
TRAINING MANUAL

Practical training guide for **facilitators**

&

Training materials for **communities**



GLOBAL
CENTER ON
ADAPTATION



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ABOUT THE GLOBAL ADAPTATION CENTER

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Part 1:

Introduction and practical guide for the trainer

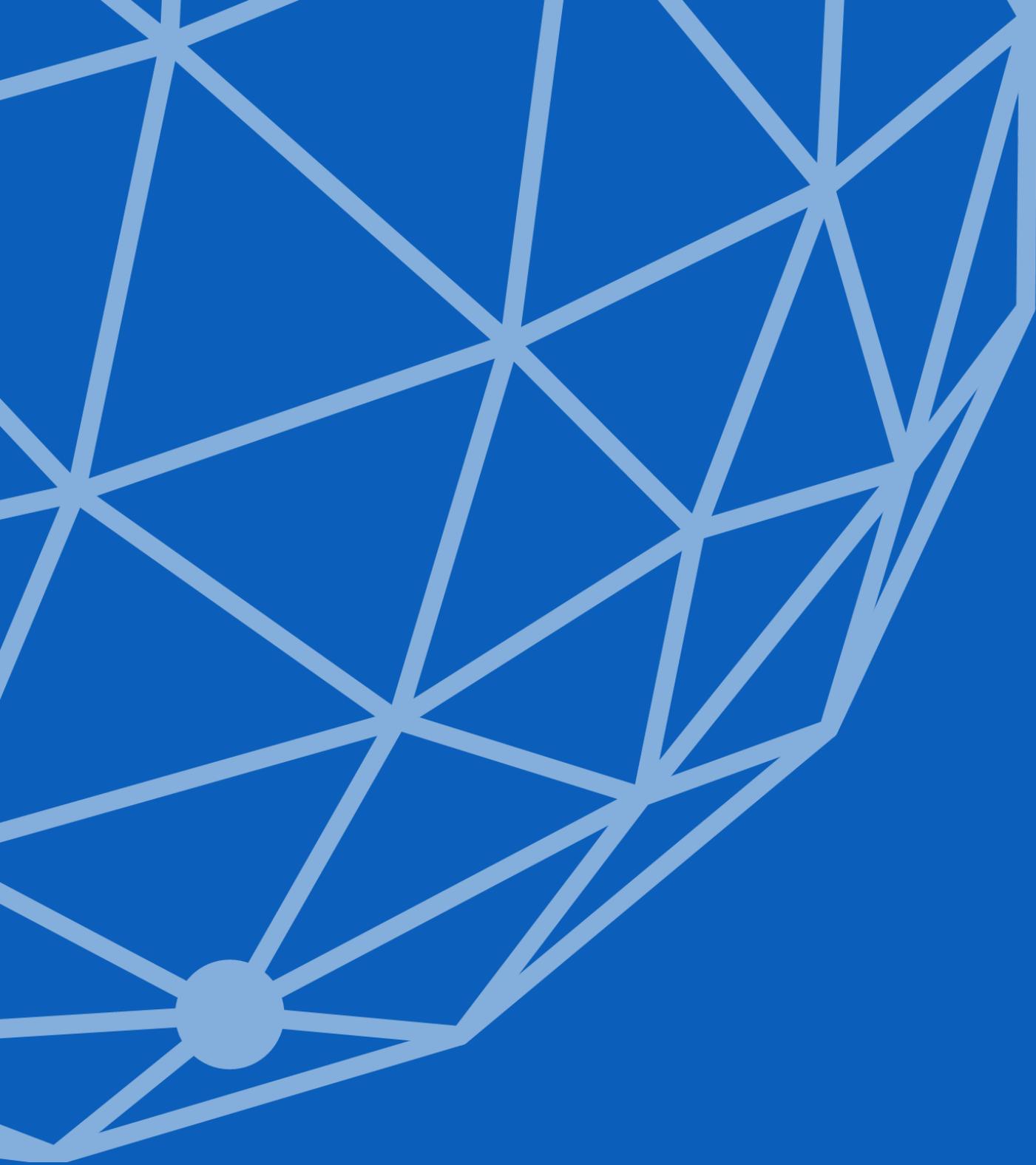
Part 2:

Practical training guide

Part 3:

Training materials





INTRODUCTION AND
PRACTICAL GUIDE FOR
TRAINERS

This manual, designed for **trainers**, aims to equip them to **train local communities**, facilitating knowledge transfer and capacity building around **nature-based practices for soil, water and land management**.

Context of the manual

- Specific to the Congo River Basin countries
- Part of a large-scale project to support countries in the Congo River watershed in managing the risk of gully erosion and urban flooding.

Purpose of the project to which this manual belongs

This project aims to promote and disseminate knowledge about nature-based **soil, water and land management practices**, with two main objectives:

- **Reduce the risk of flooding and/or erosion in gullies**, by identifying, prioritizing and designing nature-based management practices. These practices should guide the main investment components of World Bank projects.
- **Facilitate the implementation of priority practices** through capacity-building support for local authorities and communities.

This manual, designed for **trainers**, aims to equip them to **train local communities**, facilitating knowledge transfer and capacity building around **nature-based practices for soil, water and land management**.

Aim of the manual

- Support **community training** on nature-based practices for soil, water and land management (NbSWLM)
- Provide **trainers with teaching materials and practical advice on how to prepare, conduct and run training courses effectively**.

Target audience

- **Direct users:** trainers (government officials, NGO members)
- **Final beneficiaries:** local communities



Case study: earth and stone dikes for flood protection in Burundi

This manual, designed for **trainers**, aims to equip them to **train local communities**, facilitating knowledge transfer and capacity building around **nature-based practices for soil, water and land management**.

The manual can be used in a variety of contexts:

- **In support of planned or ongoing projects**
 - The manual can be integrated into training activities for local agents and communities.
 - It can be used to build capacity in donor-funded projects.
 - It can be used as a guide for the implementation of nature-based practices in targeted territories.
- **To generate new projects on the development and implementation of nature-based solutions**
 - The manual can serve as a technical basis for designing projects adapted to local realities.
 - It can support the drafting of funding proposals
 - It can encourage the emergence of community initiatives around sustainable management.
- **To reinforce and structure existing practices**
 - The manual can help valorize traditional knowledge and practices
 - It can be used to improve and formalize actions already in place.
 - It can train local relays to ensure continuity and follow-up of practices.

This manual is designed to **equip trainers to train local communities, facilitating knowledge transfer and capacity building around nature-based practices for soil, water and land management.**

Profile and skills expected of facilitators

The facilitators of this training course **do not need any technical knowledge** of the practices described in the training manual. Their main role is to ensure that **workshops with local communities are run in a participative and effective manner.**

Ideally, we expect facilitators to:

- have proven experience in facilitating workshops with local communities;
- know how to organize and lead participatory sessions, manage group dynamics and mobilize participants;
- are from local organizations or have strong links with the communities concerned;
- It is important that the facilitator and his or her team are known and recognized by the communities, to avoid a lengthy process of confidence-building.

Important

If some of the practices presented in the manual are implemented in the field, it is necessary to call on a person with technical expertise to accompany the implementation, in addition to the facilitator.

This manual, designed for **trainers**, aims to equip them to **train local communities**, facilitating knowledge transfer and capacity building around **nature-based practices for soil, water and land management**.

Manual structure

- **Practical guide for facilitators**
 - **Page 4 to 18:** Practical advice on preparation, logistics and the course of the training course
- **Training materials**
 - **Page 19 to 60:** Teaching materials for use in sessions, accompanied by presentation notes and question prompts for the trainer.



Example of practice: Row of sugar cane protecting rice fields from erosion in Burundi



PRACTICAL TRAINING GUIDE

Ideally, **the training material** presented in slides 19 to 54 should be used in a **1-3 day training with local communities**, including site visits to deploy one or two concrete practices.

The example below shows how to articulate the use of this training support within a longer training course:

DAY 1 - Theory and discussion

Morning: Introduction and needs assessment

Location: Local meeting room or covered area.

Objectives: Present the training program and assess the specific needs of the communities.

Assessment to be carried out with the community:

- Participants' level of knowledge of agricultural or soil management practices
- Identification of priority community problems (gullies, flooding, etc.)
- Determination of the most relevant practice to be demonstrated in the field the following day

Afternoon: Presentation of practices

Location: Local meeting room or covered area.

Objectives:

- Explain the purpose and benefits of the practices
- Encourage participants to ask questions and share local experiences

Content: Use slides 19 to 54 to present the different practices.

Late afternoon: Group discussions

Location: Local meeting room or covered area.

Objectives:

- Form small groups to discuss practices and select the one(s) to be deployed the following day.
- Consider: feasibility, relevance to local priorities and logistical constraints.

DAY 2 - Site visit

Morning: Preparation for deployment

Location: Local meeting room or covered area.

Objectives:

- Presentation of the day's program and detailed explanation of practical deployment.
- Reminder of deployment safety instructions

Afternoon: Deployment of the practice in the field

Location: Pre-selected site

Objectives: Deploy/build the practice selected during the discussion groups on Day 1.

PRACTICAL TRAINING GUIDE - NEEDS ASSESSMENT

Detailed instructions for needs assessment (day 1 - morning)

1. Create a climate of trust (15-20 min)

Goal: Put participants at ease and encourage their active participation.

How to do it:

- Give participants a warm welcome
- Introduce yourself and the training objectives
- Suggest a round-table discussion: each participant states his or her name, role in the community, and one thing he or she hopes to learn.
- Establish collective operating rules (listening, respect, punctuality, participation...)

2. Assess participants' knowledge (20-30 min)

Aim: To identify the level of familiarity with agricultural and natural resource management practices.

Suggested methods:

Quick survey

- Ask simple questions:
 - "What actions do you take to protect your fields from erosion?"
 - "What practices do you put in place to protect yourself from flooding?"
- Ask participants to raise their hands according to their level of knowledge: Beginner / Intermediate / Advanced

Sharing experiences

- Ask a few volunteers to describe a practice they use to manage soil, water and land.
- Record the practices mentioned on a board or a large sheet of paper

Tips:

- Don't judge answers -> there are no wrong answers
- Encourage women and young people to express themselves
- Use simple, accessible language

Detailed instructions for needs assessment (Day 1 - morning)

3. Identify priority problems (30-45 min)

Goal: Understand the major issues facing the community.

Suggested methods:

Rank problems

- Prepare a list of common problems (gullies, flooding, loss of fertility, drought, etc.).
- Give each participant 2 or 3 post-it notes or pebbles
- Ask them to place them on the issues they consider most urgent
- Count the votes and discuss the results

Participatory mapping

- Draw a simple map of the area on a large sheet of paper
- Ask participants to indicate:
 - ✓ Cultivated areas
 - ✓ Areas at risk (erosion, flooding, etc.)
 - ✓ Natural resources (springs, forests, etc.)
- Use simple symbols or objects (leaves, stones, string, etc.)

4. Select a practice to demonstrate (15-20 min)

Goal: Collectively choose an NbS practice to implement in the field.

Suggested method:

- Review problems identified
- Discuss site conditions (slope, soil type, presence of water)
- Propose a few possible practices (e.g.: hedgerows, stone barriers, retention basins)
- Vote or decide as a group on the most relevant practice to test

Tips: Work in small groups if the number of participants is high:

- Work in small groups if numbers are high
- Let participants guide the discussion
- Take photos
- Take notes of the maps produced

Tips for facilitating a community workshop

This section aims to provide recommendations for ensuring **participative, inclusive and effective facilitation**, promoting community involvement.

1. Training style

- Adopt an **interactive and participative style**: give priority to exchanges rather than lectures.
- Use simple, accessible language, illustrated by concrete examples.
- Encourage questions and value participants' contributions.

2. Room organization

- Arrange seating in a **circle or U-shape** to facilitate dialogue and participation.
- Provide space for practical activities (mapping, ranking problems).
- Ensure **accessibility and comfort**: shade, water, chairs, space for women and young people.

3. Participative methods

- Introduce simple, adaptable tools to encourage the community to adopt them:
- **Brainstorming**: quickly gather ideas and perceptions.
- **Ranking of problems**: use stickers or stones to prioritize problems.
- **Participatory mapping**: draw the area and locate the problems.
- **Storytelling**: invite participants to share real-life experiences.

4. Managing group dynamics

- **Balance participation**: explicitly invite women and young people to express themselves. If necessary, create gendered discussion groups to enable women to express themselves more freely.
- **Handle dominant participants**: thank them for their contributions, then ask for other opinions.
- Create an **inclusive space**: avoid judgments, encourage diversity of viewpoints.

5. Interactive exercises

- Role-play to simulate the implementation of a practice.
- Practical demonstrations in small groups.
- Discussions in pairs to encourage more reserved participants to speak up.

6. Questions for follow-up and reflection

- "What did you learn from this session?"
- "How can these practices be applied in your community?"
- "What obstacles do you see to their implementation?"

7. Feedback and closing

- Organize a reflection session at **the end of the day**: each participant shares one thing he or she has learned and one suggestion for improvement.
- **Feedback**: explain how identified needs and feedback will be taken into account.
- Indicate whether **materials (slides, sheets)** will be shared after the training.

The facilitator's role is to deliver **clear, attractive, inclusive training** tailored to **local communities**, in order to motivate them to (i) autonomously **implement effective NbSWLM practices to strengthen their resilience in the face of climate hazards**, and (ii) encourage their active participation in **the design, implementation, operation and maintenance of these practices**.

To this end, here are a few guidelines and practical tips to ensure the success of the training and maximize its impact:

1. Planning & preparation

- **Assess needs:** meet with local leaders, farmers, women's groups to identify priorities and seasonal constraints.
- **Plan with the community** to (i) choose the right time (avoid harvests/market days), (ii) provide an accessible and welcoming venue (shade, water, chairs), and (iii) plan for possible meals or small compensation.
- **Make sure you have the necessary materials** for all planned activities (e.g., printed sheets, cards, markers, pens, post-it notes, etc.).
- **Plan for a minimum of two people** to run the workshop (one main facilitator + one assistant for logistics, note-taking and photos).

2. Community participation, gender and inclusion

- Involve **leaders and respected figures** from the outset to build trust and legitimacy.
- Explicitly invite women, young people and marginalized groups, and adapt schedules to accommodate their participation.
- Highlight **the direct benefits** of the practices for women and young people (reduced workload, economic opportunities).
- **Group size:** ideally **15-20** participants to encourage interaction

3. Conduct and content of training

- **Clearly explain the objective:** link training to concrete community challenges (erosion, flooding, declining fertility, lack of water, etc.).
- **Capitalize on local knowledge:** build on solutions already implemented, encourage the sharing of experiences, and show how they can be reinforced through practice.
- **Highlight multiple benefits:** emphasize direct and rapid benefits (e.g. compost → increased yield) and show co-benefits (income, biodiversity, adaptation).
- **Use the TPP as a flexible basis:** adapt the focus of the themes according to local priorities, and emphasize a practice deemed more relevant to the local context.

4. Practice deployment

- **Site accessibility:** the site must be easily accessible to all participants, including the most vulnerable groups.
- **Authorizations:** all necessary authorizations to access and intervene on site must be requested and obtained in advance. Coordination with local authorities or landowners is necessary for site visits.
- **Site selection:** choose a site presenting a concrete problem to be addressed (gully, erosion, loss of fertility, etc.), which corresponds to the site characteristics needed to deploy the selected practice (see "training material" for more information).
- **Material preparation:** all necessary tools and materials must be brought along and checked before the start of the activity (the materials and tools required are listed in the "training materials" slides).
- **Safety:** prepare the site for safe operation, and remind all participants of safety instructions.
- **Coaching:** experienced practitioners **guide deployment, demonstrating steps and best practices.**
- **Active participation:** participants must **be actively involved**, reproducing or assisting implementation to promote practical and autonomous learning.

Concluding tips

1. Summarize key learnings

- Remind participants of their initial objectives and check that they have been achieved.
- Summarize the NbS practices presented and their benefits for the community.
- Highlight the strengths of participation

2. Conduct a satisfaction survey

- **Objective:** gather feedback on training, content and facilitation.

- **Possible methods:**

- Paper questionnaire** (3-5 simple questions):

- Clear explanations
- Relevance of practices presented
- Demonstration quality
- Suggestions for improvement

- Visual voting:** use stickers or smileys to gauge satisfaction.

Tip: keep the survey short (5-10 min) and anonymous for candid feedback.

3. Valuing participants' contribution

- Thank the community for its commitment.
- Emphasize that their feedback will guide the next steps.

Next steps for facilitators / sponsors

1. Document results

- Compile identified needs, priorities and the practice chosen for the demonstration.
- Include photos, maps and notes of discussions.

2. Give back to the community

- Prepare a simple report (oral or written) of the conclusions.
- Indicate how feedback will be taken into account in future actions.
- Share materials (slides, fact sheets) where possible.

3. Plan follow-up

- Define next steps for follow-up of practices deployed during training.
- Identify the actors responsible for ensuring follow-up (local leaders, associations, technical services).

4. Capitalize and improve

- Evaluate training: what went well, what can be improved.
- Incorporate these lessons into future sessions.

5. Reinforcing continuity

- Offer additional sessions or follow-up visits.
- Encourage the creation of local groups to maintain momentum.



TRAINING MATERIAL

SUMMARY

- **Climate risks and soil and water management practices**
- **The diversity of nature-based practices**
- **Overview of the practices presented in this training course**
- **Practices for community application:**
 - **Stone and vegetated weirs**
 - **Vegetated gabion**
 - **Vetiver planting on a contour line**
 - **Progressive terrace**
 - **Sylvopasture**



Source: Authors, 2025

CLIMATE RISKS AND WATER AND SOIL MANAGEMENT PRACTICES

Climate risks threaten our land and livelihoods

Flooding in Burundi in 2023



Source: Ntakirutimana Pascal, 2023

Soil erosion in Burundi



Source: Auteurs, 2025

Soil erosion in the Central African Republic



Source: Auteurs, 2025

Soil erosion in the Central African Republic

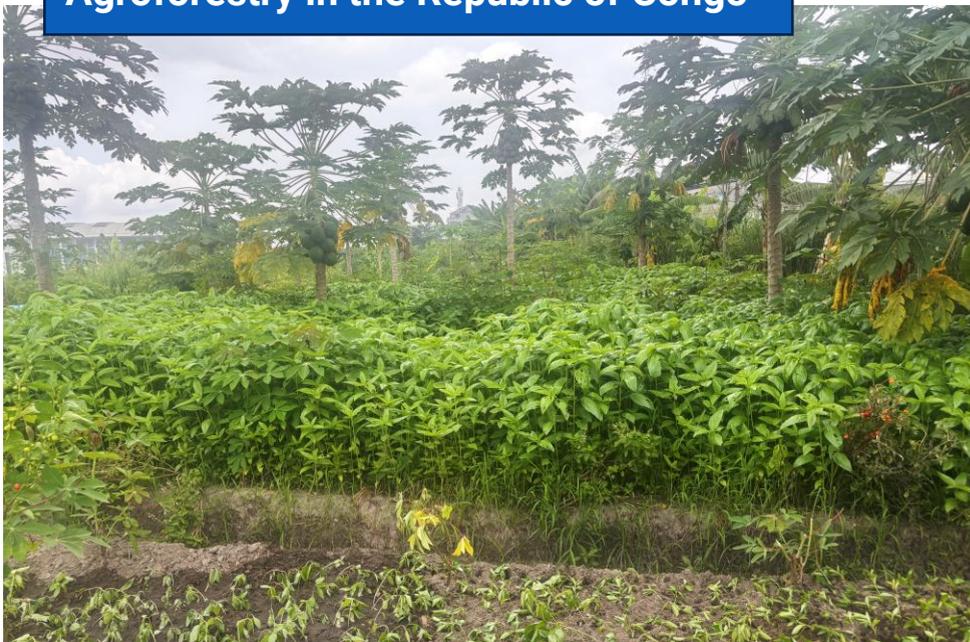


Source: Auteurs, 2025

CLIMATE RISKS AND WATER AND SOIL MANAGEMENT PRACTICES

Nature-based soil, water and land management (NbSWLM) practices use nature to protect and restore land.

Agroforestry in the Republic of Congo



Vetiver planting in Burundi



Agricultural land preparation in Burundi



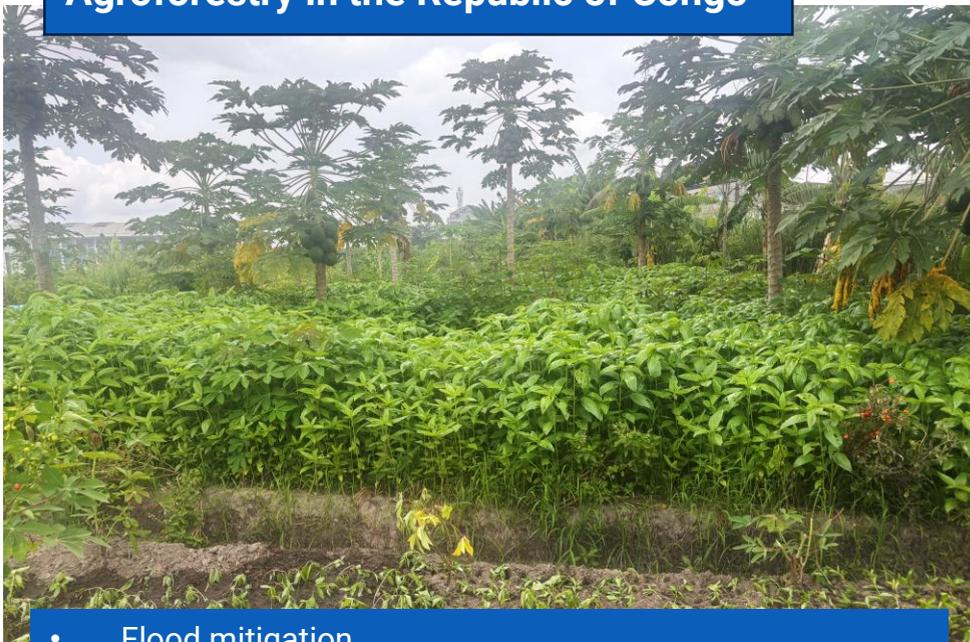
Source: Auteurs, 2025

These practices are inexpensive, effective and provide multiple co-benefits.

CLIMATE RISKS AND WATER AND SOIL MANAGEMENT PRACTICES

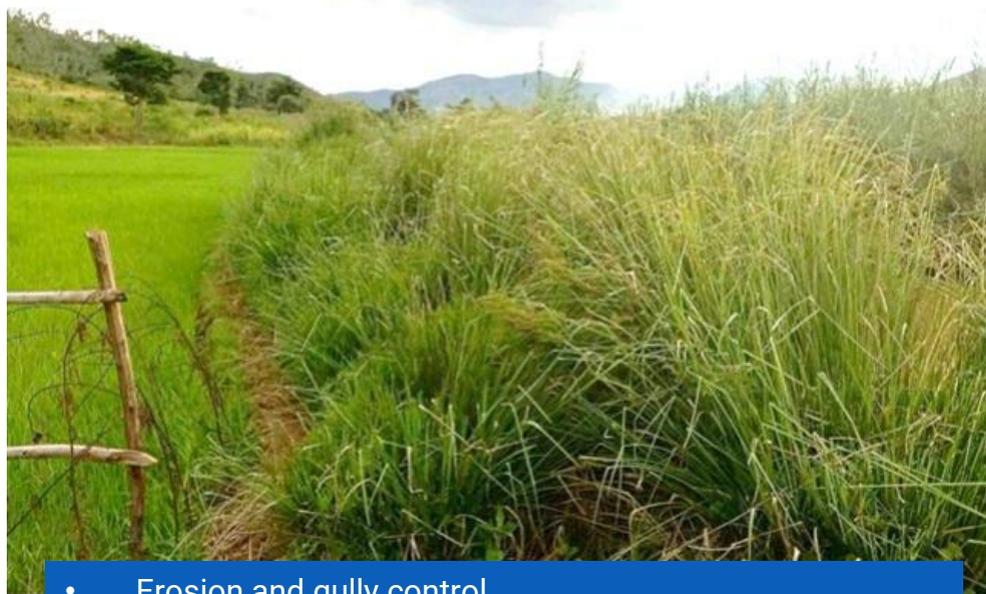
These practices reduce risks, improve harvests and strengthen community resilience.

Agroforestry in the Republic of Congo



- Flood mitigation
- Prevention of agricultural droughts
- Improved soil fertility
- Diversification of livelihoods
- Supplementary income
- Strengthening of local biodiversity

Vetiver planting in Burundi



- Erosion and gully control
- Runoff reduction
- Adaptation to extreme weather
- Protection of agricultural land
- Source of biomass
- Reduced maintenance costs

Agricultural land preparation in Burundi

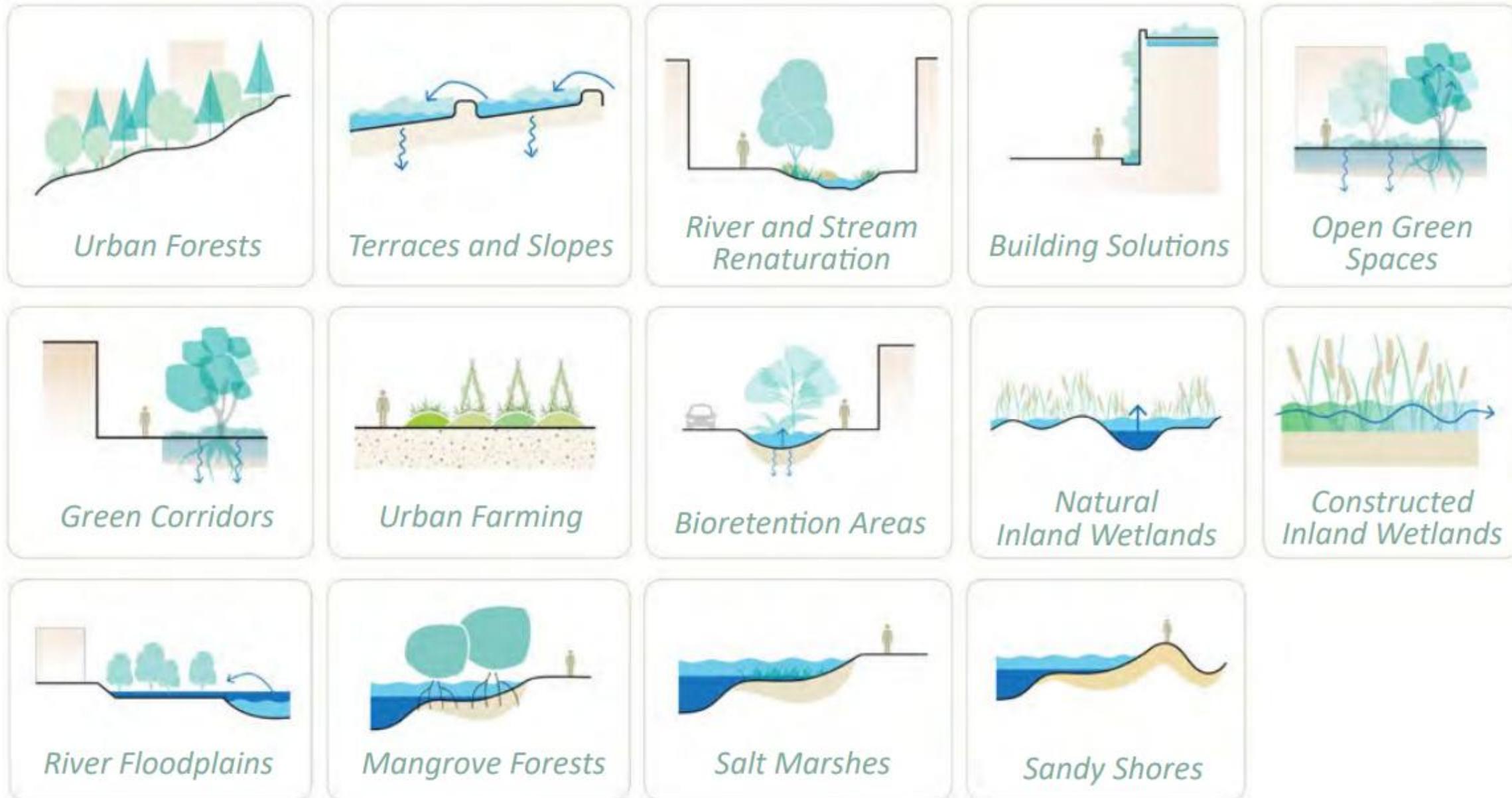


- Reduction of erosion and gully erosion
- Water management
- Prevention of landslides
- Increase in arable land
- Improved yields
- Reduction in economic losses
- Creation of local jobs

Source: Auteurs, 2025

THE DIVERSITY OF NbSWLM

NbSWLMs can take many different forms depending on the context and local needs.



Source: World Bank catalogue of nature-based solutions for urban resilience, 2021

OVERVIEW OF THE PRACTICES PRESENTED IN THIS TRAINING COURSE

Practice 1: Stone and vegetated thresholds



Practice 2: Vegetated gabions



Practice 3: Planting vetiver in contour lines



Practice 4: Progressive terrace



Practice 5: Silvopasture



For each practice, we will present :

- **Definition:** what the practice involves and what it is used for
- **Benefits:** environmental, climatic and socio-economic
- **Conditions for implementation and basic principles to be observed**
- **Key stages in implementing the practice**
- **Essential maintenance guidelines to ensure sustainability**

COMMUNITY OWNERSHIP AND LOCAL ROLES IN IMPLEMENTING PRACTICES

Why is it important?

- Ensuring the sustainability of practices.
- Reduce costs by mobilizing local knowledge.
- Reinforce collective responsibility for maintenance.

Key roles and responsibilities

Community coordination

- What does it involve? Planning work, organizing collective days, ensuring communication between members.
- Who can do it? Often a local leader, village committee or farmers' association.
- Why is this important? Without coordination, there are delays, oversights and lack of follow-up.

Maintenance

- What does it involve? Inspecting structures after the rains, repairing damaged gabions, replacing dead cuttings, filling gaps in terraces.
- Who can do it? Groups of volunteers, rotating families or local associations.
- Why is this important? Small repairs can prevent major damage.

Monitoring

- What does it involve? Observe plant growth, check soil stability, monitor drainage.
- Who can do it? Village youth, trained farmers, or a technical committee.
- Why is this important? Monitoring allows us to anticipate problems before they become serious.

Implementation of a soil management practice in the Democratic Republic of Congo



PRACTICAL FOR COMMUNITY USE: STONE AND VEGETATED WEIRS

What is a threshold?

A weir is a **small structure** built in a **gully** from wood, stones, branches or other materials.

A weir slows the flow of water, encourages sediment deposition and, ultimately, **fills in and stabilizes the gully**.

Weirs can be made in a variety of ways:

Dry stone, gabion, masonry, concrete, branch fascines or vegetated posts



Source: Authors, 2025



Source: Authors, 2025



Source: Wikimedia, Phoenix CZE



Source: Authors, 2025

FOR COMMUNITY APPLICATION: VEGETATED STONE WEIRS

Climatic and environmental benefits

- Reduces erosion and helps hold soil in place
- Allows water to infiltrate and gradually recharge the water table
- Reduces runoff and limits small-scale local flooding
- Recover gullied soil

Socio-economic benefits

- Avoids loss of money due to soil loss and damage to land or infrastructure
- Protects fields from degradation
- Improves fertility and production (more arable land thanks to sediment deposits)



Vegetated and braided weirs

Source: Authors, 2025

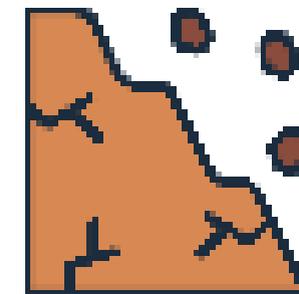
Main risks mitigated by weirs



Erosion



Flooding



Landslide

PRACTICES FOR COMMUNITY APPLICATION: STONE AND VEGETATED WEIRS

Implementation conditions and basic principles

- Installed in gullies or small temporary streams (no permanent watercourses).
- Recommended gully size: up to 2 m deep and 3 m wide
- Upstream: lighter weirs (logs, fascines) / downstream: stronger weirs (stone)
- Evenly spaced at around 5 metres apart

Materials and tools required

- Wheelbarrow
- Bricks and stone
- Posts
- Vetiver grass
- Weaving herbs
- Hoe
- Shovel
- Machete



To find out more about the implementation of this practice, click [here](#), [here](#), and [here](#)



Bamboo weirs, jute sack and Vetiver plantation

PRACTICAL TIPS FOR COMMUNITY APPLICATION: STONE AND VEGETATED WEIRS

Main stages in the installation of vegetated weirs

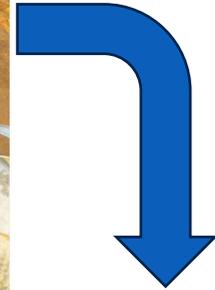
1. Dig a small ditch across the width of the gully, slightly wider than the gully itself
2. Plant vertical stakes in the ground, spaced at approximately 40 cm intervals, across the entire width of the weir
3. Weave fine branches between piles to form a wall
4. Fill the upstream space with soil and plant long-rooted plant species (such as vetiver grass) to stabilize the weir.
5. Check that water flows slowly across the weir without washing it away



PRACTICES FOR COMMUNITY APPLICATION: STONE AND VEGETATION THRESHOLDS

The main stages of installing stone thresholds

1. Dig the bottom of a ditch across the ravine.
2. Fill the bottom with stones and gravel.
3. Building the wall:
 - Downstream side: large stones for stability.
 - Upstream side: smaller stones and gravel to fill in the gaps.
4. Wall height: approximately 1 metre, with a small central ledge to guide the water.
5. Stabilise the summit and upstream areas with sand or vegetation (vetiver).
6. Install a 2 m mat of large stones downstream to protect the ground from heavy runoff.



PRACTICES FOR COMMUNITY APPLICATION: STONE AND VEGETATION THRESHOLDS

Basic maintenance instructions

- Check that the flow passes over the centre of the threshold and not underneath or to the sides.
- Regularly check the condition of the thresholds and replace any displaced stones or branches.
- When the area behind a threshold is filled with sediment, the wall can be raised to continue retaining the earth.



What is a vegetated gabion?

A gabion is a modular structure consisting of metal cages filled with loose stones. These double-twisted hexagonal steel mesh cages are strong, flexible and permeable, allowing water to pass through while resisting soil movement and erosion. A vegetated gabion is a gabion in which plants are incorporated..

What are its main uses?

Gabions, whether vegetated or not, are used for:

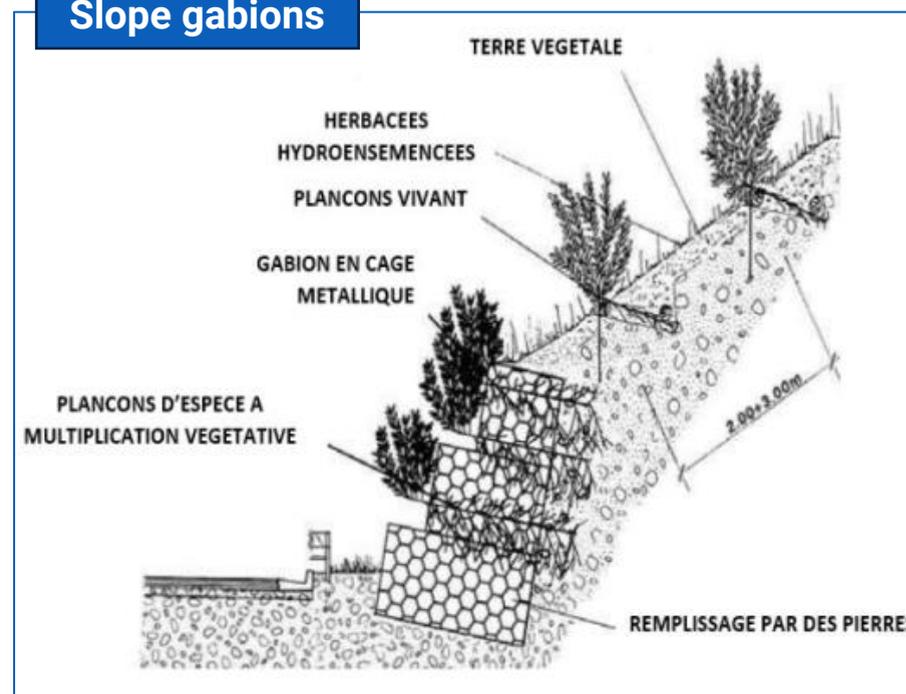
- **Serving as thresholds or filter dykes:** placed perpendicular to gullies or watercourses, these gabions slow down the water, retain sediment and limit erosion, while smoothing out the terrain profile.
- Reinforcing banks and slopes: arranged parallel to slopes or banks, they stabilise the soil and prevent landslides or scouring, while facilitating the revegetation of the site.

Gabion threshold in Burundi

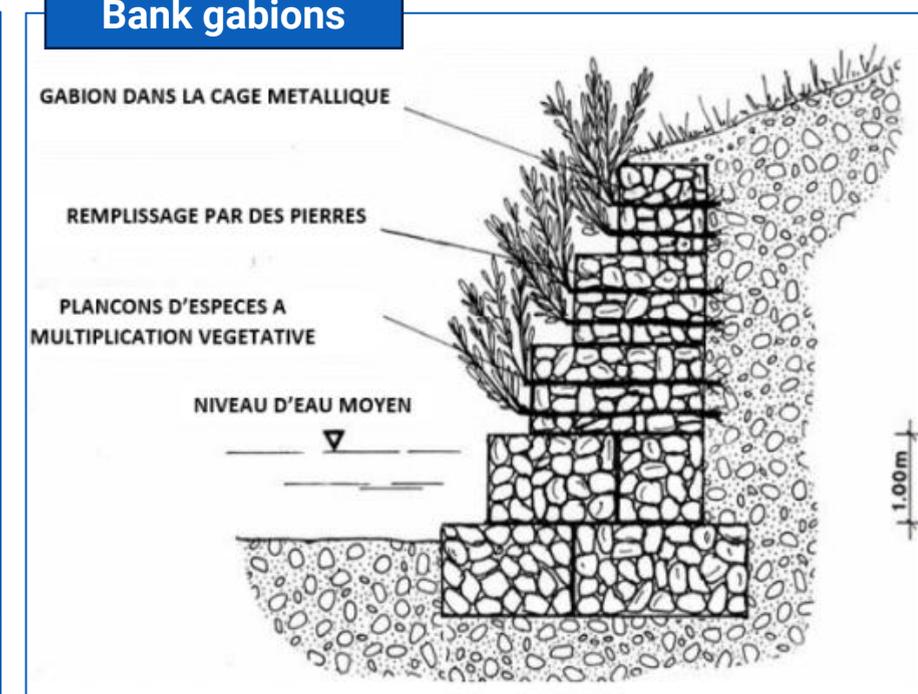


Source: Auteurs, 2025

Slope gabions



Bank gabions



Source: Manuel de génie Végétal du Burundi, 2023

Whether used as thresholds or to reinforce embankments/banks, vegetated gabions offer numerous benefits.

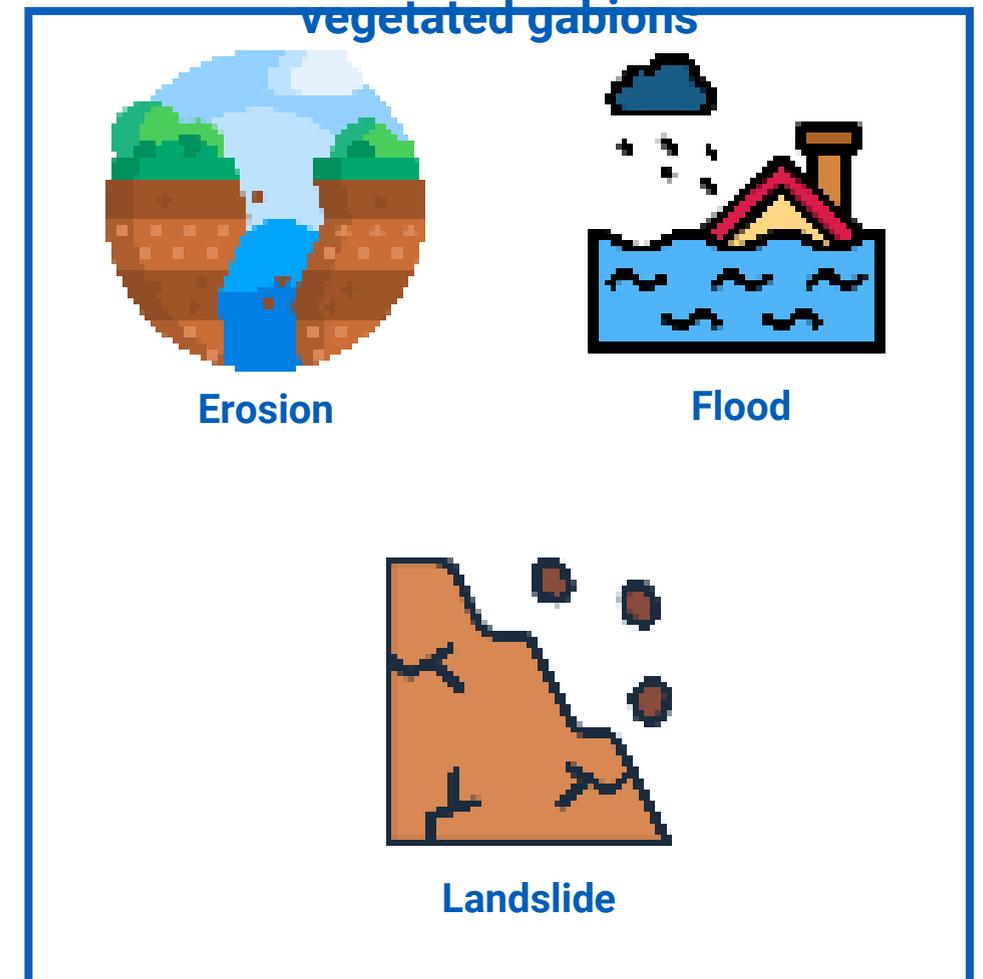
Climate and environmental benefits

- Reduces erosion and helps keep soil in place
- Allows water to infiltrate and gradually replenishes groundwater
- Reduces runoff and limits small local flooding
- For use at thresholds: helps recover eroded soil
- Restore natural ecosystems and increase biodiversity through integrated vegetation

Socio-economic benefits

- Prevents financial losses associated with soil loss and damage to land or infrastructure
- Prevents the loss of arable land by reducing erosion and gully erosion, thereby protecting productive agricultural areas

The main risks mitigated by vegetated gabions



Implementation conditions and basic principles

- Suitable for all types of environments and climates, particularly clay soils.
- Requires skilled and sufficient labour.
- Ideal if stones are available locally; otherwise, requires appropriate means of transport for import.
- Avoid the use of heavy metals in galvanised wire mesh in watercourses (if not galvanised, increase the diameter of the steel wire to ensure durability)



Materials and tools required

- Wire mesh containers (gabion baskets) or rolls of mesh to cut and assemble
- Stones or rubble of suitable size
- Wire or spiral fasteners to assemble the baskets
- Live cuttings for planting the gabions
- Pliers or tongs to secure the mesh and fasteners
- Protective gloves for handling stones and metal
- Hammer or mallet to adjust the stones and mesh if necessary
- Wheelbarrows, shovels or buckets to transport stones and materials
- Levels or string line to check the alignment and flatness of the gabions
- Possibly, lifting equipment or small machines to move heavy stones over large areas

Reinforcement of a slope with gabions in Burundi

The main stages in installing stacked vegetated gabions to reinforce riverbanks or embankments (1/2)

1. Site assessment

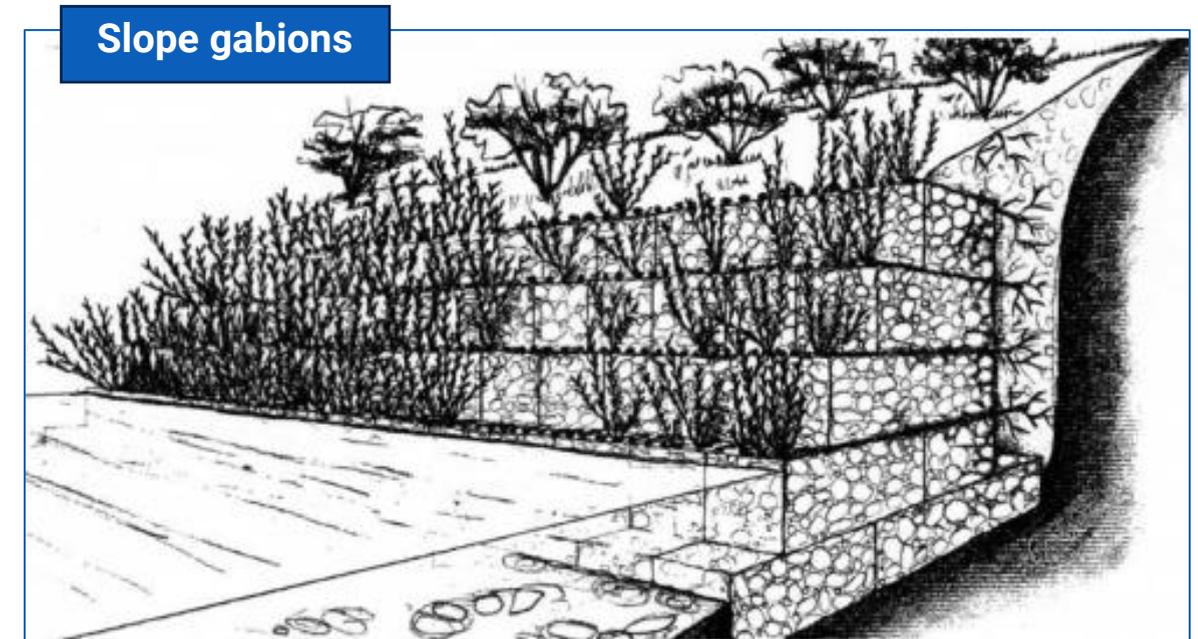
- Identify areas prone to erosion and water overflow, typically on slopes lacking vegetation.

2. Collection of materials

- Gather wire mesh cages or the materials needed to build them.
- Collect stones locally or arrange for their importation (if unavailable.)
- Transport all materials to the implementation site

3. Construction of metal cages

- Determine the size of the cages according to the location and type of mesh.
- Cut the mesh using pliers to obtain the sides of the cages.
- Assemble the bottom and sides of the cages with wire or spirals, reinforcing the corners in particular (leave the top open).



Source: *Manuel de génie Végétal du Burundi, 2023*

Steps for constructing metal cages



Source: *Cheap DIY Gabion Baskets : 4 Steps - Instructables*

The main stages in installing stacked vegetated gabions to reinforce riverbanks or embankments (1/2)

4. Preparing the site for installation

- Dig the foundation along the embankment or riverbank, at a slight angle of approximately 10° for anchoring.

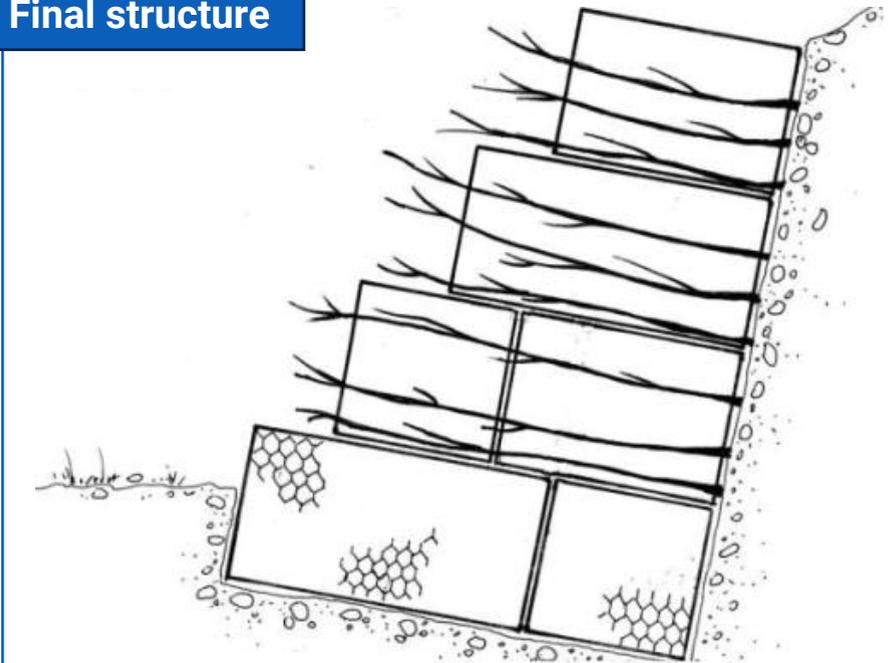
5. Installation and filling of gabions

- Place the metal cages in the prepared base.
- Fill the cages gradually with local stones.
- Insert the live cuttings as you go along so that they touch the ground behind the gabion.
- Close the top of the gabion and secure it firmly with wire or fasteners.

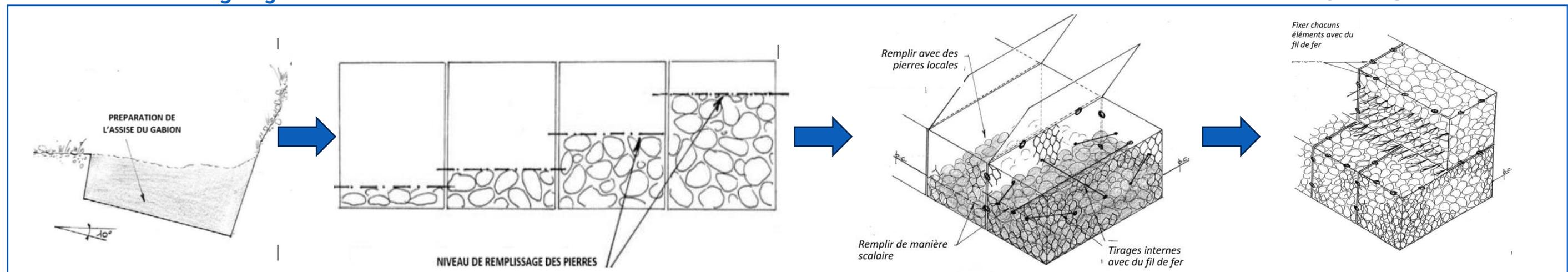
6. Row overlay

- Lay and secure the second row of gabions, making it slightly narrower than the first row to create a staircase effect and promote stability.
- Repeat the process for the following rows until you reach the desired height.

Final structure



Installation and filling of gabions



Source: Manuel de génie Végétal du Burundi, 2023

Source: Manuel de génie Végétal du Burundi, 2023

Basic maintenance instructions

- Regularly check the stability of the gabions and metal fasteners.
- Check the vegetation: replace or add any dead or missing cuttings.
- Remove any debris or objects that could block water flow or hinder vegetation growth.
- Monitor erosion around the gabions, particularly downstream and behind the cages.
- Check the stone filling: correct any areas where stones have moved or subsided.
- Check drainage to prevent water accumulation behind the gabions.
- Carry out maintenance after heavy rain or flooding to ensure that no gabions have been displaced or damaged.



Gabions on riverbanks in Burundi



PRACTICES FOR COMMUNITY APPLICATION: PLANTING VETIVER IN CONTOUR LINES

What is a contour vetiver plantation?

This practice involves planting rows of vetiver grass along the contour lines of the land. These vetiver hedges form a natural barrier, not completely closed, which slows down rainwater as it runs off. Vetiver is chosen because it is strong, easy to maintain, non-invasive, and very effective at stabilising soil and combating erosion.



Vetiver planting in Burundi



Source: Auteurs, 2025

PRACTICES FOR COMMUNITY APPLICATION: PLANTING VETIVER IN CONTOUR LINES

Climate benefits

- Improves water infiltration and increases soil moisture
- Stabilises the soil thanks to its deep roots and limits erosion.
- Reduces water runoff

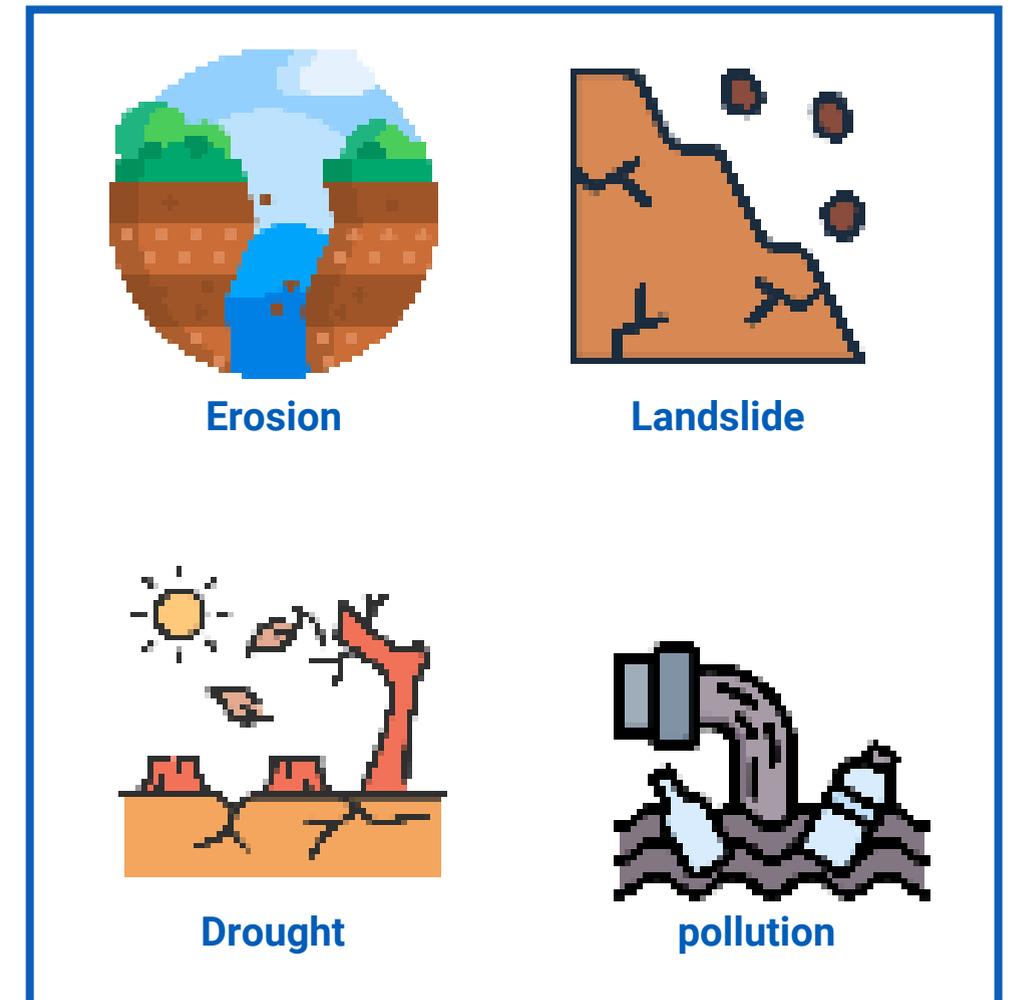
Socio-economic benefits

- Secures agricultural land by preventing its depletion
- Protects infrastructure (roads, tracks, dykes) against erosion damage
- Requires little maintenance, therefore low cost for communities

Environmental benefits

- Improves water quality by filtering sediments and pollutants carried by runoff
- Promotes groundwater recharge through improved infiltration

The main risks mitigated by this practice



PRACTICES FOR COMMUNITY APPLICATION: PLANTING VETIVER IN CONTOUR LINES



Conditions for planting vetiver

- Can grow on slopes greater than 50%
- Suitable for a wide variety of soils
- Resistant to high variations in rainfall and extreme temperatures
- Tolerates high concentrations of metals, high acidity, salinity and alkalinity, as well as acidic sulphate soils
- Non-invasive, fire-resistant, fast-growing, can be used as mulch or fuel

Limitations to this practice

- Effective only against surface erosion and small unstable slopes.
- Vetiver does not tolerate shade well, especially during the establishment phase.
- The distance between the planting site and the nursery must be taken into account, as transport can be challenging.



Slope stabilisation using vetiver in the Democratic Republic of Congo

PRACTICES FOR COMMUNITY APPLICATION: PLANTING VETIVER IN CONTOUR LINES



The main stages of establishing vetiver planting on contour lines

1. Identify and mark contour lines using stakes or ropes.
2. Clear and clean the area to remove tall grass and debris.
3. Dig holes approximately 15 cm deep along the contour line using a pointed stick.
4. Start planting from the top of the slope.
5. Insert 2-3 shoots into each hole, taking care not to bend the roots upwards.
6. Space the shoots 10 to 15 cm apart.
7. Cover the roots with 200 to 300 mm of soil and compact well.
8. Space hedges according to slope and vertical spacing.

Example

For a slope of 70% with a surface run of 1.7 m and a vertical interval of 2 m → distance between hurdles = $2 \times 1.7 = 3.4$ m.



PRACTICES FOR COMMUNITY APPLICATION: PLANTING VETIVER IN CONTOUR LINES

Basic maintenance instructions (1/2)

Watering

- Water daily for the first two weeks after planting, then every other day.
- Water twice a week until the plants are well established.
- Mature plants no longer require watering.

Replantation

- During the first month, replace any plants that have not taken root or have been washed away.
- Continue inspections until the plants are properly established.

Weeding

- Control weeds, especially vines, during the first year.
- Do not use glyphosate-based herbicides, as vetiver is very sensitive to them.



Plants de vétiver en République Démocratique du Congo et Burundi



PRACTICES FOR COMMUNITY APPLICATION: PLANTING VETIVER IN CONTOUR LINES

Basic maintenance instructions (2/2)

Size / fit

- After 10 months (or once the hedge reaches 1 metre in height), regularly trim the hedges to 15–20 cm above the ground.
- Thereafter, trim 2 to 3 times a year.
- Adapt the cutting schedule to the cyclone seasons (leave long leaves during the season, cut just after, and possibly 3 months before the start of the season).
- Fresh leaves can be used as fodder, mulch, crafts or roof covering.

Protection/fencing

- During the establishment period (a few months), protect young plants from livestock and vandalism, if necessary by fencing.
- Mature stems become hard enough to deter livestock.



To learn more about this practice, [click here](#).

To learn more about other contour engineering practices to combat runoff, [click here](#) and [here](#).

Jeunes plants de vétiver en République du Congo



PRACTICES FOR COMMUNITY APPLICATION: PROGRESSIVE TERRACE

What is a progressive terrace?

This practice combines infiltration trenches and strips of vegetation to control erosion and stabilise slopes. The trenches retain water and promote its infiltration, while the vegetation traps sediment. Banagrass (*Pennisetum purpureum* x *americanum*) is particularly well suited to this practice.

Over time, this combination gradually transforms steep slopes into terraced steps, improving soil fertility and water retention. Unlike traditional terraces, these terraces form and expand gradually, without the need for heavy labour at the outset.



PRACTICES FOR COMMUNITY APPLICATION: PROGRESSIVE TERRACE

Climate and environmental benefits

- Reduces soil erosion and surface runoff
- Traps sediment and improves soil structure
- Stabilises slopes thanks to banagrass roots
- Promotes local biodiversity by creating vegetated microhabitats
- Contributes to resilience in the face of intense rainfall and local flooding

Socio-economic benefits

- Improves long-term soil fertility and productivity (increased agricultural yields)
- Reduces the cost of restoring eroded or damaged land
- Facilitates adoption by smallholders thanks to a less labour-intensive method than traditional terraces
- Enables the introduction of intensive crops or agroforestry systems to enhance the value of gradually developed land.

Infiltration trenches with strips of vegetation in Burundi



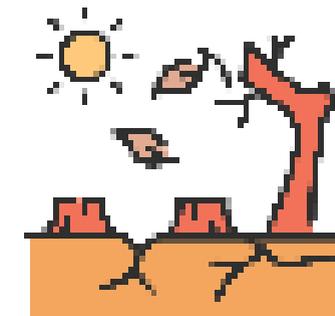
The main risks mitigated by this practice



Erosion



Landslide



Drought

PRACTICES FOR COMMUNITY APPLICATION: PROGRESSIVE TERRACE

Implementation conditions and basic principles

- Technique suitable for land with a slope of no more than 35%, and particularly effective on slopes of less than 15%
- Requires deep soil (at least 1 metre) and should be avoided on thin, clayey and schistose soils where there is a high risk of landslides
- The spacing between two ditches depends on the slope and soil type: it generally varies from 10 to 30 metres and should be reduced on sandy or loamy soils that are more susceptible to erosion.
- Ideally, installation should take place at the beginning of the rainy season (October-November).
- Installation results in a loss of cultivated area (5 to 10%) and requires a significant investment in labour.

Construction of infiltration trenches in Burundi



Materials and tools required

- Pickaxes, hoes and spades for digging ditches
- Shovels for moving earth and forming embankments upstream of the ditch
- Stakes and string for marking out contour lines
- Levelling instruments: spirit level (pipe filled with water), string level with spirit level
- Machetes or pruning shears for preparing and maintaining plants
- Wheelbarrows for transporting soil and plants
- Fixing grasses: Setaria, Vetiver, Tripsacum, Bana grass

PRACTICES FOR COMMUNITY APPLICATION: PROGRESSIVE TERRACE

The main stages in the construction of terraced gardens

1. Site identification and assessment

- Select suitable plots: slope $\leq 35\%$, soil depth ≥ 1 m. Check the soil type and avoid very clayey or schistose soils.
- Identify the areas most exposed to runoff and erosion.

2. Contour line tracing

- Marking out contour lines with stakes according to the slope and topography of the terrain.
- Using a slope triangle or a string level/spirit level/bubble level to follow the contour lines.

To take into consideration

Observe the recommended spacing between ditches:

- On gentle slopes ($< 10\text{--}15\%$), ditches can be spaced further apart, for example 25–30 m.
- On steeper slopes ($> 15\%$), spacing should be reduced, sometimes to 10–15 m, to prevent water from accelerating and washing away the soil between ditches.

Construction of terraced fields in Burundi



PRACTICES FOR COMMUNITY APPLICATION: PROGRESSIVE TERRACE

How to construct and use a slope triangle

1. Attacher deux perches de 6 pieds et une perche de 4 pieds pour former un « A ».
2. Fixer une corde en haut du cadre et y attacher un poids.
3. Sur un sol nivelé, tourner le cadre en forme de A dans les deux sens et marquer l'endroit où la corde traverse la barre transversale, respectivement.
4. Balancer un pied vers le haut ou vers le bas de la pente, de sorte que la corde traverse la barre transversale exactement à l'endroit marqué.
5. Marquer l'endroit où se trouve le deuxième pied et continuer de la même manière.
6. Ce procédé permet d'obtenir des courbes de niveau en travers de la pente.

Source: FiBL (2021). Manuel de formation en agriculture biologique pour l'Afrique. Module 2. Gestion de la fertilité des sols



Source: Auteurs, 2025

PRACTICES FOR COMMUNITY APPLICATION: PROGRESSIVE TERRACE

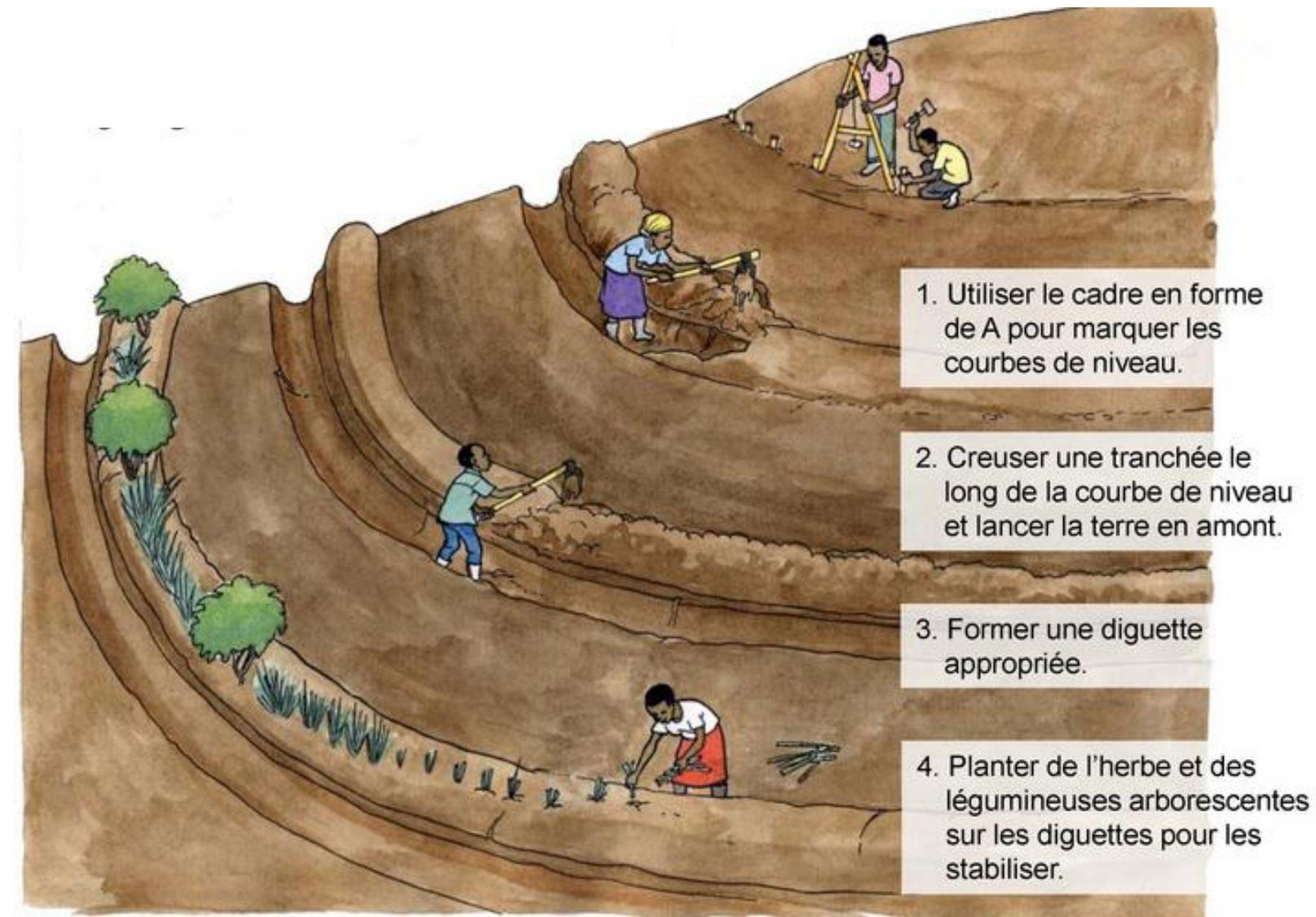
The main stages in the construction of terraced gardens

3. Digging anti-erosion ditches

- Dig ditches from the top to the bottom of the plot to prevent runoff water from destroying the lower ditches.
- Standard dimensions: 50 cm wide × 50 cm deep × 50 cm high.
- The excavated soil is placed upstream to form a small embankment on which the grasses will be planted..

4. Planting of fixative grasses

- Plant two staggered rows at emergence: Setaria (20 cm), Tripsacum (40 cm), or Bana grass (20 cm).
- Respect the spacing between plants according to local techniques and the desired density.



Source: FiBL (2021). *Manuel de formation en agriculture biologique pour l'Afrique. Module 2. Gestion de la fertilité des sols*

PRACTICES FOR COMMUNITY APPLICATION: PROGRESSIVE TERRACE

Basic maintenance instructions

Monitoring after rainfall

- Inspect ditches and embankments after every heavy rainfall.
- Immediately fill in any eroded or collapsed areas.
- Check that water is draining properly and not flowing around the ditches.

Maintenance of ditches

- Regularly remove accumulated sediment to maintain infiltration depth.
- Reform the edges if necessary to maintain the "V" or "U" shape.

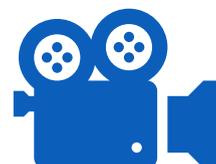
Vegetation management

- Weed around young grasses to limit competition during the first year.
- Replant areas where grasses have not taken root.
- Cut grasses 2 to 3 times a year at a height of approximately 30–40 cm to stimulate regrowth and increase density.
- Leave clippings on the ground to protect the soil and enrich organic matter.

Protection and continuous improvement

- Avoid allowing livestock or machinery to pass over embankments.
- Add compost or manure as needed to improve soil fertility and structure.

Terrace terracing with banagrass planting in Burundi



To learn more about this practice, [click here.](#)

Source: Auteurs, 2025

What is silvopasture?

- This is a type of agroforestry that combines trees, pastures and livestock farming on the same plot of land.
- Agroforestry practices aim to mitigate deforestation and soil degradation.
- Animals benefit from the shade and additional fodder provided by the trees, while helping to fertilise the soil with their manure. The trees enrich and protect the soil, while diversifying production (wood, fruit, fodder).

Silvopasture is a type of agroforestry.



Source: Environmental and Energy Study Institute

Climate benefits

- Contributes to soil stabilisation
- Vegetation cover slows down the flow of heavy rainfall and promotes infiltration
- Prevention of gully erosion and landslides

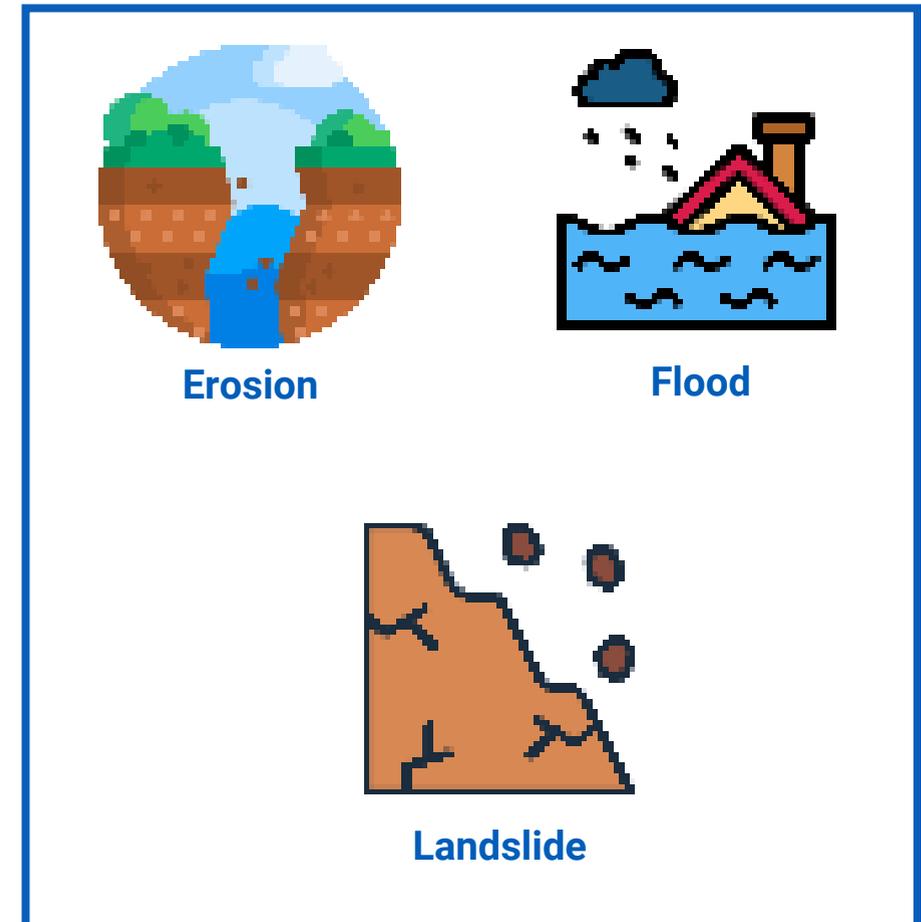
Environmental benefits

- Improved soil fertility (nitrogen fixation, addition of organic matter) Increased biodiversity and creation of habitats
- Reduced risk of fires thanks to grazing

Socio-economic benefits

- Diversification of income (animal products + forest products)
- Reduction in management costs (weed control by livestock)
- Food security and support for traditional practices

The main risks mitigated by silvopasture



Planting agroforestry trees in Burundi



Source: Auteurs, 2025

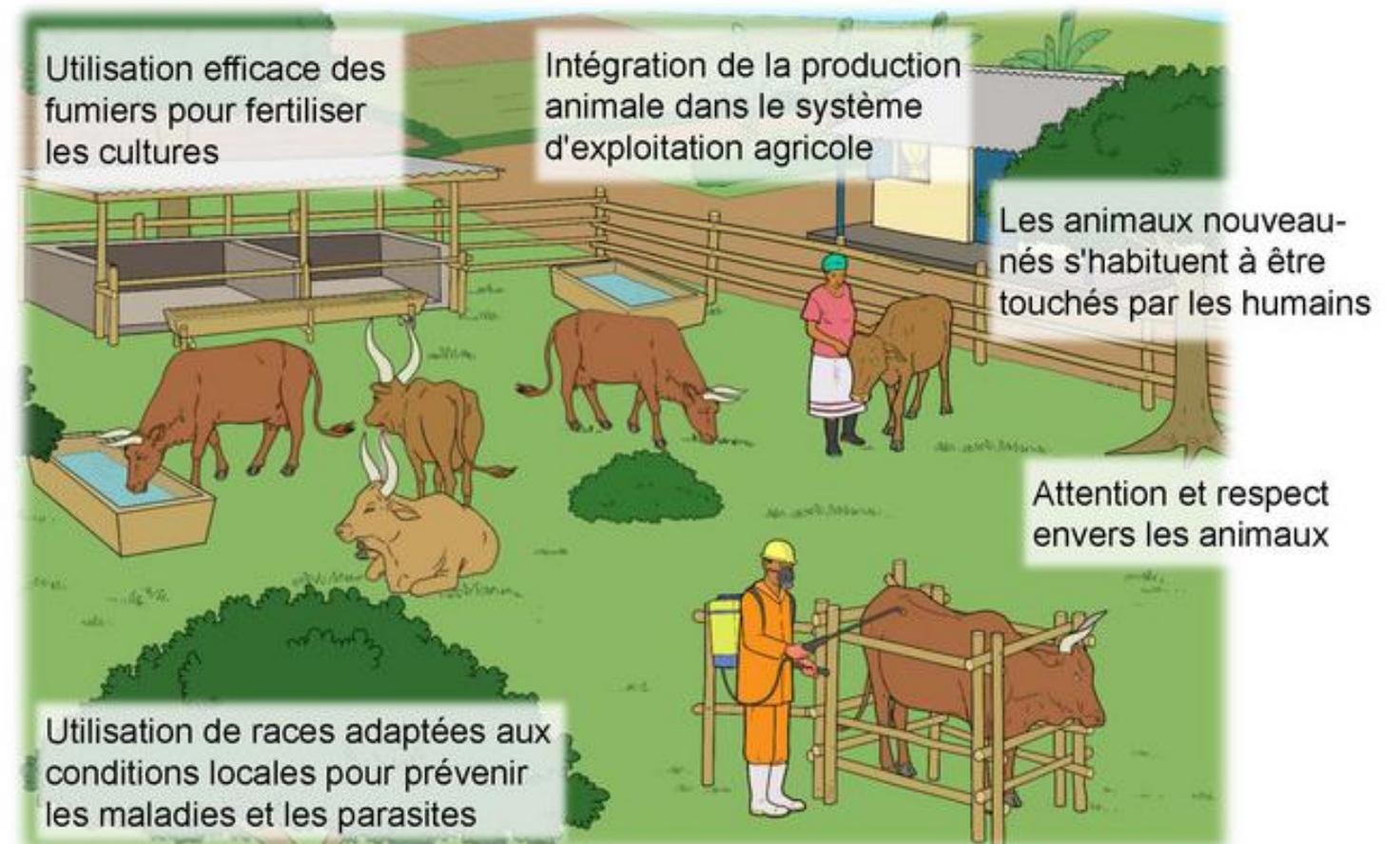
Implementation conditions and basic principles

- Plan carefully according to slope, soil, climate and local conditions.
- Use local shrubs, grasses/legumes suited to shade.
- Use breeds suited to local conditions to prevent disease and pests.
- Control grazing to protect young trees. Benefits in terms of erosion and gully formation visible after 2–3 years.
- Suitable for moderate slopes
- Less suitable: very steep/rocky terrain, uncontrolled intensive grazing

Required equipment

- Good quality seedlings
- Fences to protect seedlings from livestock
- Shovel and digging equipment (tractor or small bulldozer)
- Equipment for clearing unwanted vegetation (e.g. thorny bushes, plants that are toxic to livestock)

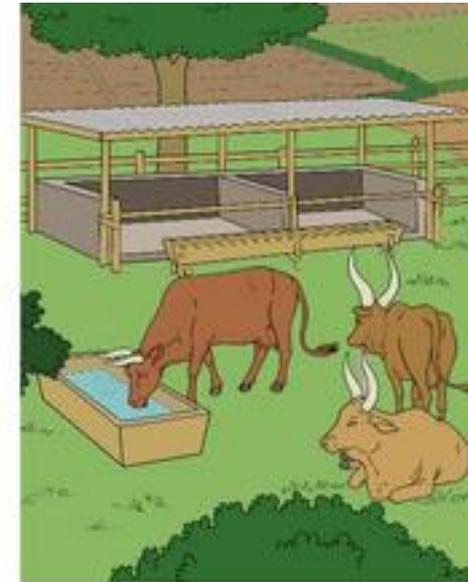
Approche générale de la gestion biologique du bétail



Source: FiBL (2021). Manuel de formation en agriculture biologique pour l'Afrique. Module 2. Gestion de la fertilité des sols

What should be considered before integrating animals into a silvopastoral system?

- Avez-vous des **connaissances** en matière de gestion d'une espèce animale ?
- Quels sont les **animaux et les races** les plus **adaptés** à la situation ?
- **Des jeunes animaux** sont-ils disponibles ?
- **Le terrain** est-il conforme à la certification biologique ?
- Des quantités suffisantes de **pâturages ou de zones de libre parcours** sont-elles disponibles ?
- Y a-t-il suffisamment de sources de **fouillage et/ou d'aliments complémentaires** ?
- De bonnes **installations d'hébergement** pour les différents types d'animaux sont-elles disponibles ou peuvent-elles être construites ?
- Y a-t-il des sources d'**eau** potable ?
- Y a-t-il des cultures appropriées qui peuvent être fertilisées avec le **fumier** ?
- **La main-d'œuvre** disponible est-elle suffisante pour s'occuper des animaux de manière adéquate ?



Source: FiBL (2021). Manuel de formation en agriculture biologique pour l'Afrique. Module 2. Gestion de la fertilité des sols

The main stages in establishing a silvopastoral practice

1. Selecting the location and method:

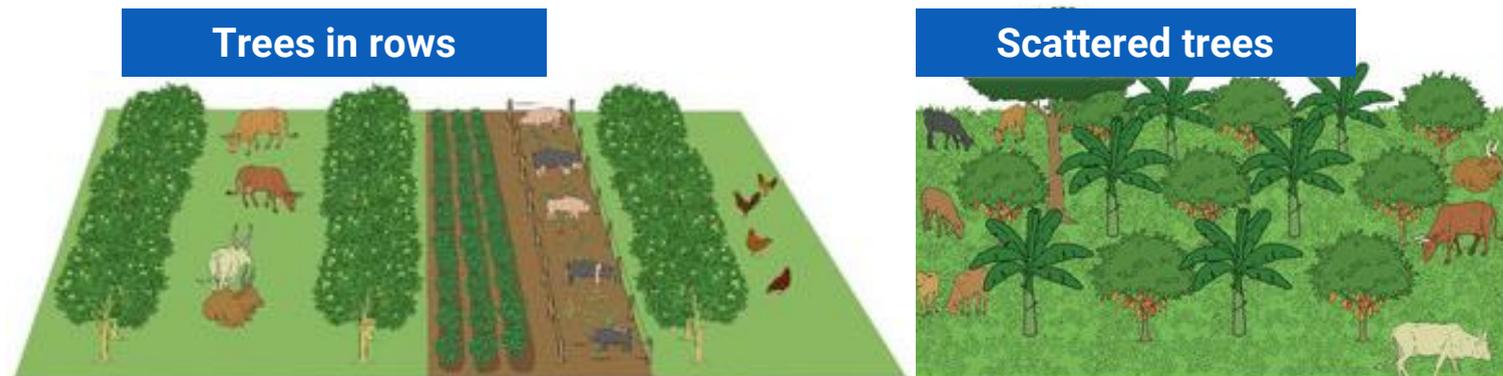
- The system can be installed in an area that is already wooded or in an open area suitable for tree growth (soil depth of at least 1.5 metres).
- Most farmers favour local species, often through assisted natural regeneration (ANR), as this improves tree survival rates and reduces costs compared to planting.

2. Define the tree configuration

- Trees can be scattered throughout the pasture or lined up in rows between strips of grass.



Source: Auteurs, 2025



Source: FiBL (2021). *Manuel de formation en agriculture biologique pour l'Afrique. Module 2. Gestion de la fertilité des sols*

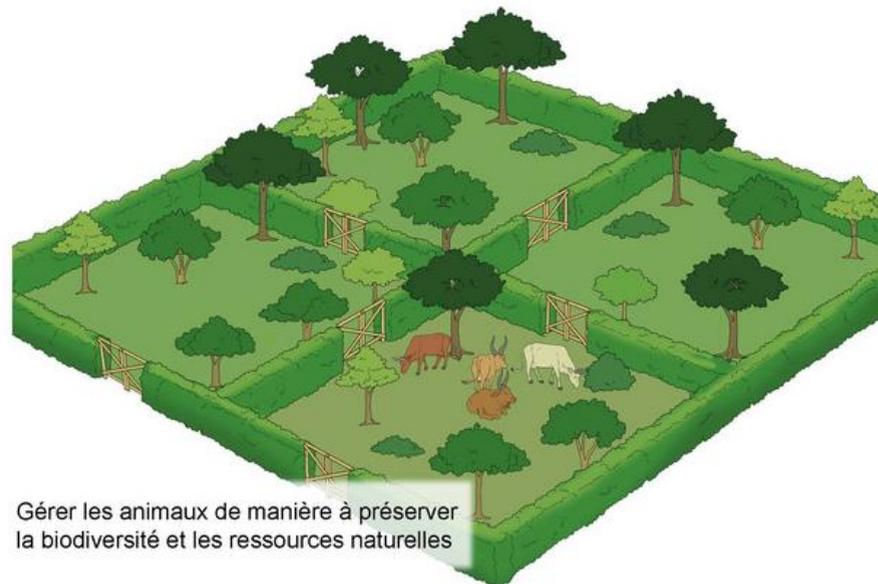


Source: Auteurs, 2025

The main stages in establishing a silvopastoral practice

3. Determine the density of the forest stand

- The recommended density varies between 100 and 600 trees per hectare, depending on local conditions.
- The trees should not be too close together so that sufficient light can reach the ground for grass to grow.
- It is advisable to take inspiration from the configuration of trees present in the region and to favour a diversity of local species.
- High diversity brings multiple benefits: better resistance to pests, varied production (medicinal plants, fruit, timber, firewood, etc.).



Agroforestry practices in Burundi



Source: Auteurs, 2025

Source: FiBL (2021). *Manuel de formation en agriculture biologique pour l'Afrique. Module 2. Gestion de la fertilité des sols*

Focus on Assisted Natural Regeneration

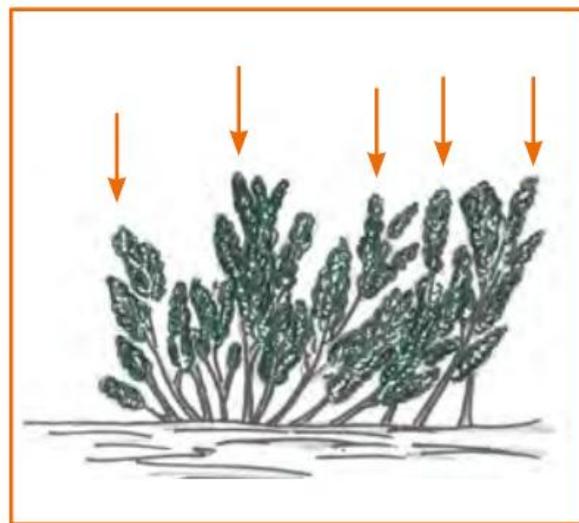
What is RNA?

A low-cost, simple and sustainable agroforestry practice for land regeneration that communities can use to restore their land, increase productivity and build resilience relatively quickly and effectively.

What is RNA?

It is a tree management practice that includes selection, pruning, protection and maintenance, as well as a practice of community empowerment. The benefits of this practice include protecting land from erosion, improving soil fertility, and producing fuelwood, timber and non-timber forest products.

1 . Select species and strains or trees



Step 1: Survey the land for sprouting stumps or seedlings and identify the tree species present.
Step 2: Select the species and stumps to be regenerated.

2. Prune and manage



Step 3: For each stock, select three to five stems to keep and prune away the unwanted stems.
Step 4: For each remaining stem, prune the side branches back to half the length of the trunk.
Step 5: Protect the stems while they grow.

3. Maintain and use



Step 6: Prune unwanted growth every two to six months, as needed.
Step 7: Use the tree for its intended purpose; harvest branches, sections of wood, or the entire tree as needed.

Basic maintenance instructions

Watering

- Water only when necessary (prolonged drought, young trees)
- Identify species that require more water and those that are naturally resistant

Weed control and protection of young trees

- Weed around seedlings to limit competition for water and nutrients.
- Protect young plants from animals and trampling.

Pruning and maintenance

- Cut away dead, broken or poorly positioned branches.
- Thin out branches that prevent light from reaching the grass or crops underneath.
- Use the cut wood as mulch or firewood.

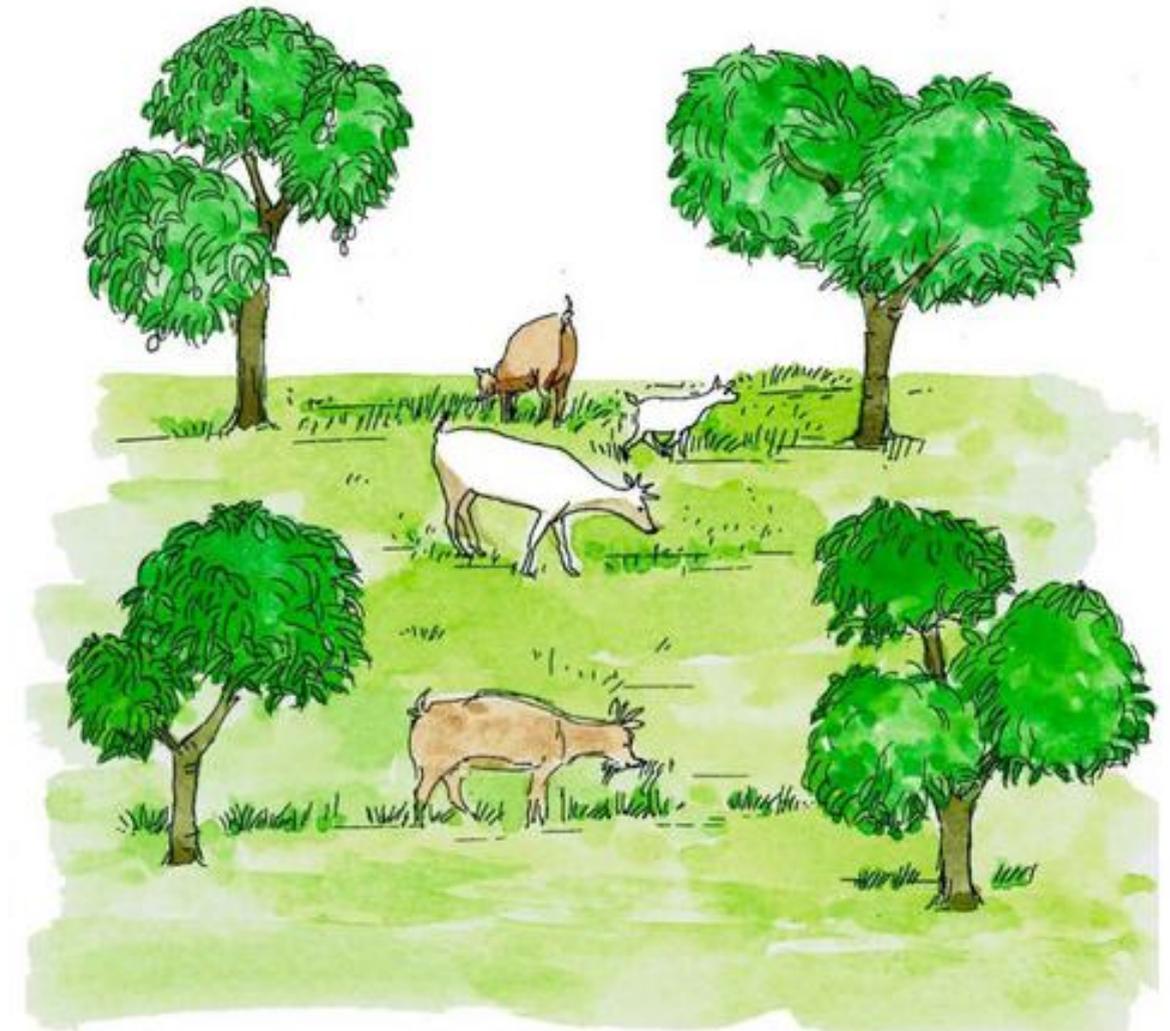
Controlled grazing

- Do not allow animals to graze freely continuously: practise pasture rotation.

Gradual improvement of the site

- Add organic matter (mulch, manure, compost) to enrich the soil.
- Over time, decide which plants to keep, promote or replace.
- Maintain species diversity to improve the resilience of the system.

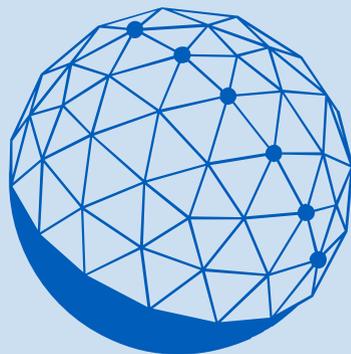
Rotation between goats, sheep and cattle to avoid selective grazing



Source: FiBL (2021). *Manuel de formation en agriculture biologique pour l'Afrique. Module 2. Gestion de la fertilité des sols*

CONCLUSION – CHOOSING THE RIGHT PRACTICE

| Practical | Mitigated risks | Suitable areas | Technical difficulty | Cost | Maintenance |
|--|---|--|----------------------|--------|-------------|
| Stone and vegetated thresholds | Erosion, flooding, landslides | Gentle to moderate slopes, ravines and small streets | Low | \$ | Low |
| Green gabions | Erosion, flooding, landslides | Riverbanks, embankments | Average | \$\$\$ | Average |
| Planting vetiver in contour lines | Erosion, landslides, drought, pollution | Moderate to steep slopes, agricultural areas, deep soils | Average | \$\$ | High |
| Stepped terrace | Erosion, landslides, drought | Low to moderate slopes, deep soils | High | \$\$\$ | High |
| Sylvopastoralism | Soil degradation, erosion, flooding, landslides | Pastoral areas, hills, forested areas | High | \$\$\$ | High |



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