



THE REPUBLIC OF SOUTH SUDAN

# COMMUNITY SEED BANKS

## Training Manual for South Sudan

### A learner's guide



MARCH 2024

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# Background and rationale

For decades, the challenge of feeding the world's ever-growing population has drawn widespread attention and spurred innovation. Industrial farming systems, introduced in the 1950s, aimed to address increasing global hunger. However, despite undeniable progress in reducing undernourishment and improving nutrition, conventional agriculture still leaves almost 800 million people chronically hungry and 2 billion suffering from micronutrient deficiencies.

High-input, resource-intensive farming systems have serious drawbacks. They cause deforestation, soil degradation, biodiversity loss, and high greenhouse gas emissions, contributing to global warming and climate change. Furthermore, they increase farming costs and contribute to non-communicable diseases across all ages and classes. Clearly, these approaches cannot ensure sustainable food production.

Our generation needs innovative systems that simultaneously increase the productivity of healthy foods and conserve natural resources, delivering greater socio-economic benefits with reduced environmental impact. A transformative shift towards holistic, participatory approaches is essential. Examples include agroecology, agroforestry, conservation agriculture, community seed banks, and strengthened national seed systems – approaches that incorporate indigenous and traditional knowledge.

On the other hand, critical parts of our food and seed systems are becoming increasingly capital-intensive, consolidated, and vertically integrated. This shift occurs throughout the supply chain, from agricultural inputs to food distribution. Consequently, small-scale producers and households with limited access to land and quality seeds are marginalized and often seek employment outside of agriculture. Such trends contribute to the migration of primary earners, typically men and younger household members. This leaves behind the elderly, less able individuals, and contributes to the "feminization" of farming in many regions. A more sustainable farming system is needed to create a better balance, encourage greater resilience to climate change and instability, and operate within societal traditions.

The community seed bank in South Sudan stands as a beacon of hope and resilience, dedicated to preserving the invaluable heritage of landraces in our region. With a clear mission such as: to deeply engage with our community in order to foster agricultural development, enhance the accessibility of seeds, and fortify food security and sovereignty is key. By safeguarding these traditional varieties, we not only protect our biodiversity but also empower our local economy. In the face of climate change challenges, seed banks serve as a stronghold, aiding in the building of resilient agricultural practices. Together, we strive toward a future where sustainable farming methods prevail, where every seed sown represents a step closer to a more secure and prosperous tomorrow for all in South Sudan

# Introduction

## About the course

This short course, titled "Community Seed Banks," consists of two modules: community seed banks, and seed labs. Participants will gain the knowledge and skills necessary to establish and manage sustainable community seed banks, and effectively operated seed labs. They will also learn how to conserve diverse, locally-adapted seed varieties within the South Sudan agricultural ecosystem, perform effective seed testing, and maintain optimal seed quality.

### Target Audience

This course is ideal for motivated agricultural professionals in training who are interested in establishing or strengthening community seed banks and/or seed labs. This includes:

- Teachers, instructors, teaching assistants, lecturers, and researchers
- Plant genetic resource center (genebank) staff
- Government extension agents
- Professionals leading efforts to establish community seed banks and/or seed labs
- Those conducting community training sessions on these topics

## About the manual

This manual consolidates information from various sources on community seed banks and seed testing to support the course's educational goals within the context of South Sudan. While sources may use alternate terms like "genebank," this manual will consistently use "community seed bank."

The first module contains eight and the second module contains five topics, each designed to achieve specific learning outcomes. The course utilizes a participatory methodology where facilitators and learners engage actively. Lectures are paired with practical exercises that draw on participants' experiences or relevant case studies.

## Acknowledgements

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Credits: Cover photo and layout by Godfrey Hakim Samuel.

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# Multiple functions and services of community seed banks.

## Overview.



This topic offers an analytical framework to decide about the objectives and organization of the core activities of a community seed bank. Usually, the key functions of community seed banks are the conservation, and distribution of diverse quality seeds, but can also include protection of endangered and heirloom varieties, repatriation of crop varieties, participatory crop/variety improvement, value addition to crops, promoting and practicing agroecological practices, and service delivery. It also includes forward-looking functions, such as adaptation to climate change, adoption of new seed conservation technologies, contribution to sustainable agriculture, and realization of food sovereignty.

## Learning Outcomes.



At the end of this topic, the learners should be able to:

- Define a community seed bank.
- Identify the major functions and related services of community seed banks.
- Use a framework of functions and services with examples of typical activities to identify the possible major functions and services that a community seed bank could have in South Sudan.

## Duration. 2hours, 25mins



Introduction and Pre-test (Evaluation)	<b>20 minutes</b>
Plenary: 1 Brainstorming, Question and Answer	<b>30 minutes</b>
Plenary: 2 Guided discussions, and presentations	<b>20 minutes</b>
Plenary: 3 Group discussions (Exercises)	<b>25 minutes</b>
Plenary: 4 Presentations	<b>30 minutes</b>
Post-test (Evaluation)	<b>15 minutes</b>
Conclusion	<b>5 minutes</b>

## Equipment or materials needed



- **Visual Aid (Slide or Poster):**
  - Title: Community Seed Banks: A Tool for Biodiversity Conservation
  - Concise Definition: Display of the definition of a community seed bank.
  - Include framework for the functions and services offered by a community seed bank.
- **Technical Equipment:**
  - Mobile projector for visual aid and potential additional media.



- **Participant Resources:**
  - Notebooks and writing tools for notes and activity engagement.
- **Interactive Materials:**
  - Large paper, markers, and affixing materials (tape/pins) for collaborative exercises (e.g., participatory setting of objectives and activities).

# Contents

## Introduction



An institution that serves the functions of a community seed bank plays a crucial role in conserving agricultural biodiversity and supporting food security. This topic digs into the various functions and services that community seed banks offer while providing an analytical framework to help guide decision-making regarding their objectives and organization.

## Brainstorming



The learners are asked probing questions, such as:

1. How many of the participants are farmers? Show by raise of hands.
2. How do you obtain seeds for planting? How do you ensure you have seeds for planting in the next planting season?
3. Have you ever jointly kept seeds for future use?
4. From your understanding of the terms "community," "seed", and "bank," what is the meaning of community seed bank?
5. What would be the typical activities of a community seed bank?
6. Do you know about a community seed bank in South Sudan?
7. What does this community seed bank do?
8. Can a community seed bank have more than one core function?
9. What kind of community seed bank activities are useful for you and your community?

Ask participants to take some notes during the exercise and signal that they will be invited to share their thoughts at the end of the learning activity.

## Key terms.



1. A “**community seed bank**” is a local, mainly informal institution, whose core function is to maintain, safeguard, and exchange local and farmer-preferred seeds for local use (Vernooy et al. 2015).
2. **Seed** is defined as the part of a plant from which a new plant can be grown. It can be:
  - *generative* - such as grain or fruit seed, usually produced through sexual reproduction and consisting of an embryo and its food stored within a hardened seed coat (testa); or
  - *vegetative* - consisting of any propagative part of a plant such as a stem, tuber, or bulb (Lewis *et al.* 1997)

## Functions and services



A community seed bank can function as a **conservation** and **distribution** center; a store and an outlet for local crop diversity and locally adapted planting materials (Vernooy et al. 2020). However, if the entity serves other seed sources of such diversity as managed by the private or public sector, then it ceases to be a community seed bank but is an enterprise. The seed bank could vend part of its deposits and other products made by **value addition to crops** to generate revenue. As such it is functioning as **income generation for the members**.

The community seed bank may periodically provide **Technical Vocational Educational and Training (TVET)** and **extension services** for members. These services may be organized when the seed bank is in partnership with stakeholders like education and training institutions to enhance **knowledge and experience sharing**. Such services build the capacity of members of the community seed bank particularly when individual members participate in the planned activities (Vernooy et al. 2020) leading to community transformation and development of their resilience. The College of Agriculture of Dr. John Garang Memorial University in Bor, South Sudan, normally provides agricultural training for the nearby community through its outreach program. Therefore, if the community establishes a seed bank with objectives that promote ecological agriculture, then the establishment will function as a **learning center**. Then, the university would be a partner.

### Exemplary activities.

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A community seed bank can perform multiple functions, not just one. Depending on the objectives set by its members, the activities might include:

- Production of selected locally adapted crops/trees.
  - Seed collection.
  - Seed cleaning.
  - Seed sorting and grading.
  - Drying of seeds.
  - Seed treatment.
  - Seed storage or safeguarding.
  - Seed-saving facility rental.
  - Seed exchange.
  - Seed repatriation and restoration.
  - Seed stocking /or depositing.
  - Seed packaging and labeling/branding
  - Cataloging (registration).
  - Seed distribution.
  - Seed loans.
  - Seed fairs.
- 



- Provision of agroecological advice and technical services.
  - Seed sales (where allowed).
  - Seedling production.
  - Sale of seedlings and other products (where allowed).
  - Documentation of traditional indigenous knowledge.
  - Awareness creation and education.
  - Training in ecological and sustainable agricultural practices
  - Exposure and Exchange learning visits.
  - Farmer-to-farmer field visits for knowledge and experience sharing.
  - Gardening workshops/ Demonstrations.
  - Crop research and development.
  - Seed testing.
  - Participatory crop/variety improvement.
  - Practicing agroecological practices, for example, agroforestry.
  - Networking and policy advocacy.
  - Collaboration and coordination meetings with stakeholders.
  - Protection of endangered crops and heirloom varieties.
  - Value addition to crop products.
  - Promotion of food sovereignty.
  - Local food exhibitions and cultural gala.
-



Figure 1: Introducing the concept of community seed bank to a group of farmers at Guduge Village, Tokiman Boma, Rajaf Payam, Juba County, Central Equatoria State, South Sudan. : Credits: University of Juba/J James .

**Table 1: Multiple functions, services, and activities of a typical community seed bank.**

Functions	Services	Examples of activities
<ul style="list-style-type: none"> <li>• Conservation</li> </ul>	<ul style="list-style-type: none"> <li>• Seed regeneration and multiplication.</li> </ul>	<ul style="list-style-type: none"> <li>• Production of selected locally adapted crops /breeding.</li> <li>• Seed collection.</li> <li>• Seed cleaning.</li> </ul>
	<ul style="list-style-type: none"> <li>• Seed preservation.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed sorting and grading.</li> <li>• Seed treatment.</li> <li>• Seed storage or safeguarding.</li> <li>• Seed-saving facility rental.</li> <li>• Seed exchange.</li> </ul>
	<ul style="list-style-type: none"> <li>• Seed repatriation.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed repatriation and restoration.</li> </ul>
<ul style="list-style-type: none"> <li>• Distribution</li> </ul>	<ul style="list-style-type: none"> <li>• Depository and cataloging.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed stocking /or depositing.</li> <li>• Seed packaging and labeling/branding.</li> <li>• Cataloging (registration).</li> </ul>
	<ul style="list-style-type: none"> <li>• Seed distribution.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed distribution.</li> <li>• Seed loans.</li> </ul>
<ul style="list-style-type: none"> <li>• Income generation for members</li> </ul>	<ul style="list-style-type: none"> <li>• Agribusiness and consultancy services.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed fairs.</li> <li>• Provision of agroecological advice and technical services.</li> <li>• Seed sales.</li> <li>• Seedling production.</li> <li>• Sale of seedlings and other products.</li> </ul>
<ul style="list-style-type: none"> <li>• Learning Center</li> </ul>	<ul style="list-style-type: none"> <li>• Agricultural Technical and Vocational Education and Training (TVET) services.</li> </ul>	<ul style="list-style-type: none"> <li>• Documentation of traditional indigenous knowledge.</li> <li>• Awareness creation and education.</li> <li>• Training in ecological and sustainable agricultural practices.</li> <li>• Exposure and Exchange learning visits.</li> </ul>
	<ul style="list-style-type: none"> <li>• Extension services.</li> </ul>	<ul style="list-style-type: none"> <li>• Farmer-to-farmer field visits for knowledge and experience sharing.</li> <li>• Gardening workshops/ Demonstrations.</li> </ul>
<ul style="list-style-type: none"> <li>• Seed development and innovation center</li> </ul>	<ul style="list-style-type: none"> <li>• Promotion of new seed conservation technologies.</li> </ul>	<ul style="list-style-type: none"> <li>• Crop research and development.</li> <li>• Seed testing.</li> <li>• Participatory crop/variety improvement.</li> </ul>
	<ul style="list-style-type: none"> <li>• Promotion of climate change adaptation practices.</li> </ul>	<ul style="list-style-type: none"> <li>• Practicing agroecological practices for example agroforestry.</li> <li>• Policy advocacy.</li> <li>• Networking, collaboration, and coordination of stakeholders.</li> <li>• Protection of endangered crops and heirloom varieties.</li> </ul>
	<ul style="list-style-type: none"> <li>• Realization of food sovereignty</li> </ul>	<ul style="list-style-type: none"> <li>• Value addition to crop products.</li> <li>• Promotion of food sovereignty.</li> <li>• Local food exhibitions and cultural gala.</li> </ul>

## Exemplary objectives



The objectives of community seeds vary, typical examples are given below.

- To establish within the community, a platform that offers multiple channels of access and availability of locally adapted seeds, and related services at affordable cost.
- To provide locally adapted seed to marginal communities not served by commercial seed dissemination efforts.
- To develop protocols for the conservation of healthy seeds and training of local communities.
- To conserve local varieties on a short-term basis.
- To conserve heirloom and rare varieties for a longer term.
- To repatriate and restore “lost” varieties.
- To maintain local control over seed conservation, exchange, and production activities.
- To foster seed exchanges at local and supra-local levels.
- To enable access to novel diversity not conserved locally.
- To breed and multiply seed varieties through participatory activities.
- To generate income through the sale of seeds and other crop products.
- To share agricultural biodiversity knowledge and expertise.
- To support traditional and ethnic food culture and cultural use.
- To contribute to ecological agriculture and food sovereignty movements.
- To cooperate with various stakeholders in building the capacity of the organization.

### Exercise 1: Functions and services of a community seed bank.

**As a graduate of the community seed bank course; given an opportunity to facilitate and support the establishment of a new community seed bank in Bor, Jonglei state. Explain two functions with their related services the new community seed bank should start with and give reasons for the choice you have made.**

### Conclusion:

Functions and services offered by a seed bank clarifies the goals and objectives set for the community seed bank. Setting clear goal and objectives is a first step for good governance of the seed bank.

### References and further reading



Lewis, V. and Mulvany, P.M. 1997. A typology of community seed banks. Natural Resources Institute, Chatham. United Kingdom.

Vernooy, R., Sthapit, B. and Bessette, G. 2020. Community seed banks: concept and practice. Facilitator handbook (updated version). Bioversity International, Rome. Italy.  
<https://hdl.handle.net/10568/81286>

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**Overview.**

This topic explores tools for evaluating the abundance and distribution of local agricultural biodiversity at the crop (species) and variety level within farming communities. It also covers methods to track trends over time. Techniques such as 5-cell analysis and historical crop/variety trend analysis are emphasized, as they provide critical insights to inform the decision-making process for establishing community seed banks.

**Learning Outcomes.**

At the end of this topic, the learners should be able to:

- Describe the current state of landraces in terms of their abundance and distribution.
- Pinpoint major shifts in abundance and distribution throughout history.
- Enumerate key factors that have shaped, and continue to shape, these trends.

**Duration.  
2 hours and  
25 minutes**

Introduction and Pre-test (Evaluation)	<b>20 minutes</b>
Plenary: 1 Brainstorming, Question and Answer	<b>20 minutes</b>
Plenary: 2 Guided discussions, and presentations	<b>35 minutes</b>
Plenary: 3 Group discussions (Exercises)	<b>15 minutes</b>
Plenary: 4 Presentations	<b>5 minutes</b>
Post-test (Evaluation)	
Conclusion	

**Equipment or materials needed**

- **Visual Aid (Slide or Poster):**
  - Title: Community Seed Banks: A Tool for Biodiversity Conservation
  - Concise Definition: Highlight the core functions of preservation and local agricultural resilience.
- **Crop Diversity Display:**
  - Curate high-quality images showcasing landrace variation within regionally relevant crops.
  - Include scientific names alongside common names.
- **Technical Equipment:**
  - Mobile projector for visual aid and potential additional media.
- **Participant Resources:**
  - Notebooks and writing tools for notes and activity engagement.

- **Interactive Materials:**

- Large paper, markers, and affixing materials (tape/pins) for collaborative exercises (e.g., participatory mapping of local crop diversity, historical timelines).

## Content

### Introduction.



Agricultural biodiversity is essential for sustainable and resilient farming systems. This topic aims to introduce two tools that aid in assessing the current abundance and distribution of local agricultural biodiversity within farming communities. Additionally, it explores how these tools can be used to analyze trends over time.

### Key terms.



1. **Community Seed Bank:** A local, informal institution designed to maintain, safeguard, and promote the exchange of local, farmer-preferred seeds (Vernooy et al. 2015).
2. **Seed:** A mature, fertilized plant ovule containing an embryo. Under favorable conditions, it can develop into a new plant.
  - *Generative:* Formed through sexual reproduction, these seeds contain an embryo, nutritive tissue (often endosperm), and a protective seed coat. Examples include grains (wheat, rice, corn), and fruits (mango, apple, beans).
  - *Vegetative Propagules:* Plant parts capable of regenerating into new plants without sexual reproduction. Examples include tubers, bulbs, and rhizomes (Lewis et al. 1997).
3. **Landrace:** A locally-adapted, traditional variety of a domesticated plant or animal species, shaped over time by environmental and cultural factors.
4. **Crop Variety:** A plant with distinct, inheritable characteristics within a species. A variety can be a cultivar (a deliberately bred hybrid).

5. **Biodiversity:** The variety of life within a given habitat, encompassing the range of species, genetic differences, and ecosystem relationships.



Figure 2: Collection of seeds from farmers at Guduge Village, Tokiman Boma, Rajaf Payam, Juba County, Central Equatoria State, South Sudan 13. February 2023. (Credits, University of Juba/ M. L. Beatrice C. M. Langwa.

## Importance of biodiversity assessment



Importance of assessing agricultural biodiversity.

- **Identification and Conservation:** It facilitates the identification and understanding of diverse plants and animals plants, animals, microorganisms, and genetic resources within agricultural systems. This enables the discovery and protection of rare or endangered species.
- **Valuable Genetic Resources:** Assessment helps pinpoint potentially valuable genetic resources, offering a foundation for crop and livestock improvement efforts.
- **Understanding Ecosystem Health:** It assists farmers and researchers in comprehending ecosystem health, leading to enhanced resilience and adaptability of crops in the face of changing environmental conditions.
- **Crop Improvement:** Biodiversity assessment supports the development of crop varieties with superior traits (yield, disease resistance, abiotic stress tolerance) by providing diverse genetic material for breeding programs.
- **Promoting Diversity:** It discourages overreliance on a limited number of crops or livestock species, reducing vulnerability to pests, diseases, and climate change.
- **Resilience to Climate Impacts:** Assessment and maintenance of agricultural biodiversity buffer against climate variability. Diverse crops and varieties often exhibit varying tolerances to extreme weather.

## Contribution of biodiversity assessment.



Agricultural systems depend on diverse, functional ecosystems for crucial services like nutrient cycling, pollination, pest regulation, and soil health. Crop rotation practices actively contribute to these interactions, enhancing crop productivity and resilience.

- Declining biodiversity signals potential issues such as soil degradation, reduced pollination, and imbalanced pest populations. Proactive monitoring of agricultural biodiversity facilitates early detection of these problems, informing management strategies to restore ecosystem health.
- Specific plant species attract pollinators, boosting pollination rates and yields. Others harbor beneficial insects for natural pest control. Evaluating agricultural biodiversity reveals these synergies, allowing farmers to foster them for improved crop performance and resilience.
- Ultimately, a thriving, diverse agricultural ecosystem underpins sustainable food production while benefiting both human communities and the broader environment.

## The biodiversity assessment tools.

### The Historical Trend Analysis

#### Trend analysis Objectives



The objective of a historical trends analysis conducted by community members in a group setting is twofold.

- **Firstly**, it raises awareness of how local biodiversity has changed over time. In many places, sadly, the number of crop species and varieties is shrinking rapidly.
- **Secondly**, it encourages the community to reflect on whether this downward trend (if present) motivates them to actively safeguard local diversity.





This analysis may inspire the community to explore establishing a community seed bank and begin multiplying rare and endangered crops and varieties.

There is no single method for performing a historical trend analysis. Depending on available resources, communities might use meta-cards (with crop names or photos) and hand-drawn maps to chart historical trends in crop and variety usage over the past 25 years or so. For example, compare the last five years with the ten years prior, and then go back a further ten years.




First, list all crops currently grown in the community (or focus on the top 20 if the list is extensive). Then, map trends (increasing, decreasing, or stable) for recent cultivation (over the past five years) compared to earlier periods. Highlight the main reasons for any identified trends. Mapping these trends fosters information exchange between generations within the community. It helps create a shared understanding of current problems within a historical context and can encourage the development of a community-driven action plan. An example map is shown in Figure 3 below.

More in-depth histories of specific crops or varieties are fascinating, but these are better gathered through interviews with key community members. This can be done at a later stage.

**Figure 3: Historical trend analysis, South Africa**

CROP	TREND	REASON
<b>MODERN MAIZE (HYBRID)</b>		<ul style="list-style-type: none"> <li>✓ Short maturity duration</li> <li>✓ High market demand</li> <li>✓ Government support</li> </ul>
<b>DRY BEANS</b>		<ul style="list-style-type: none"> <li>✓ Prioritized food security crop</li> <li>✓ Easy to grow</li> </ul>
<b>SORGHUM</b>		<ul style="list-style-type: none"> <li>✓ Poor conservation</li> <li>✓ Knowledge of use not passed on</li> </ul>
<b>OPEN-POLLINATED MAIZE</b>		<ul style="list-style-type: none"> <li>✓ No market</li> <li>✓ Difficulty to access quality seeds</li> </ul>

Source: Adapted from Vernooy et al. 2020

Symbol	Description of symbolic visual aid	Meaning
	Green upright equilateral triangle shaped card	Increasing trend
	Red Downward equilateral triangle shaped card	Decreasing trend
	Blue horizontal hexagonal shaped card	Stable trend

## Exercise 2.1: Historical trend analysis process.

Getting started:

- △ Review the objectives of conducting historical trend analysis stated in page 10 above.
- △ Understand that a community can evaluate the changes (positive or negative) in diversity of crops and/or crop varieties (in terms of number and area) over a time frame of one or two decades (comparing the situation 10 or 20 years ago with the current situation), using historical trend maps in a participatory manner.

Activity 1: A volunteer should present the status and trend of agricultural biodiversity at their payam or community level.

Activity 2: Another participant should present the example of historical trend map in Figure 3, page 11 above.

Activity 3: Each participant should select a crop and identify whether and what changes have occurred (positive or negative) in the last 20 years, in terms of diversity by area and number of farmers growing the crop (the period used depends on the age and knowledge of the participants and the history of agriculture in the payam and community).

Activity 4: The participants should map the changes (historical trend maps) in their notebooks.

Results: In a plenary session, a few participants should present their trend map showing the historical trend of the selected crop varieties.

### Assessment of abundance and distribution of agrobiodiversity

A range of tools exists for assessing biodiversity within a locality. Some leverage advanced technologies like Geographic Information Systems, remote sensing, and satellite imagery, while others prioritize a participatory approach. For a truly meaningful assessment that achieves its objectives, it is essential to involve local communities.

### Five Cell Analysis

#### Five Cell Analysis: An Effective Participatory Tool

Five Cell Analysis is a valuable participatory tool for analyzing the distribution and abundance of various landraces and varieties within a specific area. Landraces are grouped into five classes based on distribution patterns, population size, area coverage, and the number of farmers cultivating them (Joshi *et al.* 2022).

This method builds upon the earlier Four Cell Analysis approach (Sthapit *et al.* 2012, Joshi *et al.* 2004), which considered area and farmer participation to create four classes: large area/many farmers, small area/many farmers, large area/few farmers, and small area/few farmers. Five Cell Analysis provides a more comprehensive picture by including a fifth class representing those landraces facing potential

extinction, often referred to as the "red list" status (Figure 2). The Diversity Wheel is another valuable tool for analyzing the status of crop varieties and landraces. It assesses whether specific varieties are common or threatened by examining both the number of households growing them and the corresponding acreage under cultivation (Subedi et al. 2020)

### Methods for the Five-Cell Analysis

Several methods exist to analyze the distribution and population size of landraces, including direct measurement and focus group discussions (FGDs). In FGDs, genetic resources are categorized into five cells (referencing Figure 2). This approach offers a straightforward way to assess resources at the village level. If information is insufficient, certain genetic resources may be labeled as 'not evaluated.' For a comprehensive description of this tool, see Sthapit et al. (2012)

### Objectives of the assessment exercise



- To identify the common, vulnerable, endangered/ or rare and newly introduced crops in the community of South Sudan
- To document the uses of varieties in a given community in South Sudan
- To document the reasons why the varieties are found in a dynamic state in the community, and
- To identify the level and type of interventions needed for the conservation

### Exercise 2.2: Step-by-step assessment of abundance and distribution of crops.

The methodology of four-cell analysis is applicable to the five-cell analysis, only that additional information about lost landraces and newly introduced exotic varieties is added in cells six and seven like in (Figure 2) below.

#### Follow the steps below.

**Step 1:** Prepare a list of varieties managed by farmers (landraces and exotic) of selected crops.

**Activity 1** Complete columns 5 and 6 of (Table 3) below and write the varieties on cards or manila paper.



**Step 2:** Conduct participatory FCA analysis of the distribution of local crop diversity

**Activity 2**

Group the landraces into two according to their distribution.

Participants should answer the following questions.

- Which landraces are grown by many households and which are grown by few households in the community?  
This may be answered by counting the number of households that grow a particular landrace. (1 to 10) are considered few, and >10 are many.
- Which landraces are lost, what are the newly introduced exotic varieties, what are the landraces with unknown distribution, and the unassessed?  
Write the answers in cells 5, 6, and 7 respectively.

**Activity 3** Re-group the two groups above according to their abundance.

Participants should answer the following questions. And record their answers in their appropriate cells 1, 2, 3, and 4.

- Of the landraces grown by many households, which landraces are grown in large areas and which are grown in small areas of land?
- Of the landraces grown by a few households, which landraces are grown in large areas and which are grown in small areas of land?

**Step 3:** Explore use values of landraces in each cell.

**Activity 4** Write down the valuable plant parts and their respective uses against each landrace in the spaces provided.

## The common crops and agricultural commodities consumed in South Sudan

South Sudan has a range of crops adapted to the agricultural ecological zones of South Sudan. The agro-ecological zones in South Sudan are six namely the Greenbelt, Ironstone plateau, Hills and mountains, Flood plains, The Nile / Sobat Rivers, and then the Arid and pastoral zone according to the Agriculture Sector Policy Framework(ASPF), 2012.

The country is a heterogeneous nation that comprise sixty four tribes that form the communities of South Sudan. There are some crops that are unique to each community, which may be identified and selected for conservation by the concerned community. The following crops listed in the Table 2 are the most common crops across the country.



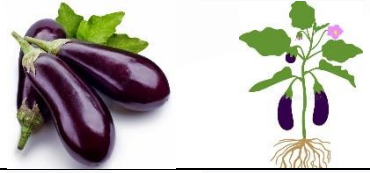









Figure 4: Jew's mellow garden at Loki'bata village, Gumbo Boma, Rajaf payam, Juba Connty, Central Equatoria State, South Sudan. Credit: University of Juba/E. Loro.



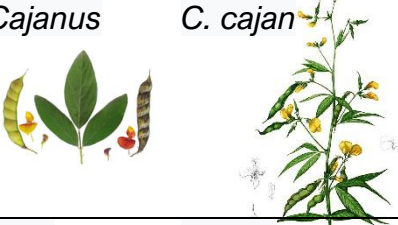




Farmers in Jonglei state performing a five cell analysis using real seeds and crops. Photo courtesy Tony Ngalamu/UoJ





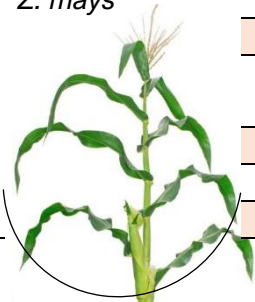
Table 2: List of landraces and varieties grown and agricultural products consumed in the communities of South Sudan.

Scientific name		Common crop name			Valuable plant part and uses	Five Cell Analysis Date:	
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties			
	<i>A. esculentus</i>	Arabic	Bamiyah			Cell:	
		Azande					Comment:
		Kakwa	Gbangu Melimeli, Mulanda			1:	
		Dinka				2:	
		English	Ladies' fingers Okra			3:	
	<i>C. capsularis</i>	Arabic	Mulukhiya/ Kudra			Cell:	
		Azande					Comment:
		Kakwa	Mondo, Gbulukutuyu,			1:	
		Dinka				2:	
		English	Jute			3:	
	<i>S. melongena</i>	Arabic	Asuate	Black Beauty		Cell:	
		Azande					Comment:
		Kakwa	Birinyanya, Birinjani			1:	
		Dinka				2:	
		English	Eggplant			3:	
	<i>S. macrocarpon</i>	Arabic				Cell:	
		Azande					Comment:
		Kakwa	Guli: Gulilopotor, Gulilotooto, Gulilokpe			1:	
		Dinka				2:	
		English	African Eggplants			3:	
	<i>A. dubius</i>	Arabic				Cell:	
		Azande					Comment:
		Kakwa	Gbe'degbe'de			1:	
		Dinka				2:	
		English	Dodo Amaranthus			3:	
		Nuer	Tamleke yaan				

Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties		
	<i>S. lycopersicum</i>	Arabic	Tamatim	Nuru F1, New Fortune, Rio Grande	Cell:	
		Azande			Comment:	
		Bari/Kakwa/Kuku/Pojulu	Nyanya lo'di'diki, Nyanya dudumala		1:	
		Dinka			2:	
		English	Tomato		3:	
		Nuer	Bandöf			
	<i>S. scabrum</i>	Arabic			Cell:	
		Azande			Comment:	
		Bari/Kakwa	Asuga, Lere		1:	
		Dinka			2:	
		English	Garden huckleberry		3:	
		Nuer				
	<i>C. frutescens</i>	Arabic	Seta		Cell:	
		Azande			Comment:	
		Bari/Kakwa	Piripiri		1:	
		Dinka			2:	
		English	Pepper		3:	
		Nuer				
	<i>C. gynandra</i>	Arabic			Cell:	
		Azande			Comment:	
		Kakwa	Tegeri		1:	
		Dinka			2:	
		English	African Spider Plant		3:	
		Nuer				
	<i>S. indicum</i>	Arabic	Simsim		Cell:	
		Azande			Comment:	
		Bari	Konyu Konyu lopke, Konyu lotör		1:	
		Dinka			2:	
		English	Sesame		3:	
		Nuer				



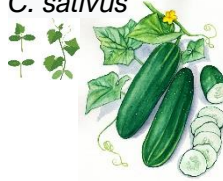


Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties		
<i>Agave</i>	<i>A. sisalana</i> 	Arabic				Cell:
		Azande				
		Kakwa	Kambatiputu			
		Dinka				
		English	Sisal			
		Nuer				
<i>Hibiscus</i>	<i>H. lobatus</i> 	Arabic				Cell:
		Azande				
		Bari/Kakwa	Pala			
		Dinka				
		English	Jute			
		Nuer				
<i>Cajanus</i>	<i>C. cajan</i> 	Arabic				Cell:
		Azande				
		Bari/Kakwa	Burukusuk, Burusu			
		Dinka				
		English				
		Nuer				
<i>Vicia</i>	<i>V. lens</i> 	Arabic	Adas			Cell:
		Azande				
		Kakwa				
		Dinka				
		English	Lentils			
		Nuer				
<i>Saccharum</i>	<i>S. officinarum</i> 	Arabic	Gasap sukar			Cell:
		Azande				
		Bari	Gbaṅa Gbaṅalopke, Gbaṅalotoṅ			
		Dinka				
		English	Sugar cane			
		Nuer				








Scientific name		Common crop name			Valuable plant part and uses	Five Cell Analysis Date:	
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties			
<i>Triticum</i> 	<i>T. aestivum</i>	Arabic				Cell:	
		Azande					Comment:
		Bari	Geme				1:
		Dinka					2:
		English	Wheat				3:
		Nuer					
<i>Sorghum</i> 	<i>S. bicolor</i>	Arabic	Dura	Godo		Cell:	
		Azande					Comment:
		Kakwa	Dura, Gaya, Kima, Go'do, Ijigo, Nyereṅwa				1:
		Dinka	Sorghum				2:
		English	Sorghum				3:
		Nuer	Bëel				
<i>Oryza</i> 	<i>O. sativa</i>	Arabic	Urz/Ruz	Narica 1 And 4		Cell:	
		Azande	Kpokpoki, tatawi				Comment:
		Kakwa	Roso Ruzu, Sindani,				1:
		Dinka					2:
		English	Rice				3:
		Nuer	Ruz				
<i>Eleusine</i> 	<i>E. coracana</i>	Arabic				Cell:	
		Azande					Comment:
		Bari/Kakwa	Leyot/ Leyo Nyaṅuliye				1:
		Dinka					2:
		English	Finger Millet				3:
		Nuer	Cäk				
<i>Zea</i> 	<i>Z. mays</i>	Arabic	Aserif	Longe 5, 10		Cell:	
		Azande					Comment:
		Bari	Leseri, Pidiyu, Popukon, Mgbaya, Bomut				1:
		Dinka					2:
		English	Maize				3:
		Nuer	Mäintap				


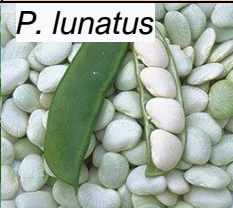

















Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties		
<i>Hibiscus</i>	<i>H. sabdariffa</i> 	Arabic	Keredeke			Cell:
		Azande				
		Bari	Kerekede Kerekede, kulu'bu			Comment:
		Dinka				1:
		English	Roselle			2:
		Nuer				3:
<i>Allium</i>	<i>A. cepa</i> 	Arabic	Basala			Cell:
		Azande				
		Bari	Basala			Comment:
		Dinka				1:
		English	Onion			2:
		Nuer	Basala			3:
<i>Cucumis</i>	<i>C. sativus</i> 	Arabic	Tiaf Ajuf			Cell:
		Azande				
		Bari	Ajuf Kiaf, Tiaf, Poso			Comment:
		Dinka				1:
		English	Cucumber			2:
		Nuer				3:
<i>Cucurbita</i>	<i>C. maxima</i> 	Arabic	Bbonjo			Cell:
		Azande				
		Bari	Kë'di Banapo, Bango			Comment:
		Dinka				1:
		English	Pumpkin			2:
		Nuer	Munjo, Monjo Munkun, Munjo			3:
<i>Arachis</i>	<i>A. hypogaea</i> 	Arabic	Fuul			Cell:
		Azande				
		Bari/ Kakwa	Soromondi/ Wande, Fulu Lokumure, Lokumusala, Makaraka			Comment:
		Dinka				1:
		English				2:
		Nuer				3:



Scientific name		Common crop name			Valuable plant part and uses	Five Cell Analysis Date:
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties		
	<i>M. esculenta</i>	Arabic	Bafura	Agrikicha		Cell:
		Azande				
		Kakwa	Gbanda, Karamgba, Malukuwa, gbesemenge			
		Dinka				
		English	Cassava			
		Nuer	Manpuör			
	<i>I. batatas</i>	Arabic	Bambe			Cell:
		Azande				
		Bari/Kakwa	Kayata, Maku, Mako Koromojo, Gbukutu			
		Dinka				
		English	Sweet Potatoes			
		Nuer	Manbök			
	<i>C. esculenta</i>	Arabic				Cell:
		Azande				
		Kakwa	Mayino, Cecerebi, Bakaya			
		Dinka				
		English	Taro/Yam			
		Nuer				
	<i>S. tuberosum</i>	Arabic				Cell:
		Azande				
		Bari	Batatas			
		Dinka				
		English	Potato			
		Nuer				
	<i>P. edulis</i>	Arabic	Batunda			Cell:
		Azande				
		Bari	Batundaloruwo, Batundamamala			
		Dinka				
		English	Passion fruit			
		Nuer				

Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:	
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties			
	<i>P. lunatus</i> 	Arabic				Cell:	
		Azande					
		Bari/Kakwa	Dugbo, Kuwenamari,				Comment:
		Dinka					1:
		English	Lima beans				2:
		Nuer					3:
<i>Phaseolus</i>	<i>P. vulgaris</i> 	Arabic	Fasuliya			Cell:	
		Azande					
		Bari /Pojuulu	Teyiko				Comment:
		Dinka					1:
		English	Kidney beans				2:
							3:
<i>Vigna</i>	<i>V. unguiculate</i> 	Arabic	Lubia			Cell:	
		Azande					
		Pojuulu	Laputu				Comment:
		Dinka					1:
		English	Cowpeas				2:
		Nuer	Noaf				3:
<i>Glycine</i>	<i>G. max</i> 	Arabic				Cell:	
		Azande					
		Bari	Soya				Comment:
		Dinka					1:
		English	Soybean				2:
		Nuer					3:
<i>Vigna</i>	<i>V. radiata</i> 	Arabic				Cell:	
		Azande					
		Bari	Logo'di: Logo'dilorwo, Logo'didorudoru				Comment:
		Dinka					1:
		English	Green gram, Mung bean				2:
		Nuer					3:

Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:	
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties			
<i>Coffea</i>	 <i>C. arabica</i>	Arabic	Bûn			Cell:	
		Azande					
		Bari	Gawa				Comment:
		Dinka					1:
		English	Coffee				2:
		Nuer					3:
<i>Mangifera</i>	 <i>M. indica</i>	Arabic	Manga			Cell:	
		Azande					
		Bari/Kakwa/Kuku/Pojulu	Manga				Comment:
		Dinka					1:
		English	Mango				2:
		Nuer					3:
<i>Persea</i>	 <i>P. americana</i>	Arabic				Cell:	
		Azande					
		Bari	Avokata				Comment:
		Dinka					1:
		English	Avocado				2:
		Nuer					3:
<i>Annona</i>	 <i>A. muricata</i>	Arabic	Gista			Cell:	
		Azande					
		Bari	Mustafiri				Comment:
		Dinka					1:
		English	Soursop				2:
		Nuer					3:
<i>Annona</i>	 <i>A. squamosa</i>	Arabic				Cell:	
		Azande					
		Bari/Kakwa	Lomu'da				Comment:
		Dinka					1:
		English	Sugar apples/Sweetsops				2:
		Nuer					3:

Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties		
<i>Citrus</i>	<i>C. medica</i> 	Arabic	Lemun			Cell:
		Azande				Comment:
		Bari	Lomunu, Lomunulopotoru, Lomunulototo'bi,			1:
		Dinka				2:
		English	Lemon, Citrus			3:
		Nuer				Cell:
<i>Musa</i>	<i>M. acuminata</i> 	Arabic	Muss			Cell:
		Azande				Comment:
		Bari	'Bögu/A'bugo Gonja, Dengegudi, Bogoya			1:
		Dinka				2:
		English	Banana			3:
		Nuer				Cell:
<i>Artocarpus</i>	<i>A. heterophyllus</i> 	Arabic	Fene			Cell:
		Azande				Comment:
		Bari	Fene: Fenemamala, Fenelokpe			1:
		Dinka				2:
		English	Jack fruit			3:
		Nuer				Cell:
<i>Psidium</i>	<i>P. guajava</i> 	Arabic				Cell:
		Azande				Comment:
		Bari	Guwafata			1:
		Dinka				2:
		English	Guava			3:
		Nuer				Cell:
		Arabic	Payipayi			Cell:

*Carica*

*C. papaya*



Azande			
Bari	Payipayi		
Dinka			
English	Pawpaw		
Nuer			






Comment:






1:






2:

3:



Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties		
<i>Tamarindus</i>		Arabic	Ardep			Cell:
		Azande				
		Bari	Pitè			
		Dinka				
		English	Tamarind			
		Nuer				
<i>Corchorus</i>		Arabic	Kudra			Cell:
		Azande				
		Kakwa	Mondo			
		Dinka				
		English	Jew's mallow			
		Nuer				
<i>Moringa</i>		Arabic				Cell:
		Azande				
		Bari	Muringa			
		Dinka				
		English	Moringa			
		Nuer				
<i>Pleurotus</i>		Arabic				Cell:
		Azande				
		Kakwa	Ku'bulu			
		Dinka				
		English	Oyster Mushroom			
		Nuer				
<i>Phoenix</i>		Arabic	Bala			Cell:
		Azande				
		Bari	Bala			
		Dinka				
		English	Date Palm			
		Nuer				

Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties		
<i>Ananas</i>	 <i>A. comosus</i>	Arabic	Ananas			Cell:
		Azande				
		Kakwa	Ananasi			
		Dinka				
		English	Pineapple			
		Nuer				
<i>Cola</i>	 <i>C. acuminata</i>	Arabic	Goro			Cell:
		Azande				
		Kakwa	Goro			
		Dinka				
		English	Cola nut			
		Nuer				
<i>Anacardiceae</i>	 <i>A. occidentale</i>	Arabic				Cell:
		Azande				
		Bari	Casinat			
		Dinka				
		English	Cashew nut			
		Nuer				
<i>Vitellaria</i>	 <i>V. paradoxa</i>	Arabic				Cell:
		Azande				
		Kakwa	Kumuro			
		Dinka				
		English	Shea butter tree			
		Nuer				
<i>Brassica</i>	 <i>B. Oleracea</i> <i>var. viridis</i>	Swahili	Sukuma wiki			Cell:
		Azande				
		Bari	Sukuma			
		Dinka				
		English	Collard greens			
		Nuer				

Scientific name		Common crop name			Valuable parts and uses.	Five Cell Analysis Date:	
Genus	Species(example)	Language	Landrace or naturalized varieties	Improved varieties			
<i>Allium</i>	<i>A. sativum</i> 	Arabic	Basalatum			Cell:	
		Azande					
		Bari	Basalatum				Comment:
		Dinka					1:
		English	Garlic				2:
		Nuer					3:
<i>Borrassus</i>	<i>Borrassus sp.</i> 	Arabic	Dilep			Cell:	
		Azande					
		Kakwa	Dilep, Wukita				Comment:
		Dinka					1:
		English	Borrassus palm, Palmyra palm				2:
		Nuer					3:
<i>Brassica</i>	<i>B. oleracea</i> 	Arabic	Cabbage			Cell:	
		Azande					
		Bari	Cabbage				Comment:
		Dinka					1:
		English	Cabbage				2:
		Nuer					3:
<i>Elaeis</i>	<i>E. guineensis</i> 	Arabic	Mbira			Cell:	
		Azande					
		Kakwa	Mbirata				Comment:
		Dinka					1:
		English	Oil Palm tree				2:
		Nuer					3:
<i>Zingiber</i>	<i>Z. officinale</i> 	Arabic	Jenzebil			Cell:	
		Azande					
		Bari					Comment:
		Dinka					1:
		English	Ginger				2:
		Nuer					3:

## Exercise 2.2: continued...

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**Step 4:** Analyze the results following a participatory approach.

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**Activity 5** After the distribution analysis of landraces based on the above questions, discuss and document the values along with reasons for grouping the landraces and varieties under each FCA cells in Figure 4 below.

Discuss and plan the conservation and use strategies of these landraces and varieties

---

**Step 5:** Use the information collected and recorded from the steps 1 to 4 above for diversifying livelihood options and forming conservation actions.

---

### Conclusion

In conclusion, the Five-Cell Analysis (FCA) presents a straightforward yet powerful tool for assessing agricultural biodiversity. Its user-friendly nature empowers diverse stakeholders to evaluate the status and significance of landraces and varieties within specific locales. This information is vital for understanding ecosystem health, developing conservation strategies, bolstering crop productivity and resilience, and safeguarding food security.

The FCA offers actionable insights to guide interventions for preserving endangered landraces.

By accepting the inherent value of agricultural biodiversity, we pave the way for food production systems characterized by sustainability and long-term resilience. This benefits not only current communities but also those who will inherit the earth.

Figure 5: The Five (Six) Cell Analysis matrix

		Area cultivated with the varieties			
		Large area (Colum A)		Small area (Column B)	
Number of households cultivating varieties	Many households (Row 1),	<b>1. Common landrace</b> On-farm conservation No risk		<b>2. Vulnerable landrace</b> Conservation dependent Awareness needed, Linkage with market	Many households,
	Few households (Row 2),		<b>5. Lost landrace crop varieties</b> - To be repatriated from nearby communities.	<b>6. Newly introduced (exotic/ improved) crop varieties</b> - Seeds need to be bought always for better yield. - New Agri-skills needed to cultivate the varieties. - Promoted by aid agencies, government, and Agro enterprises or seed companies	
		<b>3. Vulnerable landrace</b> Conservation dependent		<b>4. Endangered, rare landrace</b> Ex-situ conservation	
		Large area		Small area	
7. varieties with unknown distribution, and unassessed varieties.					

Source : Adapte from Dulloo et al, 2017.

## References and Further reading



- Anonymous. 2012. Republic of South Sudan, Agriculture Sector Policy Framework (ASPF). 2012-2017. [www.fao.org/LEX-FAOC149325](http://www.fao.org/LEX-FAOC149325) Accessed on 5th March, 2024.
- Dulloo, E.M., Rege, E., Ramírez, M., Drucker, A., Padulosi, S., Maxted, N., Sthapit, B., Gauchan, D., Roux, N., Sardos, J., Ruas, M., Rouard, M., Thormann, I., Gaisberger, H. 2017. Conserving agricultural biodiversity for use in sustainable food systems. In Researchgate <https://www.researchgate.net> (Accessed on 7<sup>th</sup> December 2023)
- Joshi, B., Gauchan, D., Ghimire, K. & Ayer, D. 2022. Five-cell Analysis (FCA). [https://www.researchgate.net/publication/361099294\\_06\\_Five-cell\\_Analysis\\_FCA](https://www.researchgate.net/publication/361099294_06_Five-cell_Analysis_FCA)
- Subedi, A., van Uffelen, G.J., Malkowsky, C. 2020. Building seed system resilience in protracted crisis situations; Seed system resilience assessment and facilitation tool (SSRA-FT). Wageningen Centre for Development Innovation, Wageningen University & Research. Report WCDI-20-120. Wageningen. DOI: <https://doi.org/10.18174/528796>
- Vernooy, R., Sthapit, B. and Bessette, G. 2020. Community seed banks: concept and practice. Facilitator handbook (updated version). Bioversity International, Rome. Italy.
- Vernooy, R.; Shrestha, P.; Sthapit, B. (Eds.) 2015. Community seed banks: origins, evolution and prospects. Issues in Agricultural Biodiversity. Routledge, London (UK).
- Economy of South Sudan. (2023, November 16). In *Wikipedia*. [https://en.wikipedia.org/wiki/Economy\\_of\\_South\\_Sudan](https://en.wikipedia.org/wiki/Economy_of_South_Sudan)
- Amaranthus dubius. (2023, October 26). In *Wikipedia*. [https://en.wikipedia.org/wiki/Amaranthus\\_dubius](https://en.wikipedia.org/wiki/Amaranthus_dubius)
- Corchorus capsularis. (2022, March 23). In *Wikipedia*. [https://en.wikipedia.org/wiki/Corchorus\\_capsularis](https://en.wikipedia.org/wiki/Corchorus_capsularis)
- Cowpea. (2023, November 5). In *Wikipedia*. <https://en.wikipedia.org/wiki/Cowpea>
- Cucumber. (2023, November 20). In *Wikipedia*. <https://en.wikipedia.org/wiki/Cucumber>
- Cucurbita maxima. (2023, November 4). In *Wikipedia*. [https://en.wikipedia.org/wiki/Cucurbita\\_maxima](https://en.wikipedia.org/wiki/Cucurbita_maxima)
- Eleusine coracana. (2023, November 7). In *Wikipedia*. [https://en.wikipedia.org/wiki/Eleusine\\_coracana](https://en.wikipedia.org/wiki/Eleusine_coracana)
- Maize. (2023, November 18). In *Wikipedia*. <https://en.wikipedia.org/wiki/Maize>
- Mulukhiyah. (2023, November 12). In *Wikipedia*. <https://en.wikipedia.org/wiki/Mulukhiyah>
- Okra. (2023, November 4). In *Wikipedia*. <https://en.wikipedia.org/wiki/Okra>
- Onion. (2023, November 20). In *Wikipedia*. <https://en.wikipedia.org/wiki/Onion>
- Oryza sativa. (2023, October 14). In *Wikipedia*. [https://en.wikipedia.org/wiki/Oryza\\_sativa](https://en.wikipedia.org/wiki/Oryza_sativa)
- Peanut. (2023, November 19). In *Wikipedia*. <https://en.wikipedia.org/wiki/Peanut>

Phaseolus vulgaris. (2023, November 20). In Wikipedia. [https://en.wikipedia.org/wiki/Phaseolus\\_vulgaris](https://en.wikipedia.org/wiki/Phaseolus_vulgaris)

Lima bean. (2023, November 20). In Wikipedia. [https://en.wikipedia.org/wiki/Lima\\_bean](https://en.wikipedia.org/wiki/Lima_bean)

Sesame. (2023, November 20). In Wikipedia. <https://en.wikipedia.org/wiki/Sesame>

Sorghum bicolor. (2023, October 5). In Wikipedia. [https://en.wikipedia.org/wiki/Sorghum\\_bicolor](https://en.wikipedia.org/wiki/Sorghum_bicolor)

Sweet potato. (2023, November 16). In Wikipedia. [https://en.wikipedia.org/wiki/Sweet\\_potato](https://en.wikipedia.org/wiki/Sweet_potato)

Roselle (plant). (2023, October 1). In Wikipedia. [https://en.wikipedia.org/wiki/Roselle\\_\(plant\)](https://en.wikipedia.org/wiki/Roselle_(plant))

Mango. (2023, November 1). In Wikipedia. <https://en.wikipedia.org/wiki/Mango>

Avocado. (2023, November 20). In Wikipedia. <https://en.wikipedia.org/wiki/Avocado>

Solanum scabrum. (2023, January 16). In Wikipedia. [https://en.wikipedia.org/wiki/Solanum\\_scabrum](https://en.wikipedia.org/wiki/Solanum_scabrum)

Soybean. (2023, November 27). In Wikipedia. <https://en.wikipedia.org/wiki/Soybean>

Potato. (2023, November 28). In Wikipedia. <https://en.wikipedia.org/wiki/Potato>

Passiflora edulis. (2023, October 11). In Wikipedia. [https://en.wikipedia.org/wiki/Passiflora\\_edulis](https://en.wikipedia.org/wiki/Passiflora_edulis)

Capsicum frutescens. (2023, November 14). In Wikipedia. [https://en.wikipedia.org/wiki/Capsicum\\_frutescens](https://en.wikipedia.org/wiki/Capsicum_frutescens)

Cleome gynandra. (2022, December 29). In Wikipedia. [https://en.wikipedia.org/wiki/Cleome\\_gynandra](https://en.wikipedia.org/wiki/Cleome_gynandra)

Coffea arabica. (2023, October 9). In Wikipedia. [https://en.wikipedia.org/wiki/Coffea\\_arabica](https://en.wikipedia.org/wiki/Coffea_arabica)

Pigeon pea. (2023, September 15). In Wikipedia. [https://en.wikipedia.org/wiki/Pigeon\\_pea](https://en.wikipedia.org/wiki/Pigeon_pea)

Lentil. (2023, December 3). In Wikipedia. <https://en.wikipedia.org/wiki/Lentil>

Sisal. (2023, November 7). In Wikipedia. <https://en.wikipedia.org/wiki/Sisal>

<https://en.m.wikipedia.org/wiki/Cashew>

<https://en.wikipedia.org/wiki/Tamarind>

[https://en.wikipedia.org/wiki/Corchorus\\_olitorius](https://en.wikipedia.org/wiki/Corchorus_olitorius)

[https://en.wikipedia.org/wiki/Moringa\\_oleifera](https://en.wikipedia.org/wiki/Moringa_oleifera)

[https://en.wikipedia.org/wiki/Date\\_palm](https://en.wikipedia.org/wiki/Date_palm)

<https://en.wikipedia.org/wiki/Pineapple>

[https://en.wikipedia.org/wiki/Cola\\_acuminata](https://en.wikipedia.org/wiki/Cola_acuminata)

<https://en.wikipedia.org/wiki/Vitellaria>

[https://en.wikipedia.org/wiki/Collard\\_%28plant%29](https://en.wikipedia.org/wiki/Collard_%28plant%29)

<https://en.wikipedia.org/wiki/Garlic>

<https://en.wikipedia.org/wiki/Borassus>

<https://en.wikipedia.org/wiki/Cabbage>

[https://en.wikipedia.org/wiki/Elaeis\\_guineensis](https://en.wikipedia.org/wiki/Elaeis_guineensis)

<https://en.wikipedia.org/wiki/Ginger>



## Overview.



This topic presents a logical sequence of the major steps involved in starting and maintaining a community seed bank.

## Learning Outcomes.



At the end of this topic, the learners should be able to:

- Describe the major steps required for the establishment and support of a community seed bank
- Establish and manage a seed bank.

## Duration.

2 hours and 25 minutes



Introduction and Pre-test (Evaluation)	<b>20 minutes</b>
Plenary: 1 Brainstorming, Question and Answer	<b>20 minutes</b>
Plenary: 2 Guided discussions, and presentations	<b>35 minutes</b>
Plenary: 3 Group discussions (Exercises)	<b>30 minutes</b>
Plenary: 4 Presentations	<b>15 minutes</b>
Post-test (Evaluation)	<b>5 minutes</b>
Conclusion	

## Equipment or materials needed



### Visual Aids (Slides or Posters)

- Definition: Community Seed Bank - Highlight its role in local biodiversity conservation and agricultural resilience.
- Framework: Illustrate core functions and services of a community seed bank (preservation, exchange, knowledge-sharing, etc.).

### Technical Equipment:

- Mobile projector for displaying visual aids.

### Participant Supplies:

- Notebooks and pens for individual note-taking and activities.

### Interactive Materials:

- Large paper, cards, markers, and affixing materials (tape/pins) for collaborative exercises (e.g., mapping local seed diversity or brainstorming interventions).

## Content

### Introduction.



Establishing and supporting a community seed bank requires careful planning and implementation. These banks are usually established and supported by local community institutions, and they work as a network of farmers organized for the exchange of seeds and information.

### Key terms.



A “**community seed bank**” is a local, mainly informal institution whose core function is to maintain, safeguard, and exchange local and farmer-preferred seeds for local use (Vernooy et al. 2015).

A **Seed** is defined as the part of a plant from which a new plant can be grown. It can be:

- *generative* - such as grain or fruit seed, usually produced through sexual reproduction and consisting of an embryo and its food stored within a hardened seed coat (testa); or
- *vegetative* - consisting of any propagative part of a plant such as a stem, tuber, or bulb (Lewis et al. 1997)

A **landrace** is any local variety of a domesticated animal or plant species that has adapted over time to its ecological and cultural environment.

A **crop variety** is a plant having characteristics that cause it to differ from other plants of the same species. A crop variety may be a cultivar; i.e., a hybrid of two species.

### Brainstorming




We shall take a few minutes to answer the following questions. These shall help us to start the learning journey on a good note:


- Have you lost any crop varieties that you wish to cultivate again?
- Do you have any options to obtain or recover these local seeds?
- Do you think the community should be involved in safeguarding local seeds?
- Have you been involved in a community seed bank before?
- Have you been involved in the collection, conservation, or distribution of seeds?


- Have you been involved in the establishment or management of a community seed bank?  
If you were involved,
- What are the main lessons you learned from your experience?
- What are the main difficulties you encountered?  
If you have no experience in establishment or management of a CSB.
- What challenges do you anticipate would be faced by a newly established community seed bank?
- From your understanding of what a community seed bank is now, what would you do to establish a functional and sustainable CSB?


### Steps for establishing a community seed bank


The steps for establishing and maintaining a community seed bank.


- 


**1** Mobilize and organize a group of community members. Organize a steering committee.
- 


**2** Assess if there is a need to establish a community seed bank by conducting a Situational Analysis, and/or a Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis of the community seed system.
- 

**3** Acquire a centrally located parcel of land where a seed storage facility may be constructed.
- 

**4** Decide how to conserve and distribute the selected seeds.
- 

**5** Collect, and clean selected crop varieties seeds including tubers and cuttings.
- 

**6** Keep important information about the seeds (e.g. varieties, season for planting, and their uses/values) and a thorough documentation of the stocks, inventory, quality and movement
- 

**7** Store the seed.
- 

**8** Plant the seed to regenerate and restock seed supplies.

9



Hold a seed and food fair where farmers exchange seeds and information, appreciate, and celebrate the tradition and new establishment.

## Case study: Limpopo, South Africa

- 1.1 Situational analysis activity 1:** To determine the current state of crop diversity in the areas selected for possible establishment of a community seed bank, a seed fair was organized during which women and men farmers were invited to display their crops and crop varieties. This was the first time such a fair was held in the country. One important observation made during the fairs was that diversity was under pressure.
- 1.2 Situational analysis activity 2:** To learn more about the status of crop diversity at the sites, a four-cell analysis was carried out. The steps described for the Five-Cell Analysis tool (introduced in Topic 2) provides insight into the relative abundance (or richness) and distribution (or evenness) of crops and/or crop varieties in a community.
- 1.3 Situational analysis activity 3:** Another tool used to learn more about the local seed system was a SWOT analysis: an analysis of the strengths, weaknesses, opportunities, and threats in the system. This was done by focus-group discussion among women and men farmers.
- 1.4 Situational analysis activity 4:** To learn more about current (and traditional) seed storage techniques and practices, a number of farmers were visited on their farm. Techniques and practices were demonstrated by farmers and their strengths and weaknesses were identified.
- 2 Motivating farmers:** The above analytical activities were complemented by a food fair to raise awareness about and increase appreciation of local food and related knowledge based on local crop diversity and to motivate farmers to join forces to conserve traditional varieties. This was also a pioneering event at both sites.
- 3 Using the findings of all the situational analyses,** a discussion was held with farmers at the selected sites to find out whether they were motivated to establish a community seed bank and to decide which crops and crop varieties to focus on. The basic organizational and technical principles were reviewed as input into the discussion. Farmers at both sites decided to proceed, and a management committee was then elected by the farmers.
- 4 Choosing crops and crop varieties:** The management committee and interested farmers discussed which crops and varieties to focus on and how to go about collecting seeds from the community.
- 5.1 Seed health and seed storage activity 1:** Attention then shifted to finding or constructing a facility to store the seeds. At one of the sites, it was decided to build a new facility on a piece of land that was offered by the village head.
- 5.2 Seed health and seed storage activity 2:** At the same time, preparations began for collecting the first seeds by the community seed bank members, and two meetings were held to collect seeds and make an inventory.
- 6.1 Seed registration activity 1:** Seeds were cleaned, packed in plastic bottles, and labeled. Their information was entered into the community seed bank seed registry.
- 6.2 Seed registration activity 2:** After the seed bank had been built and equipped, the first collection of seeds was deposited.
- 7 Seed regeneration:** Based on a group discussion with members of the community seed banks, a small number of the crops/crop varieties stored in the community seed bank were selected for first-time regeneration. A small group came together to prepare the land and sow the selected seeds.

**Source:** Extracts from Vernooij et al, 2020, page 16-17.

### Exercise 3: Steps for establishment of a community seed bank.

Drafting lessons from the case study in page 33 above;

Outline and explain the steps and processes for establishment and management of a community seed bank.

#### Conclusion.

By following the steps and processes, a community can effectively establish and support a seed bank to promote sustainable agriculture, biodiversity conservation, and food security in a region.

#### References for further reading.



Gupta, A., Mathur, P., Dadlani, M., Mitra, S. 2015. Community Seed Banks. A Working Manual.

[https://www.researchgate.net/publication/295857981\\_COMMUNITY\\_SEED\\_BANKS](https://www.researchgate.net/publication/295857981_COMMUNITY_SEED_BANKS)

Vernooy, R., Sthapit, B. and Bessette, G. 2020. Community seed banks: concept and practice. Facilitator handbook (updated version). Bioversity International, Rome. Italy. <https://hdl.handle.net/10568/81286>



## Overview.



This topic defines the key principles and practices for the effective operations of a community seed bank from a technical point of view. Technical issues range from seed selection, drying, sorting, storing, and registering, to packing and labeling/branding of seeds.

## Learning Outcomes.



At the end of this topic, the learners should be able to:

- Describe the principles and practices that are key to the effective operation of a community seed bank.
- Skillfully collect and select quality seeds, clean and maintain seed health, register new seeds, treat and process seeds for storage and monitor, regenerate, and ethically repatriate and distribute seed.
- Document management activities and track accessions entering and exiting the seed bank.

## Duration. 2hours, 25mins



Introduction and Pre-test (Evaluation)	<b>20 minutes</b>
Plenary: 1 Brainstorming, Question and Answer	<b>30 minutes</b>
Plenary: 2 Guided discussions, and presentations	<b>20 minutes</b>
Plenary: 3 Group discussions (Exercises)	<b>25 minutes</b>
Plenary: 4 Presentations	<b>30 minutes</b>
Post-test (Evaluation)	<b>15 minutes</b>
Conclusion	<b>5 minutes</b>

## Equipment or materials needed



- Slide or poster showing the definition of a community seed bank
- Slide or poster showing the framework of functions and services
- Mobile projector
- Notebooks and pens for participants
- Large sheets of paper, cards, markers, tape, or pins for examples and illustrations

## Content

### Introduction.

Operating a community seed bank requires careful attention to technical aspects to ensure its effectiveness and sustainability. This





topic focuses on defining the key principles and practices for the technical operations of a community seed bank.

**Brainstorming.** The learners are asked probing questions, such as:



- What are the essential steps involved in seed collection to ensure quality and avoid contamination with other varieties?
- How would you design a storage system that protects seeds from moisture, pests, and temperature fluctuations?
- What strategies can you implement to track seed viability over time and maintain accurate records?

Ask participants to take some notes during the exercise and signal that they will be invited to share their thoughts at the end of the activity.

**Key terms.**



1. A “**community seed bank**” is a local, mainly informal institution whose core function is to maintain, safeguard, and exchange local and farmer-preferred seeds for local use (Vernooy et al. 2015).
2. **Seed** is defined as the part of a plant from which a new plant can be grown. It can be:
  - *generative* - such as grain or fruit seed, usually produced through sexual reproduction and consisting of an embryo and its food stored within a hardened seed coat (testa); or
  - *vegetative* - consisting of any propagative part of a plant such as a stem, tuber, or bulb (Lewis et al. 1997)
3. **Accession:** In the context of a seed bank, 'accession' refers to a lot or batch of seeds that enters the bank.
4. **Seed management:** involves all the activities and processes related to the conservation, multiplication, distribution, and utilization of seeds.

## Principles and practices guiding technical operations in community seed banks



A community seed bank is an essential establishment for conserving and maintaining local agricultural biodiversity. The technical operations of a community seed bank are guided by several principles and practices. Let's discuss some of them:

1. **Selection of crop species and varieties:** Community seed banks should choose crops and varieties to be preserved. Using the step-by-step participatory approach; the Five-Cell Analysis tool described in the previous topic 3, the members of the community Seed banks

should prioritize and select the species and varieties of landraces to be conserved citing the reasons for the choices made.

- 2. Collection and Conservation:** The primary objective of a community seed bank is to collect, conserve, and maintain a diverse range of local crop varieties. This involves gathering seeds from traditional farmers, registering the seeds, documenting their characteristics, and conserving them using the methods agreed upon by the seed bank members. Depending on the type of seed selected (generative or vegetative seeds) conservation method may be on-farm, in-situ, or ex-situ conservation. It will also involve regularly regenerating seeds to maintain their genetic diversity.
  
- 3. Seed Storage and Quality Management:** Ensuring seed quality is crucial to maintain the integrity of the seed bank's collection. Quality management practices include drying the generative seeds and then storing the seeds in a cool, dry place using appropriate containers. The seed processing methods may be the traditional techniques the members already know or new innovative drying and conservation techniques that shall be taught to the farmers. Hermetic storage was found to be the most effective form of seed storage where the seeds are stored in totally airtight containers made of plastic, metal, and glass (Arnab et al. 2015). Important practice involves regular monitoring of seed germination rates, detection and prevention of seed-borne diseases or pests, and appropriate labeling and documentation of seed lots.
  
- 4. Participatory Approach:** Community seed banks often follow a participatory approach, involving farmers and community members in decision-making processes. This includes engaging farmers in seed collection and sharing, as well as encouraging their active participation in seed selection, evaluation, and overall seed bank management.
  
- 5. Knowledge Sharing and Capacity Building:** Community seed banks serve as centers for knowledge sharing and capacity building. They provide training and workshops to educate farmers on seed conservation, sustainable farming practices, and maintaining local crop diversity. The center documents the seed collection process and information about each seed collected and shares the information with other community seed banks. Sharing knowledge and empowering farmers strengthens the long-term viability and sustainability of the seed bank. The documentation

shall be done by collecting data during focus-group discussions during training sessions and observation during field visits. Moreover, the information on the varietal characteristics serves as a storehouse of information. It can be valuable for other communities and also for planning sowings within the community if the climate is not conducive.

**6. Exchange and Distribution:** A crucial aspect of a community seed bank is facilitating the exchange and distribution of seeds among farmers. Seed banks should establish protocols for fair and equitable seed sharing, ensuring that farmers have access to diverse seeds that meet their specific needs. This helps to strengthen local farming systems and promote crop resilience. The protocols established shall be part of the rules and regulations that shall guide the governance and operations of the community seed banks.

**7. Networking and Collaboration:** Collaboration and networking with other seed banks, agricultural research institutions, NGOs, and government agencies is vital for the success of a community seed bank. Sharing experiences, collaborating on research, and establishing partnerships can enhance the technical expertise and resources available to the seed bank.

**8. Adaptive Management and Continuous Improvement:** A community seed bank should continuously assess and adapt its operations to meet the evolving needs of farmers and changing environmental conditions. Regular monitoring and evaluation allow for improvements in seed bank management practices, ensuring its long-term viability and effectiveness, and assessing the trend of agricultural biodiversity.

### Seed management.

involves all the activities and processes related to the conservation, multiplication, distribution, and utilization of seeds. It aims at ensuring the availability of high-quality seeds for planting, fostering biodiversity, and supporting sustainable agriculture.

**Table 3: In a typical community seed bank, quality seed management practices include:**

No	Practices	Purpose
1.	Seed selection.	Careful selection of seeds based on genetic homogeneousness within varieties or biological diversity amongst species, adaptability, and desirable traits, and use.
2.	Seed treatment.	Processing of the planting material to make it more resilient to harsh conditions. The types of treatment fall into three main categories; pre-storage, mid-storage, and pre-sowing treatments, based on the processing time.

		Treatment activities include but are not limited to; Cleaning and sorting, drying or hardening, fungicidal and insecticidal dressing, fortification, inoculation, pelleting, infusion, osmotic or hydro-priming, soaking and fluid drilling,
3.	Seed Testing.	Conducting germination tests to assess seed viability and vigour.
4.	Seed Packaging.	Using appropriate materials for seed packaging to prevent damage and ensure longevity.
5.	Seed Storage.	Providing proper conditions like temperature, humidity, and light to maintain seed viability.
6.	Seed registration.	Maintaining detailed records of seed sources, characteristics, and distribution to track seed viability and usage.
7.	Seed monitoring.	Routine checking of the seeds to ensure quality is maintained.
8.	Seed regeneration.	Planting of seeds in order to multiply the accessions when the stock is low or to improve the seed viability after a long period of storage. Seeds are usually regenerated after an agreed time interval.
9	Seed distribution.	This is the process by which seeds are delivered to members of the community or other stakeholders, in accordance with an agreed distribution modalities. The seeds may be distributed on loan, sold, free exchange, research collaboration, conservation program, and public distribution.

### Reasons for technical practices in seed management.

The rationale for sound technical practices in seed management includes:

- Ensuring seed quality and integrity for sustainable agricultural production.
- Preserving genetic diversity and conserving plant germplasm.
- Supporting food security and livelihoods of farming communities.
- Facilitating adaptation to changing environmental conditions and challenges.
- Ensures ease during transformation from informal to formal institution.

### Exercise 4.1: Traditional and modern seed treatment methods.

1. Mention and describe the traditional seed treatment methods practiced in your community at pre-storage, mid-storage and pre-sowing time.
2. Mention and describe traditional seed storage methods practiced in your community.
3. What are the advantage and disadvantages of the traditional seed treatment and storage methods?

### Seed treatment.

This is the processing or dressing of the planting material to make it more resilient to biotic or abiotic stresses.

Weak planting material is highly vulnerable to pests and weather extremities; this is why seed treatment increases growers' chances of getting high yields. The advantage explains the popularity of seed treatment products among farmers on the one hand and a significant demand for pre-processed planting material on the other. Because the process requires extra time,

special equipment, and extreme caution with seed treatment chemicals, it makes sense for farmers to buy and for agricultural input suppliers to provide already treated seeds.

Depending on the treatment substance origin, there exist **synthetic** and **organic** seed treatments. Also, different dressing preparations target different pathogens and pests, so there are seed treatment fungicides, insecticides, nematicides, etc. The types of treatment fall into three main categories; pre-storage, mid-storage, and pre-sowing treatments, based on the processing time.

The treatment can be conducted on both sides: by a planting material producer (as a boost to regular seeds) or by a farmer (to ensure fast and effective germination and further growth).

### Seed Treatment Methods

Pre-processing of the planting material before sowing promotes germination and overall crop growth potential, as well as significantly increases resistance both to biotic and abiotic stresses. In particular, biotic factors are pathogen and pests, while abiotic stresses include **soil salinity**, poor **soil types**, droughts, and other unfavorable weather conditions.

Different methods of seed treatment comprise:

Cleaning, drying, fungicidal and insecticidal dressing, hardening, fortification, pelleting, infusion, hydro or osmotic priming, fluid drilling, and inoculation.

1. **Cleaning:** Removing debris, impurities, and damaged seeds to ensure only high-quality seeds are stored.
2. **Drying:** This is an ancient and traditional method which involved reduction of the moisture content of mature seeds before they are stored. Modern drying involves testing percentage of moisture in the seeds and recommends standards levels of 7-10% moisture levels in grains.
3. **Fungicide Seed Treatment**

This protection method controls fungal diseases like smuts, rots, or seedling blights. Seed treatment fungicides don't protect the crops throughout all **plant growth stages** but help them establish faster.

There are several types of fungicide seed treatment depending on its purpose and pathogen presence:

- **disinfection** kills already penetrated pathogens that caused infections;
- **disinfestation** controls microbes on the planting material surface;
- **protection** prevents pathogen presence and further infection.

Fungicide seed treatment chemicals may have different application forms, e.g., slurry powder or liquid. There are metallic and non-metallic, organic and synthetic, mercurial and non-mercurial fungicides, depending on composites. The ones that penetrate the planting material to prevent fungal diseases without affecting the metabolism of the host crop are known as systemic.

Fungicide seed treatment is beneficial:

- for early sowing when excessive **soil moisture** and low **soil temperature** increase the risks of damping-off diseases;
- in **conservation tillage** practices;
- when germination capacity is low.

Fungicides are more effective when used in combination with other active agents. For example, mefenoxam and metalaxyl can be successfully applied against the water molds of *Pythium* and *Phytophthora* but are inactive to *Rhizoctonia*, *Phomopsis*, and *Fusarium*. However, the combination of metalaxyl and azoxystrobin shows good activity to all the enlisted fungi but *Phytophthora*

#### 4. Insecticide seed treatment

This treatment method **prevents insect infestations** and protects the planting material from the damage they make.

Specific insecticides are often effective against specific pests, so chemical mixtures or compounds can kill more insect species. However, it is important to observe chemicals compatibility, sequence, and caution measures, and never consume treated material as human or livestock food. However, there are many organic and traditional seed treatment materials that ward off pests as well as keep the seed dry so that it increases the seed longevity and prevent molds (Vernooy et al., 2022)

- *A certain list of seed treatment chemicals (including Hexachlorobenzene) is banned due to severe poisoning with lethal consequences, and aggressive agents are replaced with milder ones.*



Photo 2: Natural repellents: dried cow dung, brick, and dried Eucalyptus leaves.  
Credit: Bioversity International/R.Vernooy

#### 5. Hardening as a Seed treatment method

Hardening suggests soaking the planting material in a specific solution to **make seedlings more resilient to cold and droughts**. It also speeds up germination, which starts after the solution absorption. To carry out the treatment process successfully, one must determine:

- the equal volume of the solution and the planting material;
- correct soaking time;
- proper drying (to the standard moisture content in seeds).

## 6. Fortification

This method provides the planting material with nutrients to **boost seedlings' vigor and make them more tolerant of unfavorable soil environments**. Typically, nutrients are delivered by soaking the planting material in a fertilizer solution, yet this type of seed treatment is not suitable for all crops. In particular, protein-containing seeds (e.g., soybeans or peas) are nourished through moist sand hydration (when the planting material is put in wet fertilized sand for a specific time).

## 7. Pelleting

This method implies coating the planting material with inert substances that **increase its shape, size, and weight**. The inert substances like lime, chalk or talcum stick to the seed with adhesives. Pelleting is applied for tiny or expensive planting material to facilitate its handling, which is particularly useful for forest tree seeds and aerial sowing. Besides, pelleting increases germination potential, seedling vigor, and immunity to diseases

- *Apart from inert substances, seed coating (shell) may contain nutrients, growth promoters, oxidizing agents (e.g., calcium peroxide CaO<sub>2</sub>), rhizobia, charcoal dust etc. example is pelleting of acacia seeds with charcoal dust in Kenya*

## 8. Infusion

In this treatment type, **useful substances slowly penetrate the planting material** with the help of organic solvents, e.g., acetone or dichloromethane. The benefit of this method is that it doesn't require long-time drying (5-10 minutes are enough). This is because organic solvents evaporate naturally when the infusion process is over. Infusion is also known as a dormancy-breaking seed treatment method.

## 9. Hydro or Osmotic Priming

It is a relatively expensive treatment method used when soaking destroys the planting material. This refers to legume seeds with big embryos and high protein content. In the case of osmopriming, water absorption is slowed down by osmotic agents. Typically used osmotic solutions are polyethylene glycol or salt solutions like KNO<sub>3</sub>, NaCl, or K<sub>3</sub>PO<sub>4</sub>.

- *Hydro-priming helps to kickstart germination process, leading to more uniform sprouting of seeds. It can improve seedling establishment and ultimately contribute to better crop yield.*
- *Osmotic priming helps improve and synchronize germination when the soil temperature is low.*

## 10. Fluid Drilling

This method is **applied to germinated planting material and aims to protect it while sowing**.

The process includes several stages:

- germination;
- separation of germinated and non-germinated kernels;
- covering the germinated material with gel (e.g., guar);
- planting the gel-covered material to the seedbed.

## Benefits of seed treatment.

Treatment of planting material positively affects the overall crop vigour and increases the plant's tolerance to biotic and abiotic stresses. Seed treatment:

- **Protects seeds from harsh weather conditions** especially when they are pelleted.
- **Increases viability of seeds by reducing damage on them** when dried seeds harden.
- **Boosts roots growth and shoots vigour** thanks to nutrients supply;

- **Provides beneficial bacteria** (e.g., rhizobia) when legume seeds are inoculated;
- **Enhances plant growth** with delivered nutrients, which makes crops stronger while **competing with weeds**;
- **Helps in integrated pest management** since colored kernels keep birds from eating them;
- **Reduces the necessity of chemical applications** in subsequent growth stages;
- **Decreases the occurrence of crop diseases** due to pathogens and unfavorable growth conditions;
- **Protects crops from nematode infestations** through nematicide seed treatment;
- **Increases plant density and field productivity** thanks to planting more viable seeds;
- **Allows collecting coated grains faster** when they are spilled.

### Exercise 4.2: Traditional and modern seed storage methods

1. Describe the modern technical seed treatment methods used in the treatment of modern improved seed.
2. Mention and describe modern seed storage techniques used today.
3. What are the challenges and gaps faced with the modern seed treatment and storage methods?



## Documentations in a Community Seed Bank

This guide aims to provide a detailed narrative on the documentation process in Community Seed Banks CSBs, especially those managed by farmers who typically rely on manual documentation systems due to the lack of computers. .

The documentation process in CSBs is based on the principles of seed bank management and includes the following procedures:

- **Accession Identification:** Assigning a unique identifier to each seed sample (accession) that enters the seed bank.
- **Proactive Management of Accessions:** Regular monitoring of the viability and health of the accessions.
- **Accession Availability:** Keeping track of which accessions are available for use and exchange.

In the context of a seed bank, 'accession' refers to a lot or batch of seeds that enters the bank. Each accession is unique and is associated with a specific farmer or source, a particular variety of crop, and a certain quantity of seeds. The management committee must proactively manage these accessions, ensuring they are available for use when needed.

## Essential Documents in Community Seed Banks

There are three key documents that must be maintained in a CSB:

1. Registration Book.
2. Management Book or Cards.
3. Movement Book (a counterfoil book).
4. Governance Manual (Rules and Regulations Book).

### 1. Registration Book

The Registration Book records all accessions that enter the Seed Bank. Each accession is assigned a unique number, and its passport data is captured. Since each accession has multiple data to be recorded about it, the relevant data shall be coded.

#### CSB Registration and Accession Coding

Each seed must be registered so that a unique code can be assigned for the accession number. The code consists of:

- **State and county code:** For example, CE01 represents Juba county with code 01 in Central Equatoria CE. This code indicates the accession's place of origin. Assign 2-digit code for each county by state.
- **Seedbank code:** Consists of 2 uppercase alphabets, allowing up to 676 CSBs to be registered in each county: For example UJ for University of Juba Genebank.

- Accession number: A 4-digit number, allowing up to 9999 accessions in a CSB.
- Generation code: A single digit number preceded by Capital letter G., assigned after each regeneration or multiplication.

Example: **CE01UJ0001-1G** : Represents first generation of Accession number 0001, from Genebank UJ in Juba county:01 Central Equatoria State: CE.

Table 4: Sample form showing Descriptors in the Registration Book.

<b>SEED REGISTRATION BOOK</b>							
<b>Description.</b>	<b>Details.</b>						
<b>Accession number:</b>	<p>_____</p> <p><i>A unique sequential number. Accession numbers are not reused.</i>  <i>For example, <b>CE01UJ0001-1G</b></i></p>						
<b>Date of entry:</b>	_____						
<b>Type of material:</b>	<p>Grain <input type="checkbox"/>, Pod <input type="checkbox"/>, Suckers <input type="checkbox"/>, Stem cutting <input type="checkbox"/>, Root tuber <input type="checkbox"/>,</p> <p>Buds <input type="checkbox"/>, Rhizome <input type="checkbox"/>, Corm <input type="checkbox"/>, Drupe <input type="checkbox"/></p>						
<b>Crop name:</b>	<p>Common names: _____</p> <p>Scientific name: _____</p>						
<b>Variety:</b>	Local names: _____						
<b>Known attributes:</b>	<p>Color: .....</p> <p>Shape: .....</p> <p>Maturity duration: .....</p> <p>Type of plant: .....</p> <p>Crop Mature height: .....</p> <p>Tolerance for drought: .....</p> <p>Tolerance for water logging: .....</p> <p>Pest and Disease tolerance: .....</p> <p>Others: .....</p> <p>.....</p> <p>.....</p>						
<b>Source of material</b>	Farmer's name/Seed Bank: _____						
<b>Place of Origin</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Village: _____</td> <td style="width: 50%;">Boma: _____</td> </tr> <tr> <td>Payam: _____</td> <td>County: _____</td> </tr> <tr> <td colspan="2">State: _____</td> </tr> </table>	Village: _____	Boma: _____	Payam: _____	County: _____	State: _____	
Village: _____	Boma: _____						
Payam: _____	County: _____						
State: _____							
<b>Latitude</b>	_____						
<b>Longitude</b>	_____						
<b>Collector's name</b>	_____						
<b>Remarks</b>	_____						



## 2. Management Records Book

Each Management Records Book monitors accessions at the seed bank and is used to document all procedures and results related to each accession. So, one accession, is recorded per page. The records have the following columns:

**Table 5: Sample form showing descriptors in a Management Records Book.**

SEED MANAGEMENT RECORDS BOOK	
Description.	Details
Accession number:	
Management activity done:	
Date when activity was done:	
Outcome of activity:	
Quantity at hand:	
Next scheduled activity:	
Date of next activity:	
Activity done by:	Name:
Remarks:	

## 3. Seed Movement Book

This book tracks the movement of seeds from the Seed Bank. It is a counterfoil book to allow the Seed Bank to maintain a copy and an original to move with the seeds if needed. The information to be captured should consist of the following:

**Table 6: Sample form showing descriptors in a Seed Movement Book.**

SEED MOVEMENT BOOK				
Description.		Details		
Accession number:				
Quantity given out:				
Recipient's	Name:			
	Address:	Village:	Boma:	
		Payam:	County:	
		State:		
Date of collection:				
Served by:		Name:		
Remarks / or Conditions:				

## Documentation Workflow




Here's a step-by-step guide to the documentation workflow in a CSB:

1. Seed enters CSB.
2. Assign an Accession number.
3. Make an entry in the Registration Book.
4. Create a Management Record page for the same Accession number.
5. If any seed moves to farmers or another Seed Bank, make an entry in the Seed Movement Book and give one part to the person taking the seeds. Retain the counterfoil.
6. Enter the movement event and update the remaining seed quantity in the Management Records Book.

## Labeling.

When labeling a container on the external surface, bear in mind that labels can drop off over time depending on the glue used. Good practice is to include another accession label in the container itself. Use a 2B pencil to write on the label to ensure the label legibility will last. Also ensure the preprinted stickers have good quality glue and they are durable.

Figure 6: Sample label for a container of an accession.

  			
<b>Accession number:</b>			
<b>Date of:</b>		Production:	Storage:
<b>Crop</b>	<b>Name:</b>		
	<b>Origin:</b>	Farmer:	Village:
		Boma:	Payam:

## Workflow for Seed Bank Management.

The workflow for seed bank management involves several steps, including seed registration, inspection and cleaning, testing, storage, movement, and drying. Each step is crucial to ensure the quality and viability of the seeds.

Each of these steps is documented in the Management records, ensuring a thorough record of each seed's journey from entry to, and exit from the seed bank.

Remember, the key to successful seed bank management is diligent documentation and proactive management of accessions.

### **Conclusion**

These principles and practices provide a foundation for the technical operations of a community seed bank, contributing to the conservation of agricultural biodiversity, sustainable farming practices, and the empowerment of local communities.

Sound technical practices in seed management involve using scientific knowledge, adopting best practices, and promoting community participation. Constraints may include limited resources, lack of technical expertise, and challenges in maintaining seed purity and quality. Knowledge gaps could relate to emerging seed technologies, climate change impacts on seed production, and innovative seed storage methods.

Implementing effective seed management practices requires collaboration among farmers, researchers, extension agents, policymakers, and other stakeholders to ensure sustainable agriculture and food security.

### **Reference and further reading**



- Bhandari, P. (2022, May 04). *Data Collection Methods | Step-by-Step Guide & Examples*. Scribbr. Retrieved 4 December 2023, from <https://www.scribbr.co.uk/research-methods/data-collection-guide/>
- Gupta, A., Dadlani, M., Quek, P., Mathur, P. 2015. *Community Seed Banks. A Working Manual*. Bioversity International, New Delhi, India. [https://www.researchgate.net/publication/295857981\\_COMMUNITY\\_SEED\\_BANKS](https://www.researchgate.net/publication/295857981_COMMUNITY_SEED_BANKS)
- Lewis, V. and Mulvany, P.M. 1997. *A typology of community seed banks*. Natural Resources Institute, Chatham. United Kingdom.
- Vernooy, R., Sthapit, B. and Bessette, G. 2020. *Community seed banks: concept and practice. Facilitator handbook (updated version)*. Bioversity International, Rome. Italy
- Vernooy, R.; Shrestha, P.; Sthapit, B. (Eds.) 2015. *Community seed banks: origins, evolution and prospects*. Routledge, London, UK. Available: <https://hdl.handle.net/10568/68708> (accessed 5 December 2023)
- Vernooy, R., Aluso, L., Adokorach, J., Gupta, A., John, R., Mohamed, M.D., Mugisha, J., Muhumuza, J., Nyabasha, S., Otieno, G. 2022. *Make them dry; keep them dry. Traditional and modern techniques and practices to store and conserve seeds safely*. Bioversity International, Rome, Italy. ISBN: 978-92-9255-261-9
- Vasyl Cherlinka, March 2022, *Seed Treatment: Methods to improve planting material* <https://eos.com/blog/seed-treatment/#> Accessed on 29<sup>th</sup> February 2024.



## Overview.



This topic examines the governance and management structures essential for operating community seed banks. It explores cost considerations, successful governance models, potential challenges, and the role of social and gender dynamics. Community seed banks, rooted in community-driven conservation and sustainable use of plant genetic resources, often involve collaborative efforts by farmers, extension staff, genebank personnel, and researchers. Their value lies in local governance systems built on collectively established rules. They foster social capital, community empowerment, and a vital platform for biodiversity management through active use and conservation.

## Learning Outcomes.



At the end of this topic, the learners should be able to:

- Define and differentiate the concepts of governance and management within community seed banks.
- Describe five core categories of governance and management systems.
- Analyze governance and management factors in successful, average, and underperforming community seed banks.
- Outline essential governance and management best practices for community seed bank operation.
- Identify key issues and challenges associated with governance and management of community seed banks.

## Duration. 2 hours, 30 minutes



- |   |                   |
|---|-------------------|
| • Introduction                          | <b>5 minutes</b>  |
| • Plenary 1: Open questions and answers | <b>20 minutes</b> |
| • Plenary 2: Guided group discussion    | <b>10 minutes</b> |
| • Plenary 3: Group presentation         | <b>15minutes</b>  |
| • Plenary 4: Group exercise             | <b>30 minutes</b> |
| • Plenary 5: presentation 20 minutes    | <b>20 minutes</b> |
| • Plenary 6: Open discussions           | <b>15 minutes</b> |
| • Plenary 7: Conclusion and evaluation  | <b>15 minutes</b> |

## Equipment or materials needed

- Slide or poster showing the definition of a community seed bank
- Slide or poster showing the framework of functions and services
- Mobile Projector



- Notebooks and pens for participants
- Large sheets of paper, cards, markers, tape, or pins for examples and illustrations

## Content

### Introductory review of community seed banks



#### Seeds as the Foundation of Genetic Diversity

Seed conservation is a cornerstone of global efforts to safeguard crop genetic diversity. This diversity comprises the variations within and between crop species, offering the raw material for adaptation and agricultural advancement (FAO, 2010). For smallholder farmers, access to a broad range of crops and varieties provides flexibility in the face of environmental variability and challenges like climate change (Jarvis et al. 2008). Community seed banks play a vital role in ensuring farmers have options for cultivating crops suited to their unique local conditions.

#### Community-Based Seed Initiatives

Community seed banks and similar initiatives represent a global movement with a history spanning several decades (Vernooy et al. 2014). They focus on conserving, strengthening, and promoting the use of local seed systems, particularly emphasizing traditional varieties alongside improved cultivars. These initiatives take many forms, from community gene banks focused on long-term preservation to seed libraries emphasizing resource sharing and farmer education. Regardless of their specific structure, community seed banks are united by a commitment to supporting farmers in managing crops of both primary and minor importance, including those often neglected by large-scale agriculture (Bellon et al. 2015).

**Brainstorming** The learners are asked probing questions, such as:



#### About Understanding Community Seed Banks

1. What key differences distinguish a community seed bank from a commercial seed company or a national genebank?
2. Can you give examples of how a community seed bank might work to support both conservation and access to crop varieties?
3. What risks might a community seed bank face (e.g., loss of knowledge, natural disasters) and how can these be mitigated?

#### About Practical Management & Operations

1. If you were starting a community seed bank, what are the first three things you would need to do to ensure it functions effectively?
2. How can a community seed bank make sure it involves all members of the community, including women, youth, and marginalized groups?
3. What strategies can be used to manage seed quality and prevent seed loss or contamination in a community seed bank setting?

### About Benefits & Impacts

1. How can community seed banks help farmers become more resilient in the face of climate change or market fluctuations?
2. In what ways do community seed banks contribute to food security and the preservation of agricultural traditions?
3. Can community seed banks play a role in fostering social cooperation and empowering communities beyond their core focus on seeds?

Ask participants to take some notes during the exercise and signal that they will be invited to share their thoughts at the end of the next learning activity.

•

### Key terms.



1. A “**community seed bank**” is a local, mainly informal institution whose core function is to maintain, safeguard, and exchange local and farmer-preferred seeds for local use (Vernooy et al. 2015).
2. **Governance** is the process whereby a group of individuals works as a collective to ensure the health of an organization. It usually includes moral, legal, political and financial aspects (Vernooy et al. 2015).
3. **Management** refers to the day – to – day coordination, execution and monitoring of key tasks required to maintain a community seed bank in a short and long term. It usually involves human resources as well as technical, administrative, organizational and financial elements (Vernooy et al. 2015).
4. **Seed** is defined as the part of a plant from which a new plant can be grown. It can be:
  - *generative* - such as grain or fruit seed, usually produced through sexual reproduction and consisting of an embryo and its food stored within a hardened seed coat (testa); or
  - *vegetative* - consisting of any propagative part of a plant such as a stem, tuber, or bulb (Lewis et al. 1997)



## Case Study of Mamudpur Nayakrishi Seed Hut (NSH) in Bangladesh:

**Purpose:** Nayakrishi Seed Hut (NSH) was established as a result of collaboration with Nayakrishi Seed Network, whose aim was to collect and maintain seeds of local crop varieties. The primary purpose was to collect local seeds to improve their livelihoods. Seed preserved were of local varieties suited to the community. The small scale farmers preferred the local varieties due to their resistance to common pests and pathogens, over commercial varieties and hybrid seeds, which are costly and require the application of chemical fertilizers, pesticides and irrigation.

**Activities:** NSH preserved 1,507kg of seeds. The main crop species were rice (17 species), wheat (1), barley (1), pulses (5), oilseeds (6), vegetables (40), spices (11) and fire crops (two). Small scale and marginalized farmers focused on the cultivation of indigenous varieties of crops according to Nayakrishi principles.

**Governance of NSH:** The seed hut was governed by management and coordination body formed of two committees: the Natural Resource Auditing Committee, with seven(7) members, and the Specialized Women's Seed Network, with eleven(11) members.

**Roles and responsibilities:** On behalf on the community, a group of households jointly took the responsibility of caring for the collected seeds and genetic resources and propagation. Seeds were distributed among the Nayakrishi farmers on demand provided that they deposit seeds in the NSH after the harvest.

### 1. The Specialized Women's Seed Network responsibility was to:

- Clean the NSH,
- Collect seeds from harvested plants,
- Dry seeds and containers,
- Ensure that stored seeds were kept dry
- Conduct weekly meetings to approve the cropping plan for the season, seed distribution and seed exchanges.

### 2. The Natural Resource Auditing Committee was to:

- Observe and monitor the maintenance of crops in the seed hut,
- Monitor the regeneration of seeds annually and in season,
- Monitor pertinent data collection and records throughout the season up to postharvest handling.
- Monitor the participation of NSH members in various events organized by NGOs and other civil organizations.

### Meetings

Nayakrishi farmers and members of the Specialized Women's Seed Network participate in regular meetings of the NSH and each farmer has the privilege to exchange seed and genetic resources with this NSH

Collaboration: NSH collaborated with the Community Seed Wealth Centre, and had been regularly participating in agricultural and plant fairs organized by the Upazila Department of Agricultural Extension and in various events organized by non-governmental organizations and other civil organizations. It was able to win five first-place prizes.

Technical issues: Eight specialized farmers were involved in high-quality seed production and practice integrated crop management. The members of the Specialized Women's Seed Network select mature,

...Please turn over

Continuation ...

robust, disease-free fruit for collection of seeds. The network members are knowledgeable and experienced in seed maintenance and management, and their expertise is useful to all farmers as they ensure the availability of high-quality seeds.

**Achievements and prospects:**

- The use of local varieties of crops had increased in Mamudpur,
- Farmers gained knowledge of on-farm resources such as crop diversification, mixed cropping and cow dung and compost.
- The application of chemical fertilizers was reduced and no pesticides are now used.
- Increased cultivation of local varieties by farmers.
- Efficient management of NSH by the women farmers
- Introduction of seventeen local varieties of a man rice.
- Increased production of major crop varieties. Major local crop varieties available in NSH has been increased from 11 in 2001, to 89. which are well suited to local flood-plain agro-ecological conditions.
- Balanced and nutritious food was ensured due to growing varieties of vegetables and pulses in their fields and homesteads.
- The NSH has been able to cooperate with the community to improve livelihoods and food security with very little outside support.
- The community holds meetings on its own initiative and finances the NSH with its own contributions.
- The NSH seeds stored and multiplied by NSH were used by its members and the surplus harvest is sold;
- The money earned from selling surplus harvest was used for running the NSH.
- The farmers were happy and content.

**Source:** Adapted from Vernooy et al, 2015, Part II, Chapter 9, page 63.

## Key governance and management practices



A successful community seed bank is that which functions under well establish governance and management system. This topic presents the elements of sound as well as poor governance and management practice of a community seed bank, analytical framework of key practices of governance and management, and the various systems for running a community seed bank.

Based on case studies conducted on several community seed banks (Vernooy et al. 2015), most of them do not have all the basic elements of governance and management structures. Most of the community seed banks have informal ways of organizing governance and management, others have only general working principles while some have detailed formalized rules and regulations. According to the conducted case studies, seed banks can be grouped into five categories of governance and management systems (Vernooy et al. 2015). Table 1 describes the five categories of governance and management system,

Table 3: Governance and management systems of community seed banks

NO.	Type	Basic elements of governance
1.	Basic stage of implementation without key formal elements of governance	Run by external stakeholders, usually project managers, often a nongovernmental organization (NGO) or donor staff. Custodian farmers are encouraged to take a leadership role as they have an affinity with local crop diversity.
2.	Under strong control of a public-sector agency and managed as a kind of decentralized national gene bank	Operated by public-sector agency. Phytosanitary regulations in place. Technically driven operational plans for ensuring quality and genetic purity.
3.	Governed by a board of volunteers and managed as a seed network based on formal membership.	Managed by small committees with both conservation and commercial arms. Support from private companies, membership fees and income from seed sales.
4	Governed by elected committee (of men and women farmers)	Executive committee (usually with balanced representation of women and men) has overall responsibility for collecting, cleaning, drying, storing,

	with transparent operational plans and guided by locally developed rules and regulatory framework	distributing and regenerating seed. Locally developed operation plans match technical requirements. Identified roles and responsibilities of committee members. Sometimes include an ex-situ backup system; a community biodiversity fund; and social auditing.
5	Governed by ideology of free access, open source and seed sovereignty	Volunteer based (with varying degrees of formal management) or network of seed-saver groups. Some cases prefer the concept of seed library over seed bank as seed should not be privatized.

**Source:** Adapted from Vernooy et al. 2015, Chapter 4, page 27.

## Governance

Community seed banks often adopt governance models mirrored in other community organizations. This typically includes:

**General Assembly:** The principal decision-making body is comprised of the broader membership. Annual meetings are standard, with special sessions convened as needed.

**Board of Directors:** Elected or appointed group responsible for executing the general assembly's decisions and managing daily operations.

**Oversight Committee:** A subset of members tasked with monitoring adherence to governing principles and ensuring accountability of board actions.

### Accountability and Seed Use

A core function of governance is establishing clear, agreed-upon rules and regulations governing seed management and use practices. These guidelines are central to the commitment to transparency and serving the best interests of all members.

## Management and technical committees

### Success, Sustainability, and Governance

Community seed bank (CSB) success and longevity hinge on two factors: strengthening technical knowledge of those driving the initiatives, and empowering local structures for independent decision-making. Typically, communities elect a management committee to supervise daily CSB operations. This committee formally divides responsibilities such as leadership, technical aspects, finance, administration, and outreach. Committee size often ranges from three to six farmers. Women, as traditional seed custodians in many cultures, play a vital role in the daily functioning of CSBs.



### Technical Committee Responsibilities

The technical committee is charged with determining practices in the following areas:

- **Collection Methods:** (e.g., seed fairs, on-farm collection, household stores, custodian farmers)
- **Phyosanitary Standards:** (maintaining pest/disease-free seed, weed seed removal, sun-drying)
- **Documentation:** (e.g., passport data, variety catalogs, community biodiversity registers)
- **Multiplication and Evaluation:** (using farmer-identified traits)
- **Storage:** (short vs. long-term, local structures vs. technical methods)
- **Monitoring:** (viability/vigor testing, initially and pre-planting)
- **Rejuvenation:** (annual multiplication in diversity blocks, determining which seeds require priority, pollen control for open-pollinated crops)
- **Distribution:** (systems enhancing access/availability across diverse user groups – men/women, income levels, researchers, private interests, tracking seed movement)

### Collaboration is Key

Both the technical and management committees share responsibility for collection, multiplication, evaluation, and developing strategies for equitable seed distribution.

### Governance and management practices for community seed banks:

Governance and management of community seed banks may be termed as good or bad on relative basis. The governance and management practices may therefore affect the viability and sustainability of the seed bank positively or negatively. The table 7 below summarizes the practices

**Table 7: Chart showing governance and management practices in seed banks.**

Good practices.	Bad practices.
1. Setting clear goals and objectives for the seed bank.	1. Setting unclear or unrealistic goals and objectives for the seed bank.
2. Transparent and inclusive decision-making processes.	2. Lack of transparency in decision-making processes.
3. Regular communication and engagement with the community.	3. Limited community engagement and consultation
4. Promoting biodiversity conservation through seed collections.	4. Ignoring biodiversity conservation in seed collections.
5. Developing seed exchange programs with other seed banks and stakeholders.	5. Limited or lack of seed exchange programs

6. Proper documentation of details related to the accessions, seed management activities and their distribution.	6. Poor documentation of information related to the accessions, management activities and their distribution.
7. Ensuring seed quality through proper storage and maintenance.	7. Neglect of seed quality leading to loss of genetic diversity
8. Engaging communities in participatory varietal selection	8. Lack of sustainability planning for long-term seed bank operations
9. Training and capacity-building for community members	9. Lack of training and capacity-building opportunities
10. Partnerships with local agriculture organizations and universities	10. Limited partnerships and collaboration with other organizations
11. Regular monitoring and evaluation of seed bank activities.	11. Inadequate monitoring and evaluation of seed bank activities.
12. Financial management and accountability practices.	12. Poor financial management and accountability practices.
13. Ensuring gender equity in seed bank operations.	13. Gender discrimination in seed bank operations.
14. Implementing disaster risk reduction measures for seed protection	14. Failure to implement disaster risk reduction measures
15. Adhering to ethical guidelines for seed collection and sharing	15. Violating ethical guidelines for seed collection and sharing
16. Establish local seed business and developing a value chain for the conserved varieties (where conditions are appropriate with consent of members)	16. Selling off seeds and developing products from conserved seeds without consent of members.

In this topic, we learned about governance and management structures of community seed banks.

Answer the following questions

1. In the context of your own region, who is/are the right group of people to govern a community seed bank?
2. What are the responsibilities of the seed bank's technical committee in managing a seed bank?
3. Which of the following is (or are) important for a community seed bank?
  - a) Being recognized and supported as a legitimate form of organization
  - b) Developing access and benefit-sharing mechanisms
  - c) Developing niche outlets for local landraces and farmer-improved cultivars
  - d) Strengthening the marketing of locally produced or bred varieties
4. With reference to Table 7 above, sort and list the governance practices and the management practices separately.
5. In a group of eight participants, you have been provided with a governance manual (Constitution) of a community seed bank. Please see the copy in annex below.

Instruction. Amend the constitution and include necessary articles and clauses as you discuss the following questions.

- i. How frequently should the general assembly convene?
- ii. What decision-making procedures will be in place (majority vote, consensus, etc.)?
- iii. What criteria will guide the selection process for the board of directors and oversight committee?
- iv. How long should leadership term limit be?
- v. Will seed access be open to all community members, or might there be restrictions (e.g., priority for members facing critical seed shortages)?
- vi. How will the community seed bank handle disagreements or differing needs among members regarding seed use or governance practices?

## **Exercise 5: Governance and management.**

## Conclusion:

Governance and management determines to a great extent the viability and sustainability of a seed bank. The concepts of governance and management discussed in this topic should guide learners and community members to make sound decisions and protocols that may ensure good governance.

## References and further reading.



- Bellon, M. R., Gotor, E., Caracciolo, F. 2015. Conserving landraces and improving livelihoods: how to assess the success of on-farm conservation projects? *International Journal of Agricultural Sustainability*, 13(2), 167-182.  
<https://doi.org/10.1080/14735903.2014.986363>
- Bhandari, P. (2022, May 04). *Data Collection Methods | Step-by-Step Guide & Examples*. Scribbr. Retrieved 4 December 2023, from  
<https://www.scribbr.co.uk/research-methods/data-collection-guide/>
- FAO 2010. *The Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture*. Food and Agriculture Organization of the United Nations: Rome.
- Gupta, A., Dadlani, M., Quek, P., Mathur, P. 2015. *Community Seed Banks. A Working Manual*. Bioversity International, New Delhi, India.  
[https://www.researchgate.net/publication/295857981\\_COMMUNITY\\_SEED\\_BANKS](https://www.researchgate.net/publication/295857981_COMMUNITY_SEED_BANKS)
- Jarvis, D. I., Brown, A. H., Cuong, P. H., Collado-Panduro, L., Latournerie-Moreno, L., Gyawali, S., ..., Hodgkin, T. 2008. A global perspective of the richness and evenness of traditional crop-variety diversity maintained by farming communities. *Proceedings of the National Academy of Sciences*, 105(14), 5326-5331.  
doi: [10.1073/pnas.0800607105](https://doi.org/10.1073/pnas.0800607105)
- Lewis, V. and Mulvany, P.M. 1997. *A typology of community seed banks*. Natural Resources Institute, Chatham. United Kingdom
- Vernooy, R., Sthapit, B. and Bessette, G. 2020. *Community seed banks: concept and practice. Facilitator handbook (updated version)*. Bioversity International, Rome. Italy.  
<https://hdl.handle.net/10568/81286>
- Vernooy, R.; Shrestha, P.; Sthapit, B. (editors). 2015. *Community seed banks: origins, evolution and prospects*. Routledge, London, UK. <https://hdl.handle.net/10568/68708>
- Vernooy, R., Gupta, A., Subedi, A. 2023. *Building an enabling framework to promote community seed banks, harnessing four core elements: recognition, respect, support, and collaboration* Wageningen Centre for Development Innovation, Wageningen, the Netherlands; Bioversity International, Rome, Italy.

**Overview.**

This topic discusses the importance of providing sound technical and organizational support to a community seed bank and what roles network building and networking can play, for example, with the national genebank or a university/research station, the agricultural extension services, or (larger) conservation initiatives.

**Learning Outcomes.**

At the end of this topic, the learners should be able to:

- Identify various types of stakeholders of a community seed bank.
- Understand the importance of various stakeholders, networks, and forms of support that community seed banks can develop and benefit from.

**Duration.**

**2hours,  
25minutes**



Introduction and Pre-test (Evaluation)	<b>20 minutes</b>
Plenary: 1 Brainstorming, Question and Answer	<b>30 minutes</b>
Plenary: 2 Guided discussions, and presentations	<b>20 minutes</b>
Plenary: 3 Group discussions (Exercises)	<b>25 minutes</b>
Plenary: 4 Presentations	<b>30 minutes</b>
Post-test (Evaluation)	<b>15 minutes</b>
Conclusion	<b>5 minutes</b>

**Equipment or materials needed**

- Slide or poster showing the definition of a community seed bank
- Slide or poster showing the framework of functions and services
- Mobile projector
- Notebooks and pens for participants

- Large sheets of paper, cards, markers, tape, or pins for examples and illustrations

## Content

### Introduction



Community seed banks can network with various actors in conservation, plant breeding, and rural development to find new ways of collaborating with farmers and strengthening the multifunctionality of farmers' seed systems. The local efforts of a community seed bank can have a multiplier effect if the members cultivate partnerships (Vernooy et al. 2020) and engage in networking and sharing of information and seeds with all stakeholders.

This topic reviews the forms of support community seed banks can mobilize and receive and the types of networks (light or dense webs) they may become involved in.

**Brainstorming** The learners would be asked probing questions, such as:



1. What do '**support**' and '**networking**' mean in the context of Community Seed Banks?
2. Why should farming communities in South Sudan be supported, to establish and operate Community Seed Banks?
3. Have community seed banks established elsewhere failed to operate as expected, what went wrong?
4. How can we strengthen community seed banks?
5. What are the factors that affect networking?
6. Who are the major stakeholders of a community seed bank in South Sudan?

Ask participants to take notes during the exercise and signal that they will be invited to share their thoughts at the end of the next learning activity.

## Key terms.



1. A “**community seed bank**” is a local, mainly informal institution whose core function is to maintain, safeguard, and exchange local and farmer-preferred seeds for local use (Vernooy et al. 2015).
2. **Seed** is the part of a plant from which a new plant can be grown. It can be:
  - *generative* - such as grain or fruit seed, usually produced through sexual reproduction and consisting of an embryo and its food stored within a hardened seed coat (testa); or
  - *vegetative* - consisting of any propagative part of a plant such as a stem, tuber, or bulb (Lewis et al. 1997)
3. **Support** means to assist or to be involved with, but not be responsible for. It refers to the assistance provided for establishing, maintaining, and operating community seed banks.

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## 4. **Networking** refers to the assistance provided for in a business or **social context**.

It refers to the collaboration and connection between the community seed banks,

and stakeholders allowing them to:

- Exchange seeds
- Share knowledge
- Share experiences.

## Stakeholders and their forms of Support



The community seed bank members need to recognize the various individuals, occupations, and institutions interested in the farmers' seed systems and mobilize support from and network with them.

Stakeholders of community seed banks that members need to mobilize, collaborate, and partner with by occupation.

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No	Stakeholders	Description of roles they play that could benefit the Seed Bank
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①

Individual farmers.

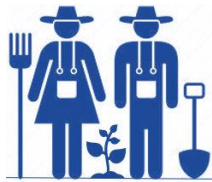


- Regeneration of a diverse range of locally adapted crop varieties.
- Conservation of traditional seed varieties and cultural heritage.
- Farmer-to-farmer exchange, seed repatriation, knowledge sharing, and networking.
- Income generation through trade in seeds and crops.

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2

Farmer organizations



- Platform for farmer-led innovation and experimentation in seed saving.
  - Collective voice in advocating for seed rights and policies.
  - Access a diverse range of locally adapted crop varieties.
  - Preservation of traditional seed varieties and cultural heritage.
  - Capacity building and knowledge sharing in seed conservation.
-



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③ Community Seed Banks



- Conservation efforts through collective action.
- Collaboration and knowledge sharing with a network of seed banks.
- Store a pool of seed varieties for conservation and distribution.
- Exchange of expertise and best practices in seed bank management.
- Visibility and recognition within the seed conservation community.

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④ Researchers and research agencies



- Collaboration with farmers and communities in participatory research projects.
- Improved understanding of local crop varieties and their potential.
- Contribution to the development of sustainable and resilient agricultural systems.
- Access to a diverse and easily accessible source of genetic material for research.
- Preservation of valuable genetic resources for future scientific studies.

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⑤ Education and Training Institutions




- Practical learning and research on seed conservation and diversity.
- Integration of seed systems into curriculum and research activities.
- Capacity building for students and professionals in seed science and technology.
- Promotion of community engagement and participatory approaches.
- Contribution to the preservation of local knowledge and traditional farming practices.


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⑥ Policy makers and Justice department.



- Support for the implementation of policies promoting seed diversity and conservation.
  - Preservation of local seed sovereignty and cultural heritage.
  - Enhanced food security and resilience to climate change at the community level.
  - Contribution to the achievement of sustainable development goals.
  - Strengthening legal frameworks for seed conservation and protection.
-

- 
- 7 Law enforcement and Security agencies
- 
- Prevention of illegal trade and smuggling of seeds and crops.
  - Enhanced ability to detect and combat the spread of invasive plant species.
  - Preservation of seed diversity as an integral part of environmental protection.
  - Contribution to the enforcement of regulations related to seed conservation.
  - Improve cooperation and information sharing with relevant stakeholders.
- 

- 8 Nutritionists, Caterers, and local restaurants
- 
- Promote recipes of nutritious and locally adapted crop varieties.
  - Promotion of healthy and sustainable diets through the use of locally produced seeds.
  - Collaboration with stakeholders to identify and promote nutritionally rich crops.
  - Support for the preservation of traditional food culture and culinary heritage.
  - Increased availability of fresh and high-quality ingredients for meal preparation.
- 

- 9 Transporters' Association
- 
- Transportation of seeds to and from community seed banks.
  - New business opportunities and revenue streams through seed delivery services.
  - Contribution to the development of local and regional seed trade networks.
  - Strengthen infrastructure and logistics for seed transportation.
  - Support for the sustainable and efficient movement of seeds.
- 

- 10 NGOs, and other Development Partners
- 
- Advocacy and support for policies promoting seed diversity and conservation.
  - Capacity building and technical assistance in seed bank management.
  - Support community-led initiatives in seed conservation and diversity.
  - Collaboration and funding opportunities for community seed banks.
  - Strengthened partnerships for sustainable agricultural development.
- 

- 11 Government
- Construct roads and communications infrastructure.
  - Promote preservation of traditional crop varieties and cultural heritage.
-



- Strengthened community engagement and participation in agricultural activities.
  - Creation of new job opportunities including extension agents to provide services for seed conservation and distribution.
  - Improved local agricultural systems and sustainable development.
- 

**12** Seed companies and farm inputs enterprises



- Improve, and multiply a range of high-value crop genetic material.
  - Collaboration with community seed banks for seed testing and evaluation.
  - Increased market opportunities for locally adapted seed varieties.
  - Enhanced reputation and recognition through support of seed conservation activities.
  - Improved understanding of local seed systems and farmer needs.
-

## Guide for discussion on support and networks

There is ample evidence that a combination of material, technical, financial, social, political, and moral support is necessary for the establishment and continuous operations of community seed banks. Although farmers are sometimes able to generate local resources to establish the seed bank and build a basic facility, external support is of great help.

However, a seed bank requires not only material resources, but also human capacity. National extension, conservation, and research agencies; national and international NGOs; and international research organizations can all provide technical training to members on a wide range of subjects: soil health analysis forms of support can strengthen operations and performance. However, dependence on a single or a few support providers may have a negative effect. As a community seed bank matures, the nature and level of support they need will change: more demand-driven forms of support can be expected to replace supply-driven forms.

The most common links built by a community seed bank are with international or national NGOs. In some cases, national and international research organizations (notably Bioversity International) provide technical and financial support. Through these support organizations, some seed banks have begun to interact with national government agencies that set policies on plant genetic resources. However, even when long-term relations exist, they are seldom stable because of their often highly personal nature as well as the financial uncertainty that faces these organizations.

Many factors influence networking dynamics, e.g., geography, roads, communications infrastructure, local culture, the role of local leaders, municipal or district politics, the occurrence of natural disasters, civil unrest or war, national policy development, international development priorities, and the international financial situation.

**Source:** Adapted from Vernooij et al. 2020

## **Factors that affect growth and development of Community Seed Banks.**

After the establishment of a community seed bank, it is expected to grow as it continues to receive support. However, some seed banks remain at the initial stage or cease to function as expected because of the following reasons:

- Cultural values that do not encourage seed sharing
- Lack of strong community support to maintain operations
- Labour shortage due to none involvement of most community members.
- Inadequate motivation, and development of the social capital
- Lack of adherence to principles, and compliance with rules and regulations that guide operations
- Over dependence on external support

## Important note!

Consider these factors from the start and reflect on how they might influence the operation and sustainability of a community seed bank and act appropriately to prevent failure.



- Appreciate the value of and joy in sharing, knowledge, and preservation of common goods.
- Unite for a common cause and develop community solutions for common problems.
- Encourage involvement of all community members, boys and girls, women and men, youths, and adults, and all relevant stakeholders.
- Get support to develop social and human capital who will own and be highly motivated to manage operations and achieve the objectives of the seed bank and grow with it.
- Implement punitive measures against members who do not comply with rules and regulations. You may also collaborate with law enforcement agencies of the local government to protect the property of the community seed bank.
- Build resilience for self-reliance and advocate for support where necessary.

## Exercise 6: Support and networking

1. Which of the following statement(s) is (are) true?
  - a) Various forms of support will always strengthen operations and performance of a community seed bank.
  - b) The degree of dependence on a single or a few support providers does not matter as such, as long as the community seed bank has the necessary resources to operate.
  - c) As a community seed bank matures, more demand-driven forms of support can replace supply-driven forms.
2. What could national guidelines for cooperation between community seed banks and support providers specify?
3. Is a community seed bank authorized to conduct participatory plant breeding and variety selection alongside the formal research system? Explain your answer.
4. Mention five important stakeholders of a community seed bank and explain their roles and how they affect the seed bank.


## Reference and further reading



Bhandari, P. (2022, May 04). *Data Collection Methods | Step-by-Step Guide & Examples*. Scribbr. Retrieved 4 December 2023, from <https://www.scribbr.co.uk/research-methods/data-collection-guide/>

Gupta, A., Dadlani, M., Quek, P., Mathur, P. 2015. Community Seed Banks. A Working Manual. Bioversity International, New Delhi, India. [https://www.researchgate.net/publication/295857981\\_COMMUNITY\\_SEED\\_BANKS](https://www.researchgate.net/publication/295857981_COMMUNITY_SEED_BANKS)

Lewis, V. and Mulvany, P.M. 1997. A typology of community seed banks. Natural Resources Institute, Chatham. United Kingdom.

Vernooy, R., Sthapit, B. and Bessette, G. 2020. Community seed banks: concept and practice. Facilitator handbook (updated version). Bioversity International, Rome. Italy. <https://hdl.handle.net/10568/81286>

Vernooy, R.; Shrestha, P.; Sthapit, B. (editors). (2015). *Community seed banks: origins, evolution and prospects*. Routledge, London, UK. <https://hdl.handle.net/10568/68708>

## Overview.



This topic gives an overview of the institutional and regulatory environments that can influence the establishment and operations of a community seed bank and its viability/sustainability.

## Learning Outcomes.



At the end of this topic, the learners should be able to:

- Identify policy measures and legislation that can support community seed banks
- Identify policy barriers to the development of community seed banks

## Duration.

1 hours,  
30 minutes



Introduction and Pre-test (Evaluation)	<b>15 minutes</b>
Plenary: 1 Brainstorming, Question and Answer	<b>10 minutes</b>
Plenary: 2 Group discussions (Exercises)	<b>20 minutes</b>
Plenary: 3 Presentations	<b>20 minutes</b>
Post-test (Evaluation)	<b>5 minutes</b>
Conclusion	

## Equipment or materials needed



- Slide or poster showing the definition of a community seed bank
- Slide or poster showing the framework of functions and services
- Mobile projector
- Notebooks and pens for participants
- Large sheets of paper, cards, markers, tape, or pins for examples and illustrations



## Introduction



Around the world, community seed banks operate in countries with diverse political regimes and policy and legal contexts. However, until now, very little attention has been paid to analyzing the policy and legal environment in which community seed banks operate. This topic aims to offer some initial insights about this very important issue.

## Key words



**Law;** is a system of rules that are created and enforced through social or governmental institutions to regulate behavior, and it can be enforced by imposition of penalties

**Policy;** is a course or principle of action adopted or proposed by a government, party, business, or individual. It sets out the goals and outlines the ways or strategies in which they are to be achieved.

**Protocol;** is a set of rules and guidelines for how something should be done. In a technical sense, it can refer to rules for communication between different systems.

**Convention;** is a widely accepted established practice or custom especially within a particular group or industry. It can also refer to a large formal assembly or conference.

## Brainstorming

- Which policies and laws concerning conservation and management of crop diversity on-farm and in situ affect the operations of community seed banks? How are they affected?
- What public policy interventions have supported the operation of community seed banks? Are community seed banks recognized and rewarded as an expression of farmers' rights? If so, are they legally protected.
- What kinds of policy instruments could be put in place, if none exist, to create incentives for community seed banks to maintain crop diversity and contribute to other ecosystem services derived from biodiversity in agricultural landscapes.

## Examples of policies.

Many policies and laws have been enacted at the national level that influence the seed systems. While at the regional level and globally there exist also protocols and treaties ratified by governments that also influence the seed systems. Some are indicated in the table 7 below.

**Table 8: Policies and laws that influence the establishment and operations of community seed banks**

Policy or law	How it affects community seed banks	Positive or negative impact
Republic of South Sudan Agriculture Sector Policy Framework, 2012-2017	<ul style="list-style-type: none"> <li>• Provides for support to farmers who are members to organized groups with common interest through extension services.</li> <li>• Empowering communities and their leaders to effectively participate in sustainable development initiatives.</li> </ul>	<ul style="list-style-type: none"> <li>• Government support through social capital development.</li> <li>• Encourages research and innovation.</li> <li>• Encourages agricultural development.</li> </ul>
South Sudan Seed Policy	<ul style="list-style-type: none"> <li>• Provides guidelines for establishing maintaining and management of seed banks and controls behavior of actors within the framework of seed policy.</li> </ul>	<ul style="list-style-type: none"> <li>• Regulation of the seed systems.</li> <li>• Strengthening of informal seed systems.</li> </ul>
Community seed bank governance manual	<ul style="list-style-type: none"> <li>• Locally agreed laws by the founding members of the community seed bank that guides operational modalities and regulating behavior of its members.</li> </ul>	<ul style="list-style-type: none"> <li>• Members can be held accountable.</li> <li>• Clarity in roles of members, their rights, and obligations</li> <li>• Promotion and multiplication of seeds of landraces.</li> </ul>
Permanent Constitution of the Republic of South Sudan	<ul style="list-style-type: none"> <li>• Is supreme law of the nation, used together with the local community laws</li> </ul>	<ul style="list-style-type: none"> <li>• Provision for enforcement of applicable laws.</li> </ul>
Arusha Protocol for the Protection of New Varieties of Plants within the Framework of the African Regional Intellectual Property Organization (ARIPO)	<ul style="list-style-type: none"> <li>• Facilitates access and encourages farmers to adopt new varieties.</li> <li>• Prevents multiplication of protected crop varieties by commercial farmers</li> <li>• Creates balance between breeders' and farmers' rights for the purpose of promoting food security</li> </ul>	<ul style="list-style-type: none"> <li>• Protection breeders' rights within contracting states</li> <li>• Protection of small-holder -farmers' rights.</li> <li>• Restriction of irresponsible and unauthorized multiplication of copyrighted new varieties by large-scale farmers.</li> </ul>
Convention on Biological Diversity	<ul style="list-style-type: none"> <li>• Promotes conservation of biodiversity</li> <li>• Promotes sustainable use of biodiversity,</li> </ul>	<ul style="list-style-type: none"> <li>• Active participation of local community members in in-situ conservation.</li> </ul>

	<ul style="list-style-type: none"> <li>• Promotes the fair and equitable sharing of the benefits arising from the use of genetic resources</li> </ul>	
International Treaty on Plant Genetic Resources	<ul style="list-style-type: none"> <li>• Promotes conservation and sustainable use of all plant genetic resources for food and agriculture</li> <li>• Encourages fair and equitable sharing of benefits arising out of their use, for sustainable agriculture and food security.</li> <li>• Encourages active participation of local communities in conservation efforts</li> </ul>	<ul style="list-style-type: none"> <li>• Active participation of local community members in in-situ conservation.</li> <li>• Concern for sustainable use of plant genetic resources.</li> <li>• Resilience of local communities is improved.</li> <li>• Climate change adaption.</li> </ul>
Companies' and associations' act	<ul style="list-style-type: none"> <li>• Registration and profiling of community seed banks when they have grown and are advanced in their operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of legally recognized community seed banks across the country.</li> <li>• Creation of enabling environment for operations, networking and collaboration of stakeholders within seed systems.</li> </ul>

## References or Further reading



Agriculture Sector Policy Framework, August 2012, Ministry of Agriculture, Forestry, Cooperatives and Rural Development. Republic of South Sudan, Juba. South Sudan.

Arusha Protocol for Protection of New Varieties of Plants within the Framework of the African Regional Intellectual Property Organization (ARIPO). (*Adopted by a Diplomatic Conference of ARIPO at Arusha, (Tanzania) on July 6, 2015*)

Convention on Biological Diversity, Text and Annexes, 2011. United Nations Environment Programme, Montreal, Quebec, Canada. Accessed on 5<sup>th</sup> February 2024, from [www.cbd.int](http://www.cbd.int)

Vernooy, R., Sthapit, B. and Bessette, G. 2020. Community seed banks: concept and practice. Facilitator handbook (updated version). Bioversity International, Rome. Italy. <https://hdl.handle.net/10568/81286>

## Overview.



This topic analyzes what the key dimensions of viability and sustainability are and how they can be addressed in practice. Among others, potential value chain activities will be addressed to create income based on the crops held by the communities and (novel) products that could be made/manufactured based on them.

## Learning Outcomes.



At the end of this topic, the learners should be able to:

- Identify at least four key dimensions of sustainability of a community seed bank
- Understand and explain the supportive conditions that must be in place for a community seed bank to remain effective.

## Duration.

1hours,  
30minutes



Introduction and Pre-test (Evaluation)	<b>15 minutes</b>
Plenary: 1 Brainstorming, Question and Answer	<b>10 minutes</b>
Plenary: 2 Group discussions (Exercises)	<b>20 minutes</b>
Plenary: 3 Presentations	<b>20 minutes</b>
Post-test (Evaluation)	<b>20 minutes</b>
Conclusion	<b>5 minutes</b>

## Equipment or materials needed



- Slide or poster showing the definition of a community seed bank
- Slide or poster showing the framework of functions and services
- Mobile projector
- Notebooks and pens for participants
- Large sheets of paper, cards, markers, tape, or pins for examples and illustrations

## Introduction



In previous topics, we discussed key aspects of the operations and performance of community seed banks. Those factors influence what is known as organizational viability. However, sustainability, or long-term viability, is the greatest challenge facing community seed banks.

Performance over time depends on the quality of technical and operational capacities, such as adherence to phytosanitary standards, quality seed production, technical rigour in monitoring germination and ensuring viability of stored seed, and management of information about stored varieties and growing conditions. It also depends on how well the chosen governance and operational management process works. Building a strong organizational foundation is crucial. As in other organizational efforts, when community seed banks are established without proper foundations, long-term survival is difficult.

A number of conditions must be met to ensure sustainability: legal recognition and protection, options for financial viability, members with adequate technical knowledge, and effective operational mechanisms. Careful and systematic planning right from the start is another important factor.

This module describes how to assess the viability of a community seed bank and introduces aspects of sustainability, namely, human and social capital, economic empowerment, policy and legal environment, and operational modality. Two learning activities focus on these dimensions.

### Key words



**“Viability”**: The property of being viable; the ability to live or to succeed.

**“Sustainability”**: The ability to sustain a business in the long term, which is state that is partly dependent on, but broader than, profitability today or in the short term; involves aspects of a plausible path toward eventual profitability (as applies to start up).

**“Human and social capital”**: The value created by social interaction within and between social networks.

**“Economic empowerment”**: The achievement of economic power by the individual members or seed bank as an institution.

**“Operational modalities”**: The methods adopted by community seed banks for participation and decision-making by members relate to the key tasks to be carried out

**“ex ante evaluation”**: a forward-looking assessment of the likely future effects of new initiatives.

## Viability of a seed bank

When a community seed bank is first established, it is valuable to make an ex ante assessment of its viability; Vernooy et al (2020). An ex ante evaluation of its viability determines likelihood of longevity of the new establishment. The evaluation identifies the seed bank’s strengths and areas for improvement. This involves scrutinizing the key dimensions that influences its viability and sustainability.

South Sudan is yet to establish its first few community seed banks. The already established seed bank like University of Juba seed bank and other new initiatives could be assessed using the following criteria.

start-up might be smooth, but that does not guarantee there will be no challenges. If the overall score is somewhere in the average grade, pay special attention to the criteria that do not score well and explore how to improve those factors over time.

**Table 9: Criteria for assessing the state of a community seed bank.**

#	Criteria	Very strong (4)	Strong (3)	Averag (2)	Weak (1)	Poor (0)	Score
1	Community engagement and participation in the seed bank						
2	Farmers’ interests in conservation of local crop varieties						
3	Inclusivity and diversity in decision making						
4	Availability of a local resource person to mobilize people and facilitate initial steps (farmers’ leadership)						
5	Seed bank governance and operational modalities (future promise for economic empowerment of members )						
6	Availability of diversity seed varieties						
7	Responsiveness to a decline in locally adapted crop diversity						
8	Seed quality and viability						
9	Adequacy of storage facilities						
10	Local Knowledge preservation						

11	Training and capacity building of human capital						
12	Funding support and resource mobilization						
13	Capacity for data management and documentation						
14	Sound technical support (from extension agents, universities)						
15	Seed bank networking and partnerships						
16	Legal and policy environment (recognition, incentives)						
17	Sustainable farming practices						
18	Community resilience and food security						
19	Adaptability to climate change						
20	Monitoring and evaluation processes						
21	Accessibility for marginalized groups (non-members)						
22	Conflict resolution mechanisms						
23	Potential to evolve into a broader community development institution						
<b>Mean score that reflects viability of seed bank</b>							

Source: Some extracts from figure 2 on page 114 of Vernooij et al (2020).

## Sustainability.

Sustainability of community seed banks has various key dimensions. Most of the key dimensions have been mentioned several times through all the seven topics discussed above. These key dimensions shall be discussed for emphasis here. These include:

### 1. Building human and social capital

A community seed bank is usually established after the effects of a local resource person to mobilize people and facilitate initial steps. Although it functions on the principles of participation, collective decision-making, and shared responsibility for resources, risks, and benefits. Women and men farmers, must be involved to work together and participate in activities, strengthen their capacity for collective action and build human and social capital.

Traditional knowledge-based practices used in seed banks are normally relatively simple and low cost. However, Some use modern equipment and the latest technologies. When participants are fully equipped with the technical knowledge and skills to conserve good-quality seed, chances of long-term functioning of the community seed bank are good. However, building capacities takes time and effort.

### 2. Operational modality



The methods adopted by community seed banks for participation and decision-making by members relate to the key tasks to be carried out. Rules and regulations are usually established by the members themselves and efforts are usually made to respect them. In most cases, both women and men farmers are active participants.

The operational dimension is important in terms of sustainability, because it is through the practices related to seed circulation among members and non-members that a community seed bank comes to life and remains active. Clear roles and responsibilities of the management team are features of well-governed community seed banks.

### **3. Economic empowerment**

To be financially viable and not depend completely on voluntary labour, a community seed bank should be designed in a way that it generates economic incentives at two levels: for its members (in particular those playing key roles) and for the organization as a whole. Community seed banks frequently become less functional when external support is withdrawn because of the lack of revenue to support member families.

### **4. Policy and legal provisions**

Without legal recognition, community seed banks are less likely to be sustainable in the long run. Most seed banks have been established with support from NGOs through project funds, usually of short duration. For seed banks to find their own funding, they require legal recognition and registration in most countries, as many funding agencies hesitate to provide support to an organization that is not a legal entity. On the positive side, obtaining legal recognition contributes to building confidence among seed bank members by requiring them to operate on equal terms with public, private, and civil society organizations.

Another strategy is for community seed banks to become part of a network connected to the national level genebank.

## **Conclusion**

It is not easy to achieve these four dimensions of sustainability. However, some community seed banks have made progress on the policy and legal sides, some have developed promising options for financial viability, some are working hard to improve technical knowledge and skills, and many are paying attention to developing more effective operational mechanisms.

Periodic assessment of the state of the community seed bank will enable checks and improvements to be made that may give the institution a chance to live longer and provide value to its members and ultimately to achieve goals set for the community seed bank.

## **References or Further reading**



Vernooy, R., Sthapit, B. and Bessette, G. 2020. Community seed banks: concept and practice. Facilitator handbook (updated version). Bioversity International, Rome. Italy.  
<https://hdl.handle.net/10568/81286>

# ANNEX

## COMMUNITY SEED BANK GOVERNANCE MANUAL

### 1. Preamble:

The community seed bank in South Sudan stands as a beacon of hope and resilience, dedicated to preserving the invaluable heritage of landraces in our region. Our mission is clear: to deeply engage with our community in order to foster agricultural development, enhance the accessibility of seeds, and fortify food security and sovereignty. By safeguarding these traditional varieties, we not only protect our biodiversity but also empower our local economy. In the face of climate change challenges, our seed bank serves as a stronghold, aiding in the building of resilient agricultural practices. Together, we strive toward a future where sustainable farming methods prevail, where every seed sown represents a step closer to a more secure and prosperous tomorrow for all in South Sudan.

### 2. The name of the seed bank shall be called .....

### 3. Vision:

Community that is secure and prosperous, with our seed bank serving as a stronghold, aiding the building of resilient, sustainable agricultural practices.

### 4. Mission:

To deeply engage with our community in order to foster agricultural development, enhance the accessibility of seeds, and fortify food security, sovereignty and local economic development.

### 5. Core Values:

- Cooperation
- Transparency
- Accountability
- Continuous learning
- Research and innovation

### 6. Goals

To safeguard the traditional varieties, with main aim of, not only protecting our biodiversity but also empower our local economy.

### 7. Objectives:

- To conserve local varieties on a short-term basis.
- To conserve heirloom and rare varieties for a longer term.
- To repatriate and restore “lost” varieties.
- To maintain local control over seed conservation, exchange, and production activities.
- To foster seed exchanges at local and supra-local levels.
- To enable access to novel diversity not conserved locally.
- To breed and multiply seed varieties through participatory activities.
- To generate income through the sale of seeds and other crop products.
- To share agricultural biodiversity knowledge and expertise.
- To support traditional and ethnic food culture and cultural use.
- To contribute to ecological agriculture and food sovereignty movements.
- To cooperate and collaborate with various stakeholders in building the capacity of the organization.

### 8. Functions and Services:

Functions	Services	Examples of activities
• Conservation	• Seed regeneration and multiplication.	• Production of selected locally adapted crops /breeding.
	• Seed preservation.	• Seed collection.
		• Seed cleaning.
		• Seed sorting and grading.
		• Seed treatment.

		<ul style="list-style-type: none"> <li>• Seed storage or safeguarding.</li> <li>• Seed-saving facility rental.</li> <li>• Seed exchange.</li> </ul>
• Distribution	<ul style="list-style-type: none"> <li>• Seed repatriation.</li> <li>• Depository and cataloging.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed repatriation and restoration.</li> <li>• Seed stocking /or depositing.</li> <li>• Seed packaging and labeling/branding.</li> <li>• Cataloging (registration).</li> </ul>
	<ul style="list-style-type: none"> <li>• Seed distribution.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed distribution.</li> <li>• Seed loans.</li> </ul>
• Income generation for members	<ul style="list-style-type: none"> <li>• Agribusiness and consultancy services.</li> </ul>	<ul style="list-style-type: none"> <li>• Seed fairs.</li> <li>• Provision of agroecological advice and technical services.</li> <li>• Seed sales.</li> <li>• Seedling production.</li> <li>• Sale of seedlings and other products.</li> </ul>
• Learning Center	<ul style="list-style-type: none"> <li>• Agricultural Technical and Vocational Education and Training (TVET) services.</li> <li>• Extension services.</li> </ul>	<ul style="list-style-type: none"> <li>• Documentation of traditional indigenous knowledge.</li> <li>• Awareness creation and education.</li> <li>• Training in ecological and sustainable agricultural practices.</li> <li>• Exposure and Exchange learning visits.</li> <li>• Farmer-to-farmer field visits for knowledge and experience sharing.</li> <li>• Gardening workshops/ Demonstrations.</li> </ul>
• Seed development and innovation center	<ul style="list-style-type: none"> <li>• Promotion of new seed conservation technologies.</li> <li>• Promotion of climate change adaptation practices.</li> <li>• Realization of food sovereignty</li> </ul>	<ul style="list-style-type: none"> <li>• Crop research and development.</li> <li>• Seed testing.</li> <li>• Participatory crop/variety improvement.</li> <li>• Practicing agroecological practices for example agroforestry.</li> <li>• Policy advocacy.</li> <li>• Networking, collaboration, and coordination of stakeholders.</li> <li>• Protection of endangered crops and heirloom varieties.</li> <li>• Value addition to crop products.</li> <li>• Promotion of food sovereignty.</li> <li>• Local food exhibitions and cultural gala.</li> </ul>

### 9. Technical Guiding Principles:

A community seed bank is an essential establishment for conserving and maintaining local agricultural biodiversity. The technical operations of a community seed bank are guided by several principles and practices. Let's discuss some of them:

- **Selection of crop species and varieties:** The seed banks shall choose crops and varieties to be preserved. Using the step-by-step participatory approach; the Five-Cell Analysis tool, the members of the community Seed banks shall prioritize and select the species and varieties of landraces to be conserved citing the reasons for the choices made.
- **Collection and Conservation:** The primary objective of the community seed bank is to collect, conserve, and maintain a diverse range of local crop varieties. This involves gathering seeds from traditional farmers, registering the seeds, documenting their characteristics, and conserving them using the methods agreed upon by the seed bank members. Depending on the type of seed selected (generative or vegetative seeds) conservation method may be on-farm, in-situ, or ex-situ conservation. It will also involve regularly regenerating seeds to maintain their genetic diversity.
- **Seed Storage and Quality Management:** Ensuring seed quality is crucial to maintain the integrity of the seed bank's collection. Quality management practices include drying the generative seeds and then storing the seeds in a cool, dry place using appropriate containers. The seed processing methods may be the traditional techniques the members already know or new innovative drying and conservation techniques that shall be taught to the farmers. Hermetic storage was found to be the most effective form of seed storage where the seeds are stored in totally airtight containers made of plastic, metal, and glass (Arnab et al. 2015). Important practice involves regular monitoring of seed germination rates, detection and prevention of seed-borne diseases or pests, and appropriate labeling and documentation of seed lots.

- **Participatory Approach:** Community seed banks often follow a participatory approach, involving farmers and community members in decision-making processes. This includes engaging farmers in seed collection and sharing, as well as encouraging their active participation in seed selection, evaluation, and overall seed bank management.
- **Knowledge Sharing and Capacity Building:** Community seed banks serve as centers for knowledge sharing and capacity building. They provide training and workshops to educate farmers on seed conservation, sustainable farming practices, and maintaining local crop diversity. The center documents the seed collection process and information about each seed collected and shares the information with other community seed banks. Sharing knowledge and empowering farmers strengthens the long-term viability and sustainability of the seed bank. The documentation shall be done by collecting data during, seed registration, recording of seed management activities focus-group discussions during training sessions and observation during field visits. Moreover, the information on the varietal characteristics serves as a storehouse of information. It can be valuable for other communities and also for planning sowings within the community.
- **Exchange and Distribution:** The seed bank shall facilitate the exchange and distribution of seeds among farmers. The Seed banks shall establish protocols for fair and equitable seed sharing, ensuring that farmers have access to diverse seeds that meet their specific needs. This helps to strengthen local farming systems and promote crop resilience. The protocols established shall be part of the rules and regulations that shall guide the governance and operations of the community seed banks.
- **Networking and Collaboration:** Collaboration and networking with other seed banks, agricultural research institutions, NGOs, and government agencies is vital for the success of a community seed bank. Sharing experiences, collaborating on research, and establishing partnerships can enhance the technical expertise and resources available to the seed bank.
- **Adaptive Management and Continuous Improvement:** The community seed bank should continuously assess and adapt its operations to meet the evolving needs of farmers and changing environmental conditions. Regular monitoring and evaluation allow for improvements in seed bank management practices, ensuring its long-term viability and effectiveness, and assessing the trend of agricultural biodiversity.

## 10. Membership:

10.1 There shall be three forms of membership.

- i. Individual members,
- ii. Associate members.
- iii. Honorary members

10.2 Individual members shall refer to farmers within the community who qualify for members by virtue of being community members.

10.3 Associate members refer to farmer groups within or outside of the community accepted on application to be member to the seed bank, where a farmer group shall be considered as a single member.

10.4 The honorary member refer to stakeholders who are well-wishers and do not have direct duties but play supportive roles and act as ambassadors for the seed bank.

10.5 Except for the honorary members, the individual and associate members shall pay a one-time membership and annual subscription fees and shall e registered.

10.6 The amount of the fees to be paid shall be agreed upon by the general assembly from time to time.

## 11. Rights and Obligations of Members:

11.1 The members have right to attend meetings of the seed bank.

11.2 A member can call a meeting through the chairperson whenever there is a matter of concern.

11.3 Members have right to access to seed bank premises. However, if restriction is deemed necessary the general assembly, a member may be required to seek authorization to gain access.

11.4 Members have right to be elected to a position of leadership if they meet the eligibility requirements in article 18.8 i) below.

11.5 Members have a right to participate in all activities of the seed bank.

**12. Leadership:**

12.1 The supreme decision making body of the seed bank shall be the general assembly whose decisions shall be executed by a Board of Directors and Management committees.

12.2 The seed bank shall be governed by a 3 to 5-member board of governors that comprise the following positions;

- i. Chairperson
- ii. Vice chairperson
- iii. Secretary
- iv. Vice secretary
- v. Treasurer

The Board of Directors shall be responsible for executing the decisions of the general assembly.

**13. Management Committees:**

The seed bank shall be managed by committees agreed upon by the general assembly, which may be as follow;

- i. ....
- ii. ....

**14. Responsibilities of Leaders & Committees:**

The following shall be the responsibilities of the leaders.

14.1 The chairperson shall:

- i. ....
- ii. ....
- iii. ....

14.2 The vice chairperson shall:

- i. ....
- ii. ....
- iii. ....

14.3 The Secretary shall:

- i. ....
- ii. ....
- iii. ....

14.4 The Vice Secretary shall:

- i. ....
- ii. ....
- iii. ....

14.5 The Treasurer shall:

- i. ....
- ii. ....
- iii. ....

The responsibilities of the committees shall be as follows:

14.6 The ..... Committee shall:

- a. ....
- b. ....
- c. ....
- d. ....

14.7 The ..... Committee shall:

- a. ....
- b. ....
- c. ....
- d. ....

**14.8 Elections**

- i) Eligibility requirements
- ii) Term of office
- iii) Conduct of elections
- iv) Bye-elections
- v) Vote of no confidence
- vi) Termination of office

**15. Meetings:**

- 15.1 Notices for meetings shall be served at least one week in advance, with exception for urgent or emergency meetings.
- 15.2 Meeting invitation shall indicate time, venue and the agenda for the meeting.
- 15.3 Quorum shall be at least two thirds (2/3) of the members of the seed bank.
- 15.4 Meetings shall be held (indicate the frequency) .....

**16. Minutes of Meetings:**

- 16.1 Minutes of all meetings shall be recorded and kept for confirmation in the following meeting.
- 16.2 The secretary shall keep safe minutes of all meetings.

**17. Documentation:**

The seed bank shall maintain the following or more books to manage documentation of seed bank information and activities.

- i. Membership registration book
- ii. Minutes of meeting register
- iii. Seed registration book
- iv. Management records book
- v. Seed movement book

**18. Resources:**

- 18.1 The leadership of the seed bank shall mobilize financial and other resources for the effective management of the institution.
- 18.2 The sources of funding for the seed bank may include the following;
  - i. Membership fees
  - ii. Subscription fees
  - iii. Donations
  - iv. Grants
  - v. Income generating activities

**19. Operation Modalities:**

- Framework outlining the operational structure and processes of the seed bank.

**20. Applicable Laws:**

This governance manual and the constitution of South Sudan shall be the supreme documents that shall guide operations of the seed bank, however should there be any contradiction then the constitution of South Sudan shall override.

**21. Amendments:**

This manual shall be subject to amendment when it is deemed necessary by the general assembly.

**22. Arbitration:**

22.1 A disciplinary committee shall be formed to resolve disputes or conflicts should they arise within the seed bank's operations.

22.2 If act is criminal in nature, the matter may be reported to the Headman at the boma or to the payam and county level depending on its gravity of the matter.



# Glossary

1. **Community Seed Bank:** A local, mainly informal institution whose core function is to maintain, safeguard, and exchange local and farmer-preferred seeds for local use. Community seed banks play a crucial role in conserving agricultural biodiversity and supporting food security by preserving a range of local crop varieties.
2. **Seed:** The part of a plant from which a new plant can be grown, which can be generative (like grain or fruit seed) or vegetative (like a stem, tuber, or bulb). Seeds are fundamental to agricultural practices and biodiversity, serving as the basis for plant reproduction and crop diversity.
3. **Landrace:** A local variety of a domesticated plant or animal species that has adapted over time to its local natural and cultural environment. Landraces are important for maintaining genetic diversity and can offer resilience to local conditions.
4. **Accession:** In the context of seed banks, 'accession' refers to a lot or batch of seeds that enters the bank. Each accession is unique and is carefully documented to track the variety's characteristics and origin.
5. **Seed Management:** Involves all activities related to the conservation, multiplication, distribution, and utilization of seeds. Effective seed management ensures the quality, diversity, and availability of seeds for sustainable agriculture.
6. **Biodiversity Assessment:** A systematic method to measure the variety and distribution of species in an environment. This is vital in agriculture for identifying the range of plant species present, which aids in their conservation and informed utilization.
7. **Conservation:** In the context of seed banks, this refers to the practices aimed at preserving the genetic diversity and viability of seeds. Conservation strategies are crucial for maintaining plant biodiversity and ensuring the availability of diverse genetic material for future agricultural needs.
8. **Distribution:** This term describes the spatial arrangement of plant species or varieties across a landscape. Understanding the distribution is essential for managing biodiversity and can influence conservation strategies and agricultural planning.
9. **Ecological Agriculture:** A farming approach that emphasizes sustainable and regenerative practices, focusing on ecological principles and biodiversity. It aims to create productive agricultural systems that are in harmony with the natural environment.
10. **Endangered Species:** Plant or animal species that are at significant risk of extinction. In agricultural contexts, this can refer to crop varieties that are in danger of being lost due to factors like habitat destruction, climate change, or genetic erosion.
11. **Food Security:** A condition where all people have access to sufficient, nutritious, and safe food at all times. Community seed banks contribute to food security by ensuring the availability and access to a diverse array of seeds, which supports diverse and resilient food systems.

12. **Genebank:** A facility that stores genetic material, such as seeds, in controlled conditions to preserve genetic diversity. Genebanks are vital for safeguarding plant genetic resources and supporting breeding programs and agricultural research.
13. **Genetic Diversity:** The range of genetic variation found within plant species, populations, or varieties. It's a key component of biodiversity and is essential for the adaptability and resilience of agricultural systems to changes and stresses.
14. **Germination Rate:** The percentage of seeds that successfully sprout and begin growth. Monitoring germination rates is crucial for seed banks to ensure the quality and viability of the seeds stored for conservation or agricultural use.
15. **Heirloom Varieties:** Traditional plant varieties that have been passed down through generations, usually within a particular cultural or geographic community. They are often valued for their unique flavors, adaptability to local conditions, and cultural significance.
16. **Hermetic Storage:** A storage method that uses airtight containers to protect seeds from moisture, pests, and other external factors that could affect their viability. It's a crucial technique for maintaining seed quality over time.
17. **Hybrid:** A plant resulting from the crossbreeding of two genetically distinct parent plants. Hybrids are often bred for specific traits, such as increased yield, disease resistance, or adaptability to certain environmental conditions.
18. **In-situ Conservation:** The practice of conserving plants or animals in their natural habitats. For plants, this means maintaining and supporting the natural populations of species within their traditional growing environments.
19. **Indigenous Knowledge:** The traditional knowledge held by indigenous peoples or local communities. It encompasses a wide range of understanding about the environment, plant species, cultivation practices, and ecological relationships, often contributing to sustainable agricultural practices.
20. **Landrace Conservation:** The effort to preserve landraces, which are locally adapted plant varieties developed over time through traditional agricultural practices. Conserving landraces is crucial for maintaining agricultural biodiversity and resilience.
21. **Local Crop Diversity:** The variety of crop species and varieties that are grown and adapted to a specific local area. This diversity is important for food security, nutritional diversity, and the resilience of agricultural systems.
22. **Micronutrient Deficiencies:** Health conditions caused by inadequate intake of essential vitamins and minerals. Agricultural biodiversity, including a variety of crops, can help provide a balanced diet and prevent such deficiencies.
23. **Natural Resources Institute:** An organization focused on the study and sustainable management of natural resources. It may be involved in research, policy development, and educational programs related to agriculture and environmental conservation.
24. **On-farm Conservation:** The practice of conserving plant genetic diversity on farms through the cultivation and management of diverse crop varieties. It allows for the dynamic evolution of crops and their adaptation to changing environmental conditions and farming practices.
25. **Participatory Crop Improvement:** An approach to crop breeding that involves collaboration between farmers, researchers, and breeders. It integrates local knowledge and preferences with scientific research to develop varieties that are well-suited to local conditions and needs.

26. **Plant Genetic Resources:** The genetic material of plants, which is valuable for breeding, research, and conservation. This includes seeds, cuttings, tissue cultures, and other forms of genetic material that can be used to breed new varieties or restore lost ones.
27. **Quality Seeds:** Seeds that meet specific standards of germination, purity, and health, which are essential for successful cultivation and reliable crop production. High-quality seeds are key to achieving good yields and are fundamental in agricultural practices.