
- Report writing & Presentation tools
- Geospatial & Mapping skills etc.

## Green Skills

- Sustainable Soil Management Awareness
- Waste Reduction & Safe Disposal
- Resource Efficiency
- Environmental Protection Practices etc.

# IMPLEMENTATION PLAN OF PEDAGOGICAL ACTIVITIES

## Activity 1: Field Sampling & Sample Preparation (1 hour 10 minutes)

Sub-Activity	Timing	Training Methods/Activity	What do trainers do	What do participants do
1	15 min	Introductory briefing & safety orientation	<ul style="list-style-type: none"> <li>Explain objectives, demonstrate safety &amp; correct sampling tools</li> </ul>	<ul style="list-style-type: none"> <li>Watch videos and take notes</li> </ul>
2	20 mins	Field demonstration: soil sampling procedures	<ul style="list-style-type: none"> <li>Demonstrate step-by-step soil sampling in different locations</li> </ul>	<ul style="list-style-type: none"> <li>Practice soil sample collection in groups</li> </ul>
3	20 mins	Sample preparation in the laboratory (drying, sieving, labeling)	<ul style="list-style-type: none"> <li>Guide preparation steps &amp; demonstrate labeling standards</li> </ul>	<ul style="list-style-type: none"> <li>Carry out drying, sieving &amp; proper labeling after watching videos</li> </ul>
4	15 mins	Group reflection & discussion	<ul style="list-style-type: none"> <li>Facilitate debrief on challenges &amp; sampling errors</li> </ul>	<ul style="list-style-type: none"> <li>Share experiences, discuss lessons learned</li> </ul>

## Activity 2: Laboratory Soil Analysis (1 hour 25 minutes)

1	15 mins	Demonstration of equipment use (pH meter, EC meter, glassware)	<ul style="list-style-type: none"> <li>Demonstrate safe operation &amp; calibration</li> </ul>	<ul style="list-style-type: none"> <li>Watch videos and take notes</li> </ul>
2	25 mins	Practical demonstration: Soil pH, EC, texture tests	<ul style="list-style-type: none"> <li>Supervise &amp; assist groups with tests</li> </ul>	<ul style="list-style-type: none"> <li>Perform tests in groups, record data</li> </ul>
3	30 mins	Practical demonstration: Organic matter & NPK analysis	<ul style="list-style-type: none"> <li>Explain procedures, troubleshoot errors</li> </ul>	<ul style="list-style-type: none"> <li>Conduct analyses, handle reagents safely</li> </ul>
4	15 mins	Lab safety & waste disposal training	<ul style="list-style-type: none"> <li>Demonstrate eco-friendly disposal</li> </ul>	<ul style="list-style-type: none"> <li>Apply correct disposal of chemical residues</li> </ul>

# IMPLEMENTATION PLAN OF PEDAGOGICAL ACTIVITIES (CONT'D)

## Activity 3: Data Interpretation and reporting (1 hour 5 minutes)

1	20 mins	<ul style="list-style-type: none"><li>Demonstration on data entry &amp; analysis (Excel/Sheets)</li></ul>	<ul style="list-style-type: none"><li>Teach digital recording &amp; simple statistics</li></ul>	<ul style="list-style-type: none"><li>Input and organise soil test results</li></ul>
2	25 mins	<ul style="list-style-type: none"><li>Interpretation exercise</li></ul>	<ul style="list-style-type: none"><li>Provide interpretation frameworks &amp; guidelines</li></ul>	<ul style="list-style-type: none"><li>Analyse data to identify soil fertility status</li></ul>
3	20 mins	<ul style="list-style-type: none"><li>Report writing session</li></ul>	<ul style="list-style-type: none"><li>Guide report format &amp; language</li></ul>	<ul style="list-style-type: none"><li>Draft reports with recommendations</li></ul>

# Materials (What trainers need to have prepared):

## Section 1: Field Sampling & Sample Preparation

### Field tools & equipment

- Soil augers, spades, core samplers
- Buckets and sample bags (clean, labelled)
- Permanent markers, tags, and field notebooks etc.

### Sample preparation items

- Drying trays or oven
- Sieves (2 mm standard mesh) etc

## Section 2: Laboratory Soil Analysis

### General lab materials

- Lab coats, gloves, goggles, aprons
- Distilled water
- Weighing balance (digital) etc

### Specific test equipment

- Soil pH test: Digital/analog pH meters, buffer solutions for calibration
- Electrical conductivity (EC): EC meter or conductivity cell
- Texture analysis: Hydrometer set, sedimentation cylinders, mechanical shaker, stopwatch. etc.

### Safety materials

- First aid kit
- Fire extinguisher

# Materials (What trainers need to have prepared):

## Section 3: Data Interpretation & Reporting

### ICT materials

- Computers/laptops (with Excel or similar spreadsheet software installed)
- Projector and screen (for presentations)
- Internet access (for research on soil interpretation standards) etc.

### Stationery & learning aids

- Flip charts/whiteboard & markers
- Handouts or interpretation guides (soil test standards, fertilizer recommendation charts)
- Templates for soil analysis reporting.

# DESCRIPTION OF ACTIVITIES

## Activity 1: Field Sampling & Sample Preparation

**Aim of the activity:** To develop practical skills in soil sampling and sample preparation techniques.

**Duration:** 70 mins

### **Step-by-step instruction of the task/practical exercise/case study:**

- **Introductory Briefing & Safety Orientation:** The facilitator explains the objectives of soil sampling, safety precautions, proper use of sampling tools, and importance of accurate sample handling.
- **Field Demonstration: Soil Sampling Procedures:** Learners observe and practice selection of representative sampling points, proper soil depth measurement, and use of augers or spades to collect soil samples without contamination.
- **Sample Preparation in the Laboratory (Drying, Sieving, Labeling):** Collected samples are air-dried, sieved to remove debris, and labeled with location, depth, and date to ensure proper identification for testing.
- **Group Reflection & Discussion:** Learners discuss challenges, share observations, and reflect on the significance of accurate sampling and preparation in soil testing and irrigation planning.

# DESCRIPTION OF ACTIVITIES (CONT'D)

## Activity 2: Laboratory Soil Analysis

**Aim of the activity:** To develop skills in soil testing, analysis, and interpretation techniques.

**Duration:** 85 min

**Step-by-step instruction of the task/practical exercise/case study:**

- **Demonstration of Equipment Use (pH Meter, EC Meter, Glassware):** The facilitator introduces soil testing equipment, explains their functions, and demonstrates correct handling, calibration, and cleaning. Learners observe and take notes.
- **Practical Demonstration: Soil pH, EC, and Texture Tests** Learners prepare soil samples and perform pH and EC measurements. Soil texture is determined using hand-feel or sedimentation methods. Results are recorded and discussed.
- **Practical Demonstration: Organic Matter & NPK Analysis:** The facilitator demonstrates procedures for estimating soil organic matter and testing NPK content using standard kits. Learners record observations and link findings to soil fertility status.
- **Lab Safety & Waste Disposal Training:** Learners are instructed on laboratory safety, proper PPE use, careful handling of glassware and chemicals, and environmentally safe disposal of soil residues and test wastes.

# DESCRIPTION OF ACTIVITIES (CONT'D)

## Activity 3: Data Interpretation and Reporting

**Aim of the activity:** To develop learners' skills in analyzing, interpreting, and reporting soil data.

**Duration:** 65 min

### Step-by-step instruction of the task/practical exercise/case study:

- **Demonstration on Data Entry & Analysis (Excel/Sheets):** The facilitator demonstrates how to enter soil test data into a spreadsheet, perform calculations (e.g., averages, percentages), and generate charts or tables for easy interpretation.
- **Interpretation Exercise:** Learners analyze provided soil test datasets to identify soil pH levels, nutrient status, salinity issues, and texture classification. Discussions highlight implications for irrigation and crop management.
- **Report Writing Session:** Learners draft structured reports summarizing methods, results, analysis, and recommendations. The facilitator reviews and provides feedback on clarity, accuracy, and professionalism.

## UNIT 1.3: USE OF CLIMATE DATA FOR FARM DECISION-MAKING

- Climate variability poses increasing challenges to agricultural productivity, sustainability, and food security in Nigeria.
- The training programme focuses on empowering participants with practical knowledge and digital skills to utilise weather and climate information for decisions such as crop selection, planting dates, irrigation scheduling, pest and disease management, and soil conservation.
- When effectively integrated into farm management, climate data shifts agricultural planning from a reactive to a proactive approach.



# LEARNING OBJECTIVES

*Students should be able to gain the following knowledge::*

- Identify major sources of climate data (e.g., meteorological stations, mobile apps, online databases).
- Explain basic climate parameters relevant to agriculture (temperature, rainfall, humidity, wind speed, solar radiation).
- Understand how seasonal and daily climate variations influence crop growth, pest dynamics, and soil moisture.
- Recognize the importance of weather forecasts in short-term farm operations.
- Relate historical climate patterns to crop selection and planting schedules.

## **Skills**

- Collect and interpret local climate data using digital and manual tools (e.g., rain gauge, thermometer, hygrometer, weather apps).
- Analyze weather and climate charts to make informed decisions on planting, irrigation, and harvesting.
- Develop a simple farm calendar integrating climate forecasts.
- Use basic data visualization tools (Excel, Google Sheets, or mobile apps) to present climate information for decision-making.
- Evaluate climate risks (e.g., drought, flooding) and suggest adaptive farming practices.

## **Attitudes**

- Appreciate the role of climate information in sustainable agricultural practices.
- Demonstrate accuracy and attention to detail when handling data.
- Develop a proactive attitude towards using technology for farm planning.
- Value teamwork and communication in group-based data collection and decision-making exercises.
- Exhibit responsibility in applying climate-based decisions to real farm contexts.

# OTHER SKILLS

## Transversal Skills

- Digital Literacy
- Problem-solving and critical thinking
- Communication skills etc.

## Digital Skills

- Data collection and recording.
- Data access and retrieval
- Data Analysis and interpretation etc.

## Green Skills

- Climate-smart decision-making.
- Environmental monitoring and reporting
- Sustainable resources management. etc.



# IMPLEMENTATION PLAN OF PEDAGOGICAL ACTIVITIES

Duration: 4 hrs 45 mins

No of Activity	Timing	Training Methods/Activity	What do trainers do	What do participants do
1	35 min	Introduction and Orientation briefing on the importance of climate data in farm decision-making	<ul style="list-style-type: none"> <li>• Introduce course objectives and relevance to sustainable agriculture</li> <li>• Explain expected outcomes and assessment methods</li> </ul>	<ul style="list-style-type: none"> <li>• Listen and take notes</li> <li>• Ask questions to clarify understanding</li> </ul>
2	25 min	Demonstration of Climate Data Tools (e.g., rain gauge, thermometer, weather apps)	<ul style="list-style-type: none"> <li>• Demonstrate how to set up, calibrate, and read instruments</li> <li>• Explain data recording techniques</li> </ul>	<ul style="list-style-type: none"> <li>• Observe demonstrations</li> <li>• Practice setting up and using tools</li> <li>• Record sample data in logbooks</li> </ul>
3	35 min	Demonstration on Data Collection Methods	<ul style="list-style-type: none"> <li>• Supervise field groups</li> <li>• Provide guidance on safety and data accuracy</li> <li>• Ensure proper use of equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Collect temperature, rainfall, and humidity data</li> <li>• Record observations in data sheets or mobile apps</li> <li>• Work collaboratively in teams</li> </ul>
4	45 min	Data Analysis and Interpretation Session (using Excel/Google Sheets)	<ul style="list-style-type: none"> <li>• Guide learners on entering data, generating graphs, and identifying trends</li> <li>• Demonstrate interpretation of climate charts</li> </ul>	<ul style="list-style-type: none"> <li>• Enter field data on digital platforms</li> <li>• Create simple graphs/charts</li> <li>• Discuss observed trends and their implications on farming</li> </ul>

# IMPLEMENTATION PLAN OF PEDAGOGICAL ACTIVITIES (CONT'D)

5	25 min	Developing a Farm Decision Plan based on analyzed data	<ul style="list-style-type: none"> <li>Facilitate group discussions on planning farm activities (planting, irrigation, harvesting)</li> <li>Provide templates or examples</li> </ul>	<ul style="list-style-type: none"> <li>Work in groups to prepare a climate-based farm calendar</li> <li>Present decision plans orally or in written form</li> </ul>
6	45min	Case Study / Scenario Analysis Using historical climate data for crop selection	<ul style="list-style-type: none"> <li>Provide sample datasets or case examples</li> <li>Ask guiding questions to stimulate critical thinking</li> </ul>	<ul style="list-style-type: none"> <li>Analyze given data sets</li> <li>Propose suitable crops or practices for each scenario</li> </ul>
7	30 min	Integration of Green and Digital Skills Workshop	<ul style="list-style-type: none"> <li>Demonstrate use of digital platforms for sustainable farm management (e.g., online weather services)</li> <li>Discuss eco-friendly decision-making</li> </ul>	<ul style="list-style-type: none"> <li>Explore digital tools under supervision</li> <li>Identify how data use supports sustainable practices</li> </ul>
8	30 min	Assessment and Reflection Session	<ul style="list-style-type: none"> <li>Assess group presentations, reports, and field logs</li> <li>Facilitate reflective discussion on lessons learned and challenges techniques; show repair of leaks</li> </ul>	<ul style="list-style-type: none"> <li>Present group findings and reflections</li> <li>Provide feedback on what they learned and how to improve</li> </ul>

# Materials (What trainers need to have prepared):

- **Instructional and Reference Materials**
  - Lesson plan and course outline.
  - Case study examples (printed or digital). etc.
- **Data Collection Instruments**
  - Rain gauge.
  - Thermometer (digital or mercury).
  - Hygrometer. etc.
- **Digital and ICT Resources**
  - Computers or laptops (one per group).
  - Internet access or mobile hotspots.
  - Spreadsheet software (Excel, Google Sheets, or LibreOffice Calc). etc.

# Materials (What trainers need to have prepared) Cont'd

- Teaching Aids and Demonstration Materials
  - Charts showing temperature, rainfall, and humidity patterns.
  - Sample farm calendars. Etc.
- Safety and Field Logistics
  - First aid kit.
  - Protective gear (caps, gloves, boots, raincoats).
- Administrative and Reporting Materials
  - Attendance register.
  - Group assignment tracker.

# DESCRIPTION OF ACTIVITIES

## Activity 1: Introduction and Orientation

**Aim of the activity:** To introduce learners to climate data relevance in informed farm decisions.

**Duration:** 35 min

**Step-by-step instruction of the task/practical exercise/case study:**

- **Opening and Orientation:** The facilitator welcomes learners and explains the purpose of the session and its relevance to farming decisions.
- **Introduction to Climate Data:** Climate data types (rainfall, temperature, humidity, etc.) are explained using simple examples related to farming activities.
- **Climate Data and Farm Decisions:** The facilitator discusses how climate data influences planting time, irrigation scheduling, crop selection, and yield outcomes.
- **Climate Variability and Risk:** Learners are introduced to climate risks such as droughts and floods and how climate information helps manage them.
- **Interactive Discussion:** Learners share local farming experiences affected by weather or climate patterns.
- **Summary and Key Takeaways:** The facilitator summarizes key points and links the activity to upcoming practical sessions..

# DESCRIPTION OF ACTIVITIES (CONT'D)

## Activity 2: Demonstration of Climate Data Tools

**Aim of the activity:** To demonstrate use of basic climate data tools for farm decisions.

**Duration:** 25 min

### **Step-by-step instruction of the task/practical exercise/case study:**

- **Introduction and Orientation:** The facilitator explains the purpose of climate data tools and their relevance to farm decision-making.
- **Demonstration of Field Instruments:** A rain gauge and thermometer are introduced. The facilitator demonstrates correct placement, installation, and reading of each instrument.
- **Hands-on Practice with Instruments:** Learners practice reading rainfall and temperature values and recording observations in simple data sheets.
- **Demonstration of Weather Apps:** The facilitator demonstrates how to access weather apps, check forecasts, and interpret key climate indicators.
- **Learner Practice with Digital Tools:** Learners explore weather apps on their devices and identify information relevant to farming activities.
- **Discussion and Comparison:** Learners compare data from field instruments and apps, discussing accuracy and usefulness.

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 3: Demonstration on Data Collection Methods

**Aim of the activity:** To build skills in collecting reliable climate data for farm decisions.

**Duration:** 35 min

#### **Step-by-step instruction of the task/practical exercise/case study:**

- **Introduction and Overview:** The facilitator explains the importance of climate data collection and its role in farm decision-making.
- **Identification of Climate Parameters:** Key parameters such as rainfall, temperature, and humidity are discussed and linked to farming activities.
- **Demonstration of Manual Data Collection:** The facilitator demonstrates how to record climate observations using rain gauges, thermometers, and data sheets.
- **Demonstration of Digital Data Collection:** Learners are shown how to access climate data from weather apps and online platforms.
- **Learner Practice Session:** Learners practice collecting and recording data using both manual tools and digital sources.
- **Data Recording and Organization:** The facilitator demonstrates how to organize collected data in simple tables or logs.

Discussion and Feedback: **Learners discuss challenges encountered, and the facilitator provides guidance on improving accuracy.**

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 4: Data Analysis and Interpretation Session

**Aim of the activity:** To develop skills in analyzing and interpreting climate data digitally.

**Step-by-step instruction of the task/practical exercise/case study:**

- **Introduction and Orientation:** The facilitator explains the purpose of climate data analysis and its relevance to farm decisions.
- **Data Entry Demonstration:** The facilitator demonstrates how to enter climate data into Excel or Google Sheets using proper formats.
- **Data Cleaning and Organization:** Learners are shown how to check for missing values, organize columns, and label datasets clearly.
- **Basic Data Analysis:** Simple calculations such as averages, totals, and trends are demonstrated and practiced.
- **Chart and Table Creation:** Learners create simple charts (e.g., rainfall trends, temperature patterns) to visualize data.
- **Interpretation Exercise:** Learners interpret analyzed data and discuss implications for planting and irrigation decisions.

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 5: Data Analysis and Interpretation Session

**Aim of the activity:** To develop skills in analyzing and interpreting climate data digitally.

**Step-by-step instruction of the task/practical exercise/case study:**

- **Introduction and Orientation:** The facilitator explains the purpose of climate data analysis and its relevance to farm decisions.
- **Data Entry Demonstration:** The facilitator demonstrates how to enter climate data into Excel or Google Sheets using proper formats.
- **Data Cleaning and Organization:** Learners are shown how to check for missing values, organize columns, and label datasets clearly.
- **Basic Data Analysis:** Simple calculations such as averages, totals, and trends are demonstrated and practiced.
- **Chart and Table Creation:** Learners create simple charts (e.g., rainfall trends, temperature patterns) to visualize data.
- **Interpretation Exercise:** Learners interpret analyzed data and discuss implications for planting and irrigation decisions.

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 6: Developing a Farm Decision Plan

**Aim of the activity:** To apply analyzed climate data in developing practical farm decision plans.

**Step-by-step instruction of the task/practical exercise/case study:**

- **Introduction and Review of Analyzed Data:** The facilitator reviews previously analyzed climate data and explains how it informs farm decisions.
- **Identification of Key Farm Decisions:** Learners identify decisions influenced by climate data, such as planting time, crop choice, and irrigation needs.
- **Risk and Opportunity Assessment:** Learners assess potential climate risks and opportunities based on the data.
- **Decision Plan Development:** Learners develop a farm decision plan outlining actions, timelines, and expected outcomes.
- **Justification Using Data:** Each decision is justified using analyzed climate information.
- **Group Discussion and Feedback:** Learners present plans, receive feedback, and refine their decision strategies.

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 7: Case Study / Scenario Analysis

**Aim of the activity:** To apply historical climate data for informed crop selection decisions

#### **Step-by-step instruction of the task/practical exercise/case study:**

- **Introduction of the Scenario:** The facilitator presents the Kaduna State scenario, highlighting uncertainty around the 2025 rainy season onset.
- **Review of Provided Climate Data:** Learners examine the 10-year historical rainfall and temperature datasets and NiMet seasonal forecasts.
- **Trend Analysis Exercise:** Learners identify patterns such as average rainfall onset dates, dry spells, and temperature trends.
- **Crop Requirement Matching:** Learners compare climate trends with water and temperature requirements of common crops grown in Kaduna State.
- **Scenario-Based Decision Making:** In groups, learners select suitable crops and justify choices based on analyzed data and forecasts.
- **Presentation and Discussion:** Groups present recommendations and discuss differences in decisions

## DESCRIPTION OF ACTIVITIES (CONT'D)

### Activity 8: Integration of Green and Digital Skills Workshop

**Aim of the activity:** To integrate green and digital skills for climate-informed farm decisions.

#### **Step-by-step instruction of the task/practical exercise/case study:**

- **Workshop Introduction and Orientation:** The facilitator explains the concept of green and digital skills and their relevance to modern farming.
- **Overview of Green Farming Practices:** Key green practices such as water efficiency, soil conservation, and climate-smart agriculture are discussed.
- **Demonstration of Digital Tools:** The facilitator demonstrates use of climate data tools, weather apps, and basic data analysis platforms.
- **Group Practical Exercise:** Learners work in groups to apply digital tools to support a green farming decision scenario.
- **Presentation of Group Outputs:** Groups present how green and digital skills were integrated in their decision-making process.
- **Reflection and Feedback Session:** Learners reflect on lessons learned, while the facilitator provides feedback and highlights best practices.

# MODULE TWO

# MODULE OVERVIEW

Emphasises on:

- The utilisation of locally available climate-smart feed resources for livestock (nutrient contents, ration formulation, and effective feeding strategies)
- Fundamental principles of water quality for aquaculture
- Climate-smart management practices that enhance feed and water efficiency, improve animal welfare, and minimise environmental impacts in livestock and aquaculture production systems

# LIVESTOCK FEED AND FEEDING MANAGEMENT

- Feed is a key input to sustainable livestock production, and constitutes about 75% of the total cost of production in Nigeria
- Climate change, among other factors, consistently influences feed availability, sustainable livestock production, food and nutrition security
- Adoption of climate-smart approaches is crucial to enhance sustainable and increased productivity, adaptation to climatic variations, ameliorate environmental footprints associated with greenhouse gas emissions, and also guarantee food and nutrition security

# APPROACHES FOR CLIMATE-SMART FEED AND LIVESTOCK FEEDING

- Identification and production of feed resources
- Utilisation of feed resources that could optimally substitute/replace the conventional feed resources at optimal cost
- Feed resources management, conservation, and storage
- Adoption of feeding strategies that will enhance resilience of livestock to climate impacts, reduce environmental pollution, greenhouse gas emissions, improve productivity, income and livelihoods

# LEARNING OBJECTIVES

<b>KNOWLEDGE</b>	<b>SKILLS</b>	<b>ATTITUDES</b>
<i>Students should be able to:</i>	<i>Students should be able to:</i>	<i>Students should be able to:</i>
<ul style="list-style-type: none"><li>● Describe climate-smart feed practices for livestock</li><li>● Explain approaches for climate-smart feed and feeding of livestock</li><li>● Identify the available climate-resilient feed resources</li><li>● Explain how to formulate climate-resilient rations</li></ul>	<ul style="list-style-type: none"><li>● Produce climate-smart feed resources</li><li>● Assess the quality of feed ingredients and compounded rations in the total mixed ration</li><li>● Demonstrate and prepare quality livestock feed</li><li>● Demonstrate improvement in the low-quality for inclusion</li></ul>	<ul style="list-style-type: none"><li>● Demonstrate commitment to learning</li><li>● Appreciate the role of feed and feed management in reducing methane emissions</li><li>● Advocate for climate-smart feeding practices</li></ul>

# OTHER SKILLS

## Transversal Skills:

- **Problem-solving and critical thinking**
  - ✓ Assessing, identifying and developing innovative solutions to challenges of livestock feeding
- **Communication and interpersonal relationships**
  - ✓ Disseminating knowledge, innovations and new ideas effectively to farmers on feed management
- **Collaboration and teamwork**
  - ✓ Working harmoniously within and outside professional groups as a team to resolve feed-related matters for livestock
- **Interpretation of feed analytical results**
  - ✓ Evaluating, calculating and interpreting the results of feed analyses for informed decisions on feed formulation and preparation of quality feed for the categories

## Digital Skills:

- Proficiency in using software to input data on feed intake, weight gain and overall performance of livestock
- Literacy in applying software to formulate balanced feed and interpreting the outcomes of the overall impact of compounded diets on livestock
- Understanding precision feeding methods and automated feeding strategies to minimise feed wastage and improve feed intake for increased livestock productivity
- Proficiency in using e-communication tools (social media platforms/apps: Facebook, TikTok, WhatsApp, Instagram, Telegram, etc.) to interact with farmers

## **GREEN SKILLS INTEGRATED:**

### **● Sustainable feed production**

- ✓ Understanding sustainable feed production systems that guarantee the continuous availability of feed resources for livestock

### **● Sustainable environmental protection**

- ✓ Knowledge of diverse livestock feed resources/ingredients/additives that are eco-friendly, enhance efficient nutrient utilisation, improve performance, are cost-effective and mitigate greenhouse gas emissions

### **● Climate-Smart Feed and Feeding Management**

- ✓ Identifying and promoting the cultivation of drought-tolerant forage resources adaptable to specific agroecology
- ✓ Using the preservation techniques that are suitable to improve the shelf-life of feed resources/ingredients.
- ✓ Adapting feeding management practices to prevailing or changing weather patterns

# COMMON & CLIMATE-RESILIENT FEED RESOURCES IN NIGERIA

Category	Examples	Key Benefits	Considerations
Grasses	Elephant, Northern Gamba, etc.	High biomass yield, tolerance to drought, etc.	Supplementation with protein sources is required
Cereal crops	Sorghum, Millet, etc.	Good for silage production, Adaptable to poor soil conditions, high in energy, etc.	Needs supplementation with nitrogen sources & processing, etc.
Fodder Trees & Shrubs	Gliricidia, Leucaena, Moringa, Albizia spp, etc.	Protein content is high, tolerate extremes of climatic conditions, grows all year round, etc.	May cause metabolic disorders, require a good management system, etc.
Crop residues	Maize stover, Corn cob, etc.	Available all year round, rich in fibre, etc.	Low in protein and minerals, etc.
Agro-by products	Wheat offal, Corn bran, BDG, etc.	High in energy content & fibre contents, etc.	Relatively lower in protein content, etc.

## **“SOLUTIONS TO FEED SHORTAGE CONSTRAINTS:” – PROBLEM-BASED LEARNING ACTIVITY**

- **Activity 1: Preparation of Urea-treated Molasses Maize Stover/corncob**

- **Aim of activity:**

To assess feed shortage challenges associated with climate change and proffer climate-resilient feed options

- **Duration:** 45 min

- **Material required:**

Corn cobs, maize stover, urea fertilizer, weighing scales, water, sprinkler, plastic bags or plastic drums, shovels, grinder, a nylon sheet, etc.

- **Step-by-step instruction of the task/practical exercise/case study:**
  - Collect maize stovers from the field immediately after harvesting maize grains and cobs
  - Chop to moderate sizes of 5-8cm
  - Dissolve 4-5kg of urea in 50 litres of water, and blend thoroughly until the urea crystals disappear from the solution
  - Add 10kg of molasses to the urea solution and mix thoroughly
  - Sprinkle urea-molasses solution uniformly on 100kg of maize stover
  - Store urea-treated molasses maize stover in a container or in a concrete-lined pit, and cover with plastic film or nylon sheet to make it air-tight
  - Allow to ensile for 3-4 weeks
  - Open the treated maize stover, collect the quantity required and aerate for a day before feeding to animals

- **Preparation of a total mixed ration of crop residue-based**

- Collect cowpea husk from the field after harvesting and processing of pulses
- Collect palm kernel sludge and soybean hull from the palm kernel and soya bean oil processing mills
- Harvest *Gliricidia sepium* leaves at the right maturity stage and air-dry in the shade
- Crush the dried cowpea husk to a moderate particle size
- Mix all the feed ingredients according to the following proportions: 30% Palm kernel sludge, 12% soya bean hull, 53% cowpea husk, 4.5% *Gliricidia* leaves and 0.5% salt

## **Activity 2: “Silage For All-Year-Round Feeding“- Problem-Based Learning**

### **Aim of the activity:**

- To produce high-quality silage for all-year-round feeding of small ruminants

### **Material required:**

- Forages/crops, silage production and quality management guides, video clips of silage-making, pictures of plastic containers/drums, nylon sheeting, whiteboards, markers and flip charts

■ **Preparation of *Albizia lebbeck*-Cassava peel silage**

- Harvest fresh foliage of *Albizia lebbeck* from the tree and *Panicum maximum* (Guinea grass) at the sixth week re-growth interval
- Chop the foliage into 3-5 cm lengths
- Allow the leaves of *Albizia lebbeck* and Guinea grass to wilt under the shade for 24 hours
- Collect fresh cassava peel
- Weigh each of the materials: cassava peel, *Albizia lebbeck* and Guinea grass in the proportion of 60, 25 and 15%, respectively
- Mix all the materials to form a homogenous mixture

## Preparation of *Albizia lebbbeck*-Cassava peel silage Cont'd

- Fill the plastic drum (120 litres) lined with a nylon sheet with the materials in layers
- Compact the materials manually to eliminate trapped air until the plastic drum is filled
- Wrap the exposed inner nylon sheet over the ensiled material in the plastic drum tightly
- Place heavy sandbags of 50-60kg on the ensiled materials
- Allow ensiled materials to ferment for 28 days
- Open the silage after 28 days for quality assessment

**NB: Preparation of maize stover or grass-legume silages follows the same principles/procedures**



# WATER QUALITY MANAGEMENT FOR FISH PRODUCTION

- Aquaculture contribute to food security, employment generation, and improvement of rural livelihoods in Nigeria
- Poor water quality remains one of the leading constraints to efficient aquaculture systems, and contribute to:
  - High mortality rates
  - Disease outbreaks
  - Slow growth, and
  - Reduced economic returns for both small-scale and commercial farmers
- Maintenance of optimal water conditions is key to improving fish health, growth performance, and overall farm productivity

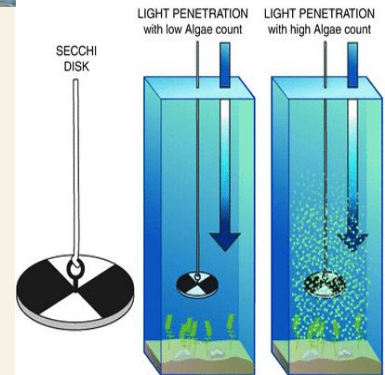
# RELEVANCE OF WATER QUALITY MANAGEMENT TO CLIMATE-SMART AGRICULTURE (CSA) IN NIGERIA

- Good water quality directly boosts productivity (growth rates, feed conversion efficiency, etc.) and all year-round production
- Optimal water quality allow fish farms to adapt to the extremes of climate change (rising temperatures, droughts, flooding, and increased evaporation)
- Reduces the release of harmful emissions and pollutants into the environment (e.g. reducing organic waste loads, optimising feeding, preventing nutrient runoff, and integrating energy-efficient aeration systems)

# INVENTORY FOR WATER QUALITY MANAGEMENT IN FISH PRODUCTION

## Water Testing Equipment:

- pH meters,
- Dissolved oxygen meters,
- Thermometers,
- Ammonia, nitrite, and nitrate test kits
- Alkalinity and hardness test kits
- Turbidity meters or Secchi discs
- Microbial test kits
- Aeration and water movement devices: Paddlewheel blowers and diffusers, Water pumps



# INVENTORY FOR WATER QUALITY MANAGEMENT IN FISH PRODUCTION

## ▪ Pond and Tank Management Materials:

- **Agricultural lime (calcium carbonate):** Stabilises pH, increases alkalinity, and improves the overall productivity of earthen ponds.
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- **Salt (sodium chloride):** A simple treatment for mild stress, parasites, and maintaining osmotic balance in fish.
- **Fertilizers (organic and inorganic):** Used in semi-intensive ponds to boost natural phytoplankton production for young fish.
- **Probiotics:** Improve water microbial balance and reduce harmful ammonia buildup.
- **Alum (aluminium sulphate):** Reduces turbidity caused by clay particles, improving water clarity and pond performance.

# INVENTORY FOR WATER QUALITY MANAGEMENT IN FISH PRODUCTION

- **Water Supply and Distribution Infrastructure:** Boreholes and wells, Overhead tanks and reservoir systems, Pipes, valves, hoses, Sluice gates and monk structures, etc.
- **Waste and Sediment Management Tools:** Siphoning tubes,



# LEARNING OBJECTIVES

<b>KNOWLEDGE</b>	<b>SKILLS</b>	<b>ATTITUDES</b>
<i>Students should be able to:</i>	<i>Students should be able to:</i>	<i>Students should be able to:</i>
<ul style="list-style-type: none"><li>● Identify and describe key water quality parameters essential for fish production</li><li>● Biological and chemical contaminants (e.g., coliforms, heavy metals)</li><li>● Determine the effects of water quality on fish health, including stress, growth performance, feeding efficiency, reproduction, and mortality</li><li>● Identify the sources of water pollution on aquaculture systems</li><li>● Describe basic principles of water quality correction</li></ul>	<ul style="list-style-type: none"><li>● Use water quality testing tools and equipment</li><li>● Collect water samples accurately from ponds, tanks, and raceways</li><li>● Analyse and interpret water quality data, compare with recommended limits, and identify possible problems</li><li>● Carry out corrective actions (aeration, water exchange procedures, liming, manage feeding rates, etc.)</li><li>● Record and maintain water quality logbooks and prepare short technical reports.</li></ul>	<ul style="list-style-type: none"><li>● Appreciate the importance of water quality as a foundation for sustainable fish production</li><li>● Demonstrate accuracy and attention to detail during water sampling, measurement, and record-keeping</li><li>● Develop cleanliness and hygiene practices in the aquaculture environment</li><li>● Exhibit responsibility and environmental sensitivity, understanding the need to maintain healthy aquatic ecosystems</li></ul>

# OTHER SKILLS

## Transversal Skills:

- **Problem-solving and critical thinking:** Ability to identify water quality problems and propose appropriate corrective measures
- **Communication skill:** Clear verbal communication when presenting observations or explaining water quality findings, writing technical notes, water quality reports, etc.
- **Teamwork and Collaboration:** Working in groups to collect pond water samples, carry out measurements, and analyse data
- **Planning and Organisational Skills:** Scheduling regular water monitoring activities and following systematic procedures, properly organising sampling equipment, test kits, and digital tools

**Digital Skills:** Use of Digital Water Quality Measuring Devices, Digital Data Recording and Management, Digital Communication Skills, etc.

**Green Skills:** Sustainable Water Resource Management, Environmental Monitoring and Stewardship, Waste Reduction and Eco-friendly Practices, Pollution Prevention, Climate-Smart Aquaculture Practices, etc.

# DEMONSTRATION ON ASSESSMENT OF WATER AND QUALITY & TESTING EQUIPMENTS

## Aim of the activity:

To demonstrate key water quality parameters and testing equipment for fish production

**Duration:** 25 min.

**Materials required:** Water quality testing tools, sampling equipment (scoop, waterproof markers, labels, water containers), aquaponics water quality apps

## Step-by-step instruction of the task/practical exercise/case study:

- **Introduction to Water Quality Parameters:**

- The facilitator explains key water quality parameters relevant to fish production and their effects on fish health.

- **Demonstration of Testing Equipment:**

- Various water quality testing instruments are introduced, such as pH meters, DO meters, thermometers, etc., and their functions are explained.

- **Equipment Handling and Setup:**

- The facilitator demonstrates proper handling, basic calibration checks, and preparation of equipment before use.

- **Water Sample Collection:**

- Learners observe correct procedures for collecting water samples from ponds or tanks.

- **Measurement and Reading:**

- The facilitator demonstrates how to take measurements for different parameters and record results accurately.

- **Learner Practice Session:**

- Learners practice using selected equipment under supervision.

- **Discussion and Review:**

- Results are discussed, common errors are highlighted, and questions are addressed.

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**Q & A**

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