GEAVET TRAINING PROGRAMME FOR CSA

GEAVET TRAINING PROGRAMME FOR CLIMATE-SMART AGRICULTURE (CSA):

KENYA

UNIT 1.2 WATER QUALITY MANAGEMENT

ENGLISH VERSION

GEAVET Project n° 101129027

Open Educational Resources

PART I – LEARNING MATERIAL

1. Introduction

Water is the lifeblood of agriculture, yet its availability and quality are increasingly threatened by climate change. For Kenyan smallholder farmers, who depend on mixed crop-livestock systems, poor water quality directly translates to sick animals, reduced crop yields, and heightened vulnerability. Contaminated water spreads diseases like diarrhoea and typhoid in livestock, lowers their productivity, and can introduce harmful pathogens into irrigation systems. This document provides a comprehensive, practical, and locally relevant guide to Climate-Smart (CS) Water Quality Management, focusing on safeguarding water resources, building resilience against climate shocks, and mitigating environmental impact through practical strategies tailored for the Kenyan context.

2. Knowledge: What the Learner Will Understand

2.1. Defining Climate-Smart Water Quality Management

Climate-Smart Water Quality Management is an integrated approach to safeguarding water resources for agricultural use. It is built on three interconnected pillars:

1. **Sustained Productivity**: Ensuring a consistent supply of clean water for optimal animal health and crop growth, leading to stable and improved yields and incomes.
2. **Enhanced Resilience (Adaptation)**: Implementing strategies to protect water sources from contamination and depletion, especially during climate shocks like droughts and floods, which can concentrate pollutants or damage infrastructure.
3. **Reduced Environmental Impact (Mitigation)**: Preventing agricultural water pollution (e.g., from soil erosion, livestock waste, and agro-chemicals) protects downstream ecosystems and contributes to broader environmental health goals.

2.2. The Critical Link Between Water Quality, Animal Health, and Crop Productivity

Understanding the direct impact of water on farm outputs is crucial.

- **For Livestock:** Contaminated water is a primary vector for diseases. Bacteria (e.g., *E. coli*), parasites, and high levels of nitrates or salts can cause illness, reduce feed conversion efficiency, lower milk production, and even lead to animal death. Clean water is as important as quality feed.

- **For Crops:** Using polluted water for irrigation can deposit harmful pathogens on leafy vegetables, introduce heavy metals into the soil, and clog irrigation systems with algae or silt. Salty water can slowly poison plants and degrade soil structure.
- **Economic Cost:** The cost of treating sick animals and lost production far exceeds the cost of preventing contamination through good water management.

2.3. Identifying Common Water Contaminants in a Kenyan Smallholder Context

Kenyan farms face specific water quality challenges. The table below (Table 3) summarizes the main culprits.

Table 3. Common Water Contaminants in Kenyan Agriculture

Category	Examples & Sources	Impact on Livestock	Impact on Crops
Biological	• Bacteria (*E. coli* from manure • Algae (from nutrient runoff) • Parasites	• Diseases: Diarrhoea, worms, liver fluke	• Pathogen transfer to edible parts • Clogged drippers
Chemical	• Nitrates (from manure/fertiliser) • Pesticides • Salts (naturally occurring)	• Nitrate poisoning • Reproductive issues	• Toxicity • Stunted growth • Soil salinisation
Physical	• Silt/Sediment (soil erosion)	• Reduced water intake	• Soil crusting • Reduced

	● Organic debris	● Habitat for pathogens	infiltration ● Clogged systems

3. Skills

3.1. Basic Visual and Olfactory Tests for Water Quality Assessment

A farmer can be the first line of defence in water quality monitoring. Thereby, the “Look, Smell, Inquire Method” has been proven successful for simple assessments. Regarding the look, it is important to check for a clear colour (not brown or green), floating debris, and any algal blooms. In terms of the smell, the water should not have a strong odour. A rotten smell typically indicates bacterial decay, while a musty or earthy smell can stem from algae or organic matter. Lastly, ask yourself if there has been any heavy erosion nearby, if animals are accessing the water source directly, and if there has been any potential chemical runoff.

3.2. pH Tests for Water Quality Assessments

Water quality affects not only human and animal health but also agricultural productivity and food processing safety. Many chemical and biological reactions (such as nutrient availability, microbial growth, and pesticide effectiveness) depend on water’s properties. One of the most important basic indicators of water quality is pH, which measures how acidic or alkaline water is on a scale typically from 0 to 14 (lower numbers = more acidic; higher numbers = more alkaline). In agriculture and processing contexts, extreme pH values can reduce nutrient availability in soil, increase the toxicity of certain elements, or interfere with fermentation and preservation processes (WaterCAN, n.d.).

The pH value of water influences soil and water chemistry, affecting plant growth and post-harvest processes. A pH that is too low (acidic) or too high (alkaline) can limit how nutrients dissolve in water and how organisms respond. For many agricultural uses and irrigation water, a pH range of about 6.5 to 8.0 is considered suitable because it supports most crops and prevents harmful chemical imbalances.

Testing water pH is straightforward and requires only a small sample and simple tools such as pH test strips or a portable meter. To use test strips:

➢ Collect a clean water sample in a glass or container.

➢ Dip a pH strip into the sample and wait a few seconds for the colour to develop.
➢ Compare the strip's colour to the provided chart that comes with the test kit to determine the pH value (e.g., 6.5, 7.0, 8.0).
➢ Record the value and consider whether the water falls within acceptable ranges for your intended use.

Learning how to perform a pH test empowers farmers, processors, and community groups to monitor their water sources, identify potential problems early, and make informed decisions about water treatment or selection of crop and processing methods. For a step-by-step guide with examples, the following video can give helpful insights into the process: https://www.youtube.com/watch?v=V_bd-Ijo7Ic

3.3. Turbidity Tests for Water Quality Assessments

Turbidity is a key indicator of water quality and refers to how cloudy or muddy water appears due to suspended particles such as silt, sand, organic matter or microorganisms. High turbidity can signal soil erosion, runoff from farms, or pollution from upstream activities. It also matters for agriculture and food processing because muddy water can carry pathogens, reduce the effectiveness of disinfection, and clog irrigation or processing equipment (WaterCAN, n.d.). Monitoring turbidity helps farmers and processors decide whether water should be treated, filtered, or allowed to settle before use, especially during rainy seasons when erosion is more likely (FAO, 2017).
High turbidity is a sign that water contains suspended particles that may be harmful or reduce water usability. For example:

- **Pathogens** often attach to soil particles, increasing contamination risk.
- **Irrigation systems** can get blocked by silt, reducing efficiency.
- **Food processing equipment** may require more cleaning when turbid water is used.
- **Water settling or filtration** may be required before safe use in washing or processing.

Because turbidity levels rise and fall with rainfall patterns and erosion events, testing it regularly is an important part of understanding overall water quality.

A turbidity tube is a simple, low-cost tool that allows communities and farmers to estimate turbidity in **Nephelometric Turbidity Units (NTU)** without laboratory equipment. Before you begin:

- Use a **clean bucket** to collect your water sample.

- Take measurements outdoors in daylight, but **avoid direct sunlight**. Stand so that your body casts a shadow over the tube for better visibility.
- **Do not wear sunglasses**, as they distort colour perception.
- If possible, work with a **partner** to confirm the reading.

Here is a step-by-step guide on how to perform a turbidity test. Image 1 and the reference document by Myre & Shaw (2006) may clarify the process further.

➢ **Collect the sample:** Dip your bucket into the water source without disturbing the bottom, which could add sediment and distort results.
➢ **Rinse the tube:** Rinse the turbidity tube with the sample water, then pour it out.
➢ **Stir the sample:** Stir the water in the bucket vigorously so particles are evenly mixed, but avoid creating bubbles.
➢ **Position yourself:** Hold your head about 10–20 cm above the tube, looking straight down at the viewing disk at the bottom.
➢ **Pour slowly:** Pour water into the tube steadily. Avoid bubbles—if they appear, pause until they disappear.
➢ **Watch the disk:** Continue pouring until the pattern on the disk just disappears from view.
➢ **Read the result:** Read the value on the scale at the waterline.

1. Example: “20 NTU”
2. If you fill the tube completely and the disk is still visible, record the reading as “<5 NTU”.

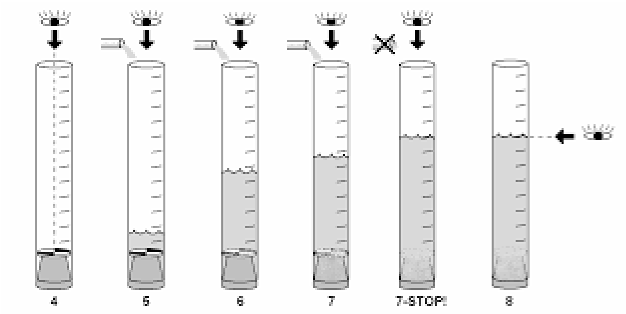

Image 1. How to use a turbidity tube (Myre & Shaw, 2006)

Lastly, a few more things need to be kept in mind when performing a turbidity test:

- Highly coloured water (e.g., from leaves or tannins) can falsely increase turbidity readings.
- The turbidity scale is logarithmic, meaning values cannot be averaged or interpolated linearly.

- Multiple tests over time give a clearer picture of water quality trends.

3.4. Interpreting Test Results and Taking Action

Knowing what the results mean is key for any farmer performing the above-mentioned tests. Here are a few examples of suggested actions based on test results:

- **If pH is too low (acidic)**: Can corrode metal pipes and increase solubility of toxic metals. Consider adding agricultural lime to water sources (where practical and on advice).
- **If pH is too high (alkaline):** Can reduce effectiveness of some pesticides and lead to scale build-up in pipes.
- **If Turbidity is high:** This is a sign of erosion. Implement soil conservation measures (e.g., grass strips, cover crops) near the water source. For immediate use, allow water to settle in a tank before use.
- **If Nitrates are high (using a test strip):** This indicates contamination from fertilizer or manure. Prevent livestock from wading into the water source and create a buffer zone between farmland and the water body.

4. Case Studies

4.1. The Kapingazi River (Kenya) Case Study:

Description of the Action: The Kapingazi River, which feeds into the Ewaso Ng'iro River on the slopes of Mount Kenya, is a crucial source of water for households, livestock, and irrigation in Embu County. By the late 1990s, the river and its catchment were severely degraded due to deforestation, charcoal burning, unsustainable farming, and livestock access along the riverbanks. These pressures caused declining water levels, rising turbidity (muddiness), and poor water quality—directly threatening community health, agriculture, and local ecosystems. To reverse this decline, the Kapingazi River Water Resource Users Association (WRUA), supported by the national Water Resources Management Authority (now WRA) and partners such as WWF–Kenya, launched a large-scale, community-led conservation programme in the 2000s. The intervention combined several strategies:

- Riparian land rehabilitation, including fencing riverbanks to keep livestock out and planting thousands of indigenous trees to stabilise soils and filter runoff.
- Climate-smart agriculture training, such as contouring, terracing, cover cropping, and agroforestry, to reduce erosion and chemical pollution from farms.

- Community governance, where the WRUA developed bylaws on water abstraction and pollution control, enabling local stakeholders to manage and safeguard the river collectively.

This multi-pronged, participatory approach linked nature-based solutions with sustainable farming and strong community institutions.

The Results: A long-term evaluation of the project's impact, drawing on a study by Mburu et al. (2015), showed clear improvements:

- **Improved water quality:** Physico-chemical testing revealed lower turbidity and sediment loads, showing that reduced erosion and healthier riverbanks led directly to cleaner water.
- **More reliable water flow:** Catchment rehabilitation improved groundwater recharge, resulting in steadier water availability even in dry seasons.
- **Better livelihoods:** Climate-smart agriculture increased crop yields, diversified farming income, and improved livestock health, strengthening the economic stability of households.
- **Greater community resilience:** The WRUA became a strong local institution capable of managing conflicts, enforcing bylaws, and adapting to environmental challenges, making the community more resilient to climate shocks such as droughts or floods.

Overall, the project demonstrated that ecological restoration, combined with good governance and sustainable agriculture, can transform a degraded river system into a reliable source of clean water.

Key Take-Aways for Kenyan Learners: This case shows that sustainable water management succeeds when communities take ownership of their resources and combine scientific knowledge with local action. Kenyan learners can see the practical value of protecting riparian zones, reducing erosion, and adopting climate-smart farming—not just for environmental reasons but for reliable water access, healthier farms, and more resilient livelihoods. The WRUA model also highlights the importance of community governance: when people work together, set collective rules, and share responsibility, long-term environmental challenges become manageable. Finally, this story offers a replicable model that can be applied to other rivers and catchments across Kenya, helping the country meet its national water policy goals and align with international standards for integrated water resource management.

4.2. The Vrana Lake (Croatia) Case Study

Description of the Action: Vrana Lake, located in northern Dalmatia, Croatia, is the country's largest natural freshwater lake and a designated Nature Park and

Ramsar Wetland of International Importance. It plays a vital role as an ecological habitat, a water source for surrounding agricultural areas, and a focal point for ecotourism and recreation. By the early 2000s, however, the lake was experiencing increasing environmental stress due to human pressures within its catchment.

Agricultural intensification in the surrounding karstic landscape led to high nutrient runoff (particularly nitrogen and phosphorus) which caused eutrophication and recurring algal blooms. At the same time, unregulated tourism activities, illegal fishing, and saline intrusion from nearby coastal aquifers further degraded water quality. During dry periods, reduced freshwater inflows and sea-level influence increased salinity and altered the lake's natural chemistry, threatening biodiversity, including waterfowl and endemic fish species.

To address these interconnected challenges, the Vrana Lake Nature Park Authority, supported by the Croatian Ministry of Economy and Sustainable Development, the EU Interreg Programme, and environmental NGOs such as Association BIOM, launched an integrated water and ecosystem management programme in the 2010s. Guided by national legislation and the EU Water Framework Directive, the intervention combined several approaches:

- Establishing buffer zones and promoting agro-environmental practices to reduce nutrient runoff from farms.
- Restoring wet meadows to act as natural filters for sediments and nutrients while improving bird habitats.
- Expanding scientific monitoring using sensors and regular sampling to guide adaptive management.
- Engaging local communities—farmers, fishers, schools, and tourism operators—through education, consultations, and stewardship activities.

This integrated, multi-level approach linked nature-based solutions with scientific monitoring and participatory governance.

The Results: A joint evaluation conducted in 2024 by Croatian Waters and the Vrana Lake Nature Park Authority showed clear and positive outcomes from more than a decade of sustained intervention:

- **Improved water quality:** Long-term monitoring recorded reduced nutrient concentrations, lower turbidity, and decreased chlorophyll-a levels, resulting in fewer algal blooms and more stable dissolved oxygen conditions.

- **Better salinity management:** While saline intrusion remains a natural challenge in the karst system, improved freshwater retention and better regulation of groundwater abstraction reduced its long-term ecological impacts.
- **Biodiversity recovery:** Restored wet meadows and shoreline habitats supported the return of bird populations, including threatened species, while fish stocks showed signs of recovery due to stronger enforcement against illegal fishing.
- **Strengthened local stewardship:** Community engagement and education improved environmental awareness, compliance with park regulations, and cooperation among land users, tourism operators, and authorities.

Overall, the project demonstrated that sustained, integrated management can reverse degradation in sensitive freshwater ecosystems.

Key Take-Aways for Kenyan Learners: This case study highlights how integrated water and ecosystem management can protect and restore freshwater resources under pressure from agriculture, tourism, and climate variability. Kenyan learners can draw clear lessons on the value of buffer zones, wetland restoration, and reduced nutrient runoff in protecting water quality. The importance of scientific monitoring—using data to guide decisions and adapt to drought conditions—is also directly relevant to Kenyan catchments facing climate stress. Equally important is the role of community engagement and strong institutions. The Vrana Lake experience shows that when government agencies, local communities, and NGOs collaborate under clear rules and shared responsibility, long-term water quality improvement is possible. This model offers transferable lessons for managing lakes, wetlands, and river basins in Kenya, particularly in areas where agriculture and ecosystem conservation must coexist.

5. Digital Training Tools

Table 4: Digital Training Tools

Tool / Platform	**Use in Module**	**Skills Reinforced**
GEA_VET LMS (Moodle)	Hosts e-modules, video tutorials, forums and quizzes	Digital literacy; communication & knowledge sharing

WhatsApp / Telegram Learning Group	Quick Q&A, photo sharing, peer support	Digital communication & collaboration
Simple Data Spreadsheet (Google Sheets / offline Excel)	Record and track water test data; visualise trends	Data management & interpretation
Water Quality Mobile Apps (e.g., Water Quality Index Calculator)	Input basic parameters and receive a simple water quality rating	ICT4Ag; problem solving
Mentimeter / Padlet	Instant polling and idea collection during PBL sessions	Digital collaboration; critical thinking

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PART 2 – CURRICULUM

Learning Objectives:

<table>
<tr><th>KNOWLEDGE</th><th>SKILLS</th><th>ATTITUDES</th></tr>
<tr>
<td>Students will know:
● Defining Climate-Smart Water Quality Management
● The critical link between water quality, animal health, and crop productivity
● Identifying common water contaminants in a Kenyan context.</td>
<td>Student will be able to:
● Conduct basic visual and olfactory water assessment
● Perform simple on-farm water tests (pH, turbidity, nitrate strips)
● Interpret test results and take corrective action
● Implement low-cost water protection practices (fencing, buffer strips)</td>
<td>Student will develop the following mindset:
● Valuing water as a finite resource
● Proactive vigilance
● Community stewardship
● Openness to simple technology</td>
</tr>
<tr><td colspan="3">TRANSVERSAL SKILLS INTEGRATED:
● Critical Thinking & Problem Solving: Analyse water quality issues, link contamination sources to health and productivity problems, and design practical, low-cost improvements such as buffer zones or settling tanks.
● Collaboration & Community Learning: Work in mixed farmer-student teams during water testing exercises; share local knowledge and best practices for protecting shared water sources.
● Adaptability & Innovation: Adjust water sourcing and treatment methods during droughts or floods; experiment with simple filtration or rainwater harvesting techniques.
● Communication & Knowledge Sharing: Record, explain, and teach climate-smart water quality techniques to peers and community members using simple language and visuals.</td></tr>
<tr><td colspan="3">DIGITAL SKILLS INTEGRATED:
● Digital Literacy / ICT4Ag: Use smartphones or tablets to access videos, job-cards, and GEA_VET e-learning materials on water testing and protection.
● Mobile-Based Advisory Tools: Use SMS or mobile apps for weather forecasts, drought alerts, or to access water quality data from local authorities.
● Digital Communication & Collaboration: Share photos of water sources, test results, or protection measures with peers and trainers via WhatsApp groups or</td></tr>
</table>

LMS forums. ● **Data Management & Interpretation:** Enter and analyse simple water test data using mobile apps or spreadsheets to track changes over time. ● **Cyber-awareness & Digital Responsibility:** Protect data privacy when uploading farm or water source information; apply safe digital behaviours.
GREEN SKILLS INTEGRATED: ● **Water Resource Management:** Implement practices that use water efficiently and protect it from pollution. ● **Environmental Stewardship:** Protect riparian zones and watersheds to maintain ecosystem health. ● **Sustainable Land Management:** Use soil conservation practices to reduce erosion and siltation of water bodies. ● **Ecosystem Services Management:** Enhance natural benefits like water filtration by protecting wetlands and buffer strips.

Implementation plan of pedagogical activities - Scheme of work

Duration: 3 hours				
Target: TVET students, farmers, extension officers				
No. of Activity	**Duration**	**Training Methods / Activity**	**What the trainers do**	**What the participants do**
1.	55 min	Problem-based Learning Activity "The Murky Water Mystery"	● Give an introduction into water quality management and common contaminators of water ● Present scenario ● Guide diagnosis	● Work in groups to identify contamination sources and propose tests and solutions
2.	40 min	Hands-on Demonstration & Peer Coaching	● Demonstrate tests ● Supervise teach-back	● Perform tests ● Fill job-cards ● Re-teach another group
3.	40 mins	Community Mapping & Action Planning	● Facilitate mapping and	● Map local water sources

			action plan development	• Draft action plan
4.	25 mins	Digital Simulation & Data Exercise	• Demonstrate app/spreadsheet • Supervise data entry	• Input sample data • Interpret trends
5.	20 mins	Collaborative Reflection Forum	• Facilitate wrap-up and uploading of reflections	• Share one action • Comment on peers' posts
Materials (What trainers need to have prepared): • Water samples (clear, muddy, algae-rich) • pH test strips, turbidity tubes, nitrate strips • Clean buckets, sampling containers, syringes or pipettes • PPE (gloves), measuring cylinders, job-cards • Android devices with water quality apps/GEA_VET LMS, internet access or offline materials • Scenario brief, community mapping templates, action plan worksheets • Short video clips of EU WFD implementation and Vrana Lake case study				
Other notes:				

PART 3 – ACTIVITY GUIDE

DESCRIPTION OF THE ACTIVITIES

1. 'The Murky Water Mystery' — Problem-Based Learning Activity

In this activity, learners work through a realistic water-contamination mystery affecting a local farm. Animals are falling sick and crops are failing, and participants must analyse clues, examine possible contamination sources on a map, and decide which water tests to run (visual, pH, turbidity, nitrate). Working in small groups, they investigate symptoms, select appropriate diagnostic methods, and design a simple protection and monitoring plan. The trainer guides the process by asking probing questions and ensuring scientific accuracy. This activity strengthens critical thinking, teamwork, and decision-making under uncertainty, and can be adapted to local contexts by adjusting the scenario details (e.g., latrine leakage, runoff after heavy rains, agrochemical spills).

1. **Aim of the activity:** To help learners understand how to identify water quality problems, choose appropriate tests, and design basic protection and monitoring plans using scientific reasoning.

2. **Duration:** 55 min

3. **Material required:**

- Scenario story (printed or projected)
- Map of a fictional or local farm area
- pH strips, turbidity tube, nitrate test strips
- Flip charts and markers
- Sample photos of contamination sources (optional)

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

- ➢ **Short lecture:** Explain in easy language what water quality management is, why it is needed, and what the most common contaminators and challenges for good water quality are. Invite students to ask questions and make comments.
- ➢ **Introduce the scenario:** Present the story of the farm experiencing animal illness and crop failure.
- ➢ **Group formation:** Divide learners into groups of 4–6.
- ➢ **Problem analysis:** Groups review symptoms, examine the map, and identify possible contamination sources.
- ➢ **Select tests:** Groups decide which water tests to run and explain why (pH, turbidity, nitrate, visual inspection).
- ➢ **Design a protection plan:** Groups propose immediate on-farm actions (e.g., fencing riparian zones, composting manure, planting buffer strips).
- ➢ **Monitoring schedule:** Groups create a simple 6-week monitoring plan using available tests.
- ➢ **Group presentations:** Each group shares their conclusions and recommendations.
- ➢ **Trainer summary:** Trainer highlights common findings, reinforces scientific reasoning, and connects the activity to real-world water safety challenges.

References/Sources/Further materials:
None required; trainer may add local water test kits or photos.

2. Hands-on Demonstration & Peer Coaching

This practical session provides hands-on experience in basic water quality assessment. Trainers demonstrate essential field techniques such as the “Look, Smell, Inquire” initial check, clean sampling procedures, pH strip use, turbidity tube measurements, and good record-keeping practices. Participants then practise these methods in small groups and engage in peer coaching, where each group teaches another group one of the techniques. Trainers give real-time correction and provide job-cards to ensure step-by-step consistency. This method builds confidence and is especially valuable in settings without laboratory access.

1. **Aim of the activity:** To build practical skills in water sampling, testing, and documentation while enabling participants to learn through doing and peer teaching.

2. **Duration:** 40 min

3. **Material required:**

- Clean sampling containers
- pH strips, turbidity tube, observation sheets
- Job-cards with standard procedures
- Flip chart for recording results
- Handwashing station or clean water for rinsing equipment

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

- ➢ **Trainer demonstration:** Show the "Look, Smell, Inquire" approach, proper sampling technique, and correct use of pH strips and turbidity tube.
- ➢ **Group practice:** Participants test samples in small groups, rotating roles (sampler, tester, recorder).
- ➢ **Peer coaching:** Each group becomes a "mini-trainer" and teaches another group one testing method.
- ➢ **Feedback:** Trainers circulate, correct errors, and reinforce quality standards.
- ➢ **Recording results:** Groups document their readings and compare variations.
- ➢ **Wrap-up:** Trainer summarises best practices and common mistakes.

References/Sources/Further materials:
Job-cards and WRA water sampling guidelines (optional).

3. Community Mapping & Action Planning

In this activity, participants work together to map local water sources such as springs, wells, streams, or dams, and identify potential contamination risks including latrines, livestock pens, and areas with fertiliser use. Using the map, groups prioritise one shared community water source and develop an action plan outlining roles, responsibilities, short-term protection measures, and a 6-month monitoring schedule. This activity encourages community ownership, systems thinking, and collaborative problem-solving.

1. **Aim of the activity:** To help participants understand local water systems, identify contamination risks, and design actionable community-level water protection plans.

2. **Duration:** 40 min

3. **Material required:**
- Large sheets of paper or community maps
- Coloured markers
- Icons or stickers for water sources and risk points
- Templates for action planning and monitoring schedules

4. **Step-by-step instruction of the task/practical exercise/case study:**
- ➢ **Introduction:** Trainer explains the purpose of community water mapping.
- ➢ **Mapping exercise:** Participants draw or annotate water sources and nearby risks.
- ➢ **Source prioritisation:** Groups select one key shared source to focus on.
- ➢ **Action planning:** Groups propose interventions (e.g., fencing, tree planting, community clean-up days).
- ➢ **Monitoring plan:** Groups schedule simple tests (pH, turbidity), roles, and frequency for 6 months.
- ➢ **Presentation and feedback:** Groups share plans; trainer highlights feasibility and sustainability elements.

References/Sources/Further materials:
Local water authority guidelines, community mapping tools (optional).

4. Digital Simulation & Data Exercise

In this exercise, participants learn how to use digital tools to record, visualise, and interpret water quality data. Using a simple mobile app or spreadsheet, they enter sample pH and turbidity results collected from different locations and dates. The trainer demonstrates how to generate graphs (e.g., turbidity trends over time) and how to interpret patterns. Learners discuss possible management actions—such as soil conservation after turbidity increases—and practise sharing reports through WhatsApp or the LMS. This activity supports digital literacy and evidence-based decision-making.

1. **Aim of the activity:** To train participants in digital data entry, visualisation, interpretation, and communication for water quality monitoring.

2. **Duration:** 25 min

3. **Material required:**

- Mobile phones or laptops
- Simple water quality app or spreadsheet template
- Sample datasets or freshly collected readings
- Projector for demonstration

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

➢ **Introduction to digital tools:** Trainer explains how apps/spreadsheets support monitoring.

➢ **Data entry:** Participants enter provided or collected water quality data.

➢ **Visualisation:** Trainer demonstrates creating graphs (trend lines, comparisons).

➢ **Interpretation:** Groups identify patterns (e.g., turbidity spikes after rainfall).

➢ **Management planning:** Groups propose actions based on observed trends.

➢ **Sharing results:** Participants practise exporting or messaging a summary report.

References/Sources/Further materials:
Spreadsheet template or recommended apps (depending on the local region)

5. Collaborative Reflection Forum

At the end of the unit, learners record a 1–2 minute reflection video or write a short post describing one water-related action they will implement in their farm, community, or workplace. Peers review and comment on each other's reflections, while trainers moderate and provide summarised feedback. The activity encourages accountability, consolidates learning, and strengthens the peer network for continued support.

1. **Aim of the activity:** To reinforce learning, promote accountability, and encourage participants to commit to practical water protection actions.

2. **Duration:** 20 min

3. **Material required:**

- Smartphones or laptops
- Course LMS or WhatsApp group
- Reflection prompt

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

➢ **Reflection prompt:** Learners respond to the question, "What is one action you will implement to improve water quality?"

➢ **Recording or writing:** Participants record a short video or write a post.

➢ **Peer interaction:** Partners comment on at least one peer reflection.

➢ **Trainer synthesis:** Trainer compiles common themes and shares a summary of intended actions.

- ➢ **Follow-up plan:** Group agrees on how actions will be revisited in future sessions.

References/Sources/Further materials:
None required.