

THE SEEDS OF CHANGE

Seed Bank Management Manual



Message from Ms. Rosinah Mbenya, Country Coordinator, PELUM Kenya

In the quiet hands of farmers, gardeners, and indigenous communities across the world, the humble seed has remained a vessel of hope, heritage, and resilience. Long before industrial agriculture took root, seed saving was a common and essential act—a sacred covenant between people and the land. Today, as we face the intersecting challenges of climate change, biodiversity loss, and food insecurity, the power of the seed has never been more relevant—or more at risk.

This book, *the Seed of Change*, is both a call to action and a guide for transformation. It highlights the wisdom of farmer-managed seed systems and the essential role of seed sovereignty the right of communities to save, use, exchange, and breed their own seeds. In a time when corporate control of seeds is increasing, this movement stands as a powerful reminder that true food security begins at the grassroots level, where seeds are not commodities, but a shared inheritance.

The importance of seed saving is key in bridging the gap between traditional wisdom and modern opportunities. Seeds represent more than the start of plant growth—they carry stories, cultural heritage, and genetic diversity vital for adapting to changing environments. By saving seeds, we preserve the agricultural knowledge and innovations of countless generations while ensuring food security and biodiversity for the future.

This book explores the history and techniques of seed saving, providing practical guidance on selecting, collecting, and storing seeds. It caters to gardeners, small-scale farmers, and global seed-saving advocates, emphasizing the significance of seed banks in safeguarding the planet's food systems.

Seed saving is an act of resilience and sustainability, where each preserved seed contributes to a future of abundance, diversity, and ecological stability. It is my hope that this book will inspire you and communities to embrace seed saving as a meaningful step toward creating a sustainable and food-secure world.

Let this book be your companion in sowing not only seeds of plants, but seeds of change. Because in every seed saved, there is a story protected, a future imagined, and a world reborn.

Message from Samuel Nderitu ,Executive Director , GBIACK

The importance of seed saving lies not only in preserving plant varieties but in bridging the gap between traditional wisdom and modern opportunities for ecological and social transformation. Seeds are more than the beginning of plant life—they are carriers of cultural identity, ancestral knowledge, and ecological memory. Each seed holds a story, a lineage shaped by generations of farmers and communities who selected, adapted, and shared them to meet local needs and environmental conditions.

In a rapidly changing world marked by climate instability, soil degradation, and corporate control over agriculture, seed saving becomes a radical and necessary act. It empowers communities to reclaim their right to grow, exchange, and steward the biodiversity that sustains life. This right, known as seed sovereignty, is fundamental to food sovereignty, ecological resilience, and social justice. It challenges industrial systems that prioritize profit over diversity and places the power back into the hands of farmers, especially women, Indigenous peoples, and smallholders who have long been the custodians of seed diversity.

By saving seeds, we not only preserve plant genetics and agricultural innovations honed over millennia, but also ensure the continuity of biodiversity that is vital for adapting to evolving climates and ecological disruptions. Seed saving strengthens local food systems, reduces dependence on commercial seed markets, and revitalizes traditional practices that are deeply intertwined with community well-being and spiritual connection to the earth.

This book explores the rich history, and practical techniques of seed saving. It offers step-by-step guidance on selecting, collecting, cleaning, and storing seeds, while also addressing the political, cultural, and ecological dimensions of seed sovereignty. Whether you are a home gardener, a small-scale farmer, an educator, or a global advocate, this book invites you to become an active participant in conserving the living legacy of our seeds.

It also emphasizes the role of community seed banks, cooperative networks, and farmer-led seed systems in safeguarding agricultural biodiversity and building climate-resilient ecosystems. These decentralized, grassroots initiatives are not only repositories of genetic diversity—they are spaces of empowerment, learning, and ecological stewardship.

Seed saving is ultimately an act of hope, resilience, and resistance. It honors the past, protects the present, and prepares us for a more just and abundant future. Each seed saved is a commitment to regeneration, diversity, and sovereignty.

It is my hope that this book will inspire you—and your community—to embrace seed saving as a powerful and meaningful step toward creating a food-secure, biodiverse, and ecologically sustainable world.

Enjoy the reading!

Acknowledgement

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Red and White Sorghum displayed in a community seed fair at GBIACK

ABOUT PELUM KENYA

Participatory Ecological Land Use Management (PELUM) Association is a network of Civil Society Organizations / NGOs working with Small-scale farmers and pastoralists in East, Central, and Southern Africa. The Association membership has grown from 25 pioneer members (in 1995) to over 280 members. PELUM Kenya is the Kenyan country chapter of the PELUM Association and has a membership of 69 Member Organizations.

PELUM Kenya network promotes agroecological principles and practices through the following approaches: advocacy and policy influence, networking, capacity development, information, and knowledge sharing. The various agroecological practices promoted include; organic agriculture, sustainable agriculture, regenerative agriculture, agroforestry, permaculture, conservation agriculture, biodynamic agriculture, family farming, and biointensive agriculture.

Vision : Empowered, prosperous, healthy, and resilient communities.

Mission : To promote agroecological principles and practices for sustainable livelihoods among smallholder farmers, pastoralists and fisherfolk

Core Values

1. Commitment to partnership, participation, and networking: PELUM Kenya will strive to establish linkages with strategic partners and strive to ensure Member Organizations work towards a common goal.
2. Commitment to gender equity and social Inclusion: PELUM Kenya recognizes the needs for our work to reflect and promote respect for youth and women empowerment. Additionally, PELUM Kenya will work with other like-minded partners to promote equality and dignity especially with regards to the agricultural communities.
3. Transparency and Accountability: As PELUM Kenya we will hold ourselves accountable for ethical behavior and responsibility for our action while maintaining integrity in our performance and advocating for the same among member organizations
4. Quality service delivery: PELUM Kenya will endeavor to deliver its mandate while maintaining professionalism and delivery of the highest standard to its beneficiaries.

Operating principles

- 1) Diversity: Showcasing the diversity of Ecological Agricultural practices amongst members within and without the Network.
- 2) Learning and Knowledge management: Enable learning for experiences and best practices sharing among members & other actors through networking with others.
- 3) Membership: Ensure that PELUM Kenya is a member-driven Network.

- 4) Innovation. Encourage and support innovativeness across the Network.
- 5) Sustainable Ecosystem: Always striving towards an ecosystem that is healthy and sustainable.
- 6) Advocacy: Advocate on Agricultural ecological issues in favour of small -scale farmers & pastoralists.
- 7) Inclusive Practices: Promoting inclusive practices at all levels as the basis of ownership, empowerment and sustainability.
- 8) Participation: Recognize participation as an enabling & empowering process (everybody's opinion matters, participation is drawn from the members, enhances ownership of the processes, has the strength of inclusiveness, and accommodates

ABOUT GROW BIOINTENSIVE CENTRE FOR KENYA

The Grow Biointensive Agriculture Center of Kenya, demonstrates, trains and promotes Grow Biointensive Agriculture methods and agroecological practices for sustainability among small-scale farm holders in Central, Eastern, and Nairobi counties in Kenya.

Grow Biointensive Agriculture Center of Kenya (G-BiACK) is a community-focused organization dedicated to transforming lives through sustainable agriculture and environmental stewardship.

Founded with the mission of empowering small-scale farmers, G-BiACK specializes in teaching **GROW BIOINTENSIVE** farming techniques that emphasize soil health, resource efficiency, and biodiversity preservation. Our approach is rooted in sustainable practices that enhance food security, increase yields, and promote ecological balance.

At G-BiACK, we work closely with local farmers, youth, and communities to offer practical training, innovative solutions, and access to resources that support organic farming and sustainable livelihoods. Our programs are designed to address pressing challenges such as climate change, food insecurity, and soil degradation while celebrating Kenya's rich agricultural heritage.

Through partnerships, workshops, and on-ground initiatives, we aim to inspire a new generation of environmentally conscious farmers who are committed to feeding their communities and nurturing the planet.

Our Vision.

Communities in which there is a healthy environment and healthy people who are gainfully employed and lead fulfilled lives.

Our Mission.

To seed a sense of empowerment and self reliance in communities that leads to improved food security (sovereignty) and livelihoods and a healthier (improving) environment.



Mr. Nderitu, Executive Director at GBLACK inspecting the maturity of seeds

IMPORTANCE AND BENEFITS OF SEED SAVING

Seed saving is an ancient practice of collecting, cleaning, storing, and replanting seeds, vital for food security, biodiversity, and cultural preservation. It offers numerous benefits, including:

1. Preserving Biodiversity

- Protects a wide variety of plant genes, ensuring ecological resilience.
- Enhances plants' adaptability to changing conditions, pests, and diseases.



Farmers showcasing different beans varieties in their seed bank

2. Cultural Preservation

- Safeguards traditional farming knowledge and practices.
- Maintains culturally significant crops and traditional foods.²²

3. Enhancing Food Security

- Strengthens food systems against climate change and crop failures.
- Locally saved seeds perform better in their native environments, ensuring reliable yields.



GBIACK staff harvesting cassava and sorghum

4. Economic Advantages

- Reduces dependency on commercial seeds, saving costs for farmers.
- Supports local seed businesses and reduces reliance on big corporations.

5. Environmental Sustainability

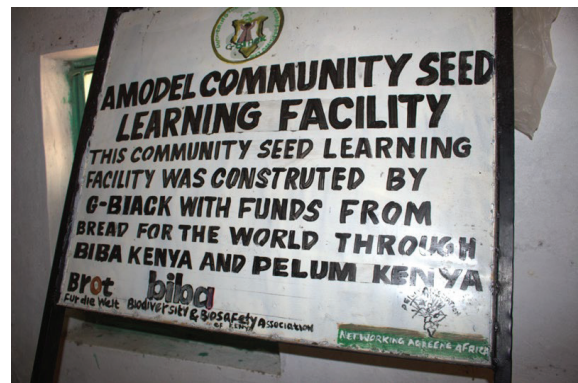
- Lowers the need for chemical inputs, reducing pollution.
- Promotes sustainable practices that protect soil health and biodiversity.

6. Advancing Plant Breeding and Research

- Contributes to breeding programs for stronger, more adaptable crops.
- Provides genetic resources for scientific studies and innovation.

7. Community Empowerment

- Enhances local control over food supplies.
- Educates communities on eco friendly agricultural practices.



8. Climate Adaptation

- Helps crops adapt to unpredictable weather, reducing crop failure risks.
- Supports ecosystems by fostering pollinators, pest control, and soil health.

9. Improved Nutrition

- Preserves heirloom varieties with superior nutritional content.
- Promotes dietary diversity for better health.

10. Protecting Rare and Endangered Plants

- Prevents extinction of rare species.
- Provides secure storage in seed banks as a safety measure.

Seed saving not only fosters self-reliance and food independence but also ensures a resilient, sustainable, and nutritionally rich future for farming and food systems.

Seed saving is cost-effective from a financial viewpoint. Buying seeds annually can be an expensive affair, especially for large gardens or farms. Thus growing crops from saved seeds helps growers to direct their resources more efficiently and invest in other areas of their farming.



BACKGROUND AND SIGNIFICANCE OF CULTURE IN SEED SAVING

Seed saving has historically been crucial for human survival, deeply intertwined with cultural traditions and agricultural practices. Early communities relied on seed preservation for sustainability, embedding traditional knowledge and rituals into their farming practices. This cultural legacy is preserved in heirloom varieties, which embody the tastes, colors, and resilience of crops developed over generations. Saving seeds honors past generations and sustains their agricultural heritage.

In modern times, the dominance of global seed companies limits diversity, with seeds often treated with chemicals and engineered for dependency on pesticides. In contrast, regionally adapted seeds, saved over seasons, learn from local environments and require fewer chemical inputs. This adaptability enhances food security, garden health, and resilience in the face of climate change and unstable food systems.

Initiatives like the GROW BIOINTENSIVE Agriculture Centre of Kenya (G-BiACK) seed learning center promote seed saving as a tool for preserving biodiversity, cultural practices, and sustainability. Through workshops and training, individuals learn to select, collect, clean, and store seeds, focusing on open-pollinated plants that produce true-type offspring. The center fosters collaboration among farmers, supports local seed savers, and emphasizes the importance of traditional and indigenous seeds.

Seed saving is more than a gardening practice; it is a commitment to ecological durability, agricultural diversity, and cultural preservation. By adopting this practice, communities strengthen agriculture and secure a sustainable, resilient future for all.

Historical Context and Cultural Significance of Seed Saving

Seed saving is an ancient agricultural practice dating back over 10,000 years, when early humans transitioned from hunting and gathering to settled farming communities. By selecting and saving seeds from the best plants, early farmers improved crop quality, ensuring reliable food supplies and fostering the growth of civilizations.

Culturally, seed saving holds deep significance across the world. Many traditions and ceremonies revolve around seeds as symbols of life and continuity. In some indigenous cultures, seeds are sacred and central to religious and communal activities, preserving ancestral farming knowledge and fostering connections to heritage. Sharing seeds during celebrations strengthens community bonds and ensures the preservation of agricultural diversity and traditions.



Traditional methods of maize seed storage

THE IMPORTANCE OF HEIRLOOM VARIETIES AND SEED SAVING

Heirloom Varieties

Heirloom seeds, passed down through generations, are vital for preserving plant genetic diversity and cultural heritage. These seeds produce plants true to their original characteristics, retaining unique flavors, colors, and resilience to pests and environmental changes. They provide a glimpse into historical farming and cooking traditions, offering qualities often lost in modern industrial agriculture.

Preservation of Biodiversity and Knowledge

Saving seeds ensures the survival of diverse plant species and preserves traditional farming knowledge. This practice maintains a link between generations, emphasizing the value of local environmental adaptation and sustainable farming methods. As industrial farming prioritizes uniformity, seed saving safeguards biodiversity and cultural practices.

Key Benefits of Seed Saving

Genetic Diversity and Resilience

Seed saving supports a rich pool of plant genes, enhancing resilience against pests, diseases, and climate variability. It reduces the risks of total crop failure by fostering diversity.

Self-Sufficiency and Food Sovereignty

Farmers gain independence from commercial seed companies, allowing them to adapt crops to local conditions and maintain traditional plant varieties. This promotes community control over food systems.

Cost-Effectiveness

By reusing seeds, farmers cut costs, especially helpful for small-scale growers. Savings can be reinvested in soil improvement and other sustainable practices.

Local Adaptation

Locally saved seeds develop traits suited to regional climates and soils, improving crop performance and reducing reliance on external inputs like fertilizers and pesticides.

Cultural Heritage and Community Building

Heirloom seeds carry stories and cultural significance, preserving culinary and farming traditions. Seed exchanges and community gatherings strengthen social bonds and promote knowledge sharing.

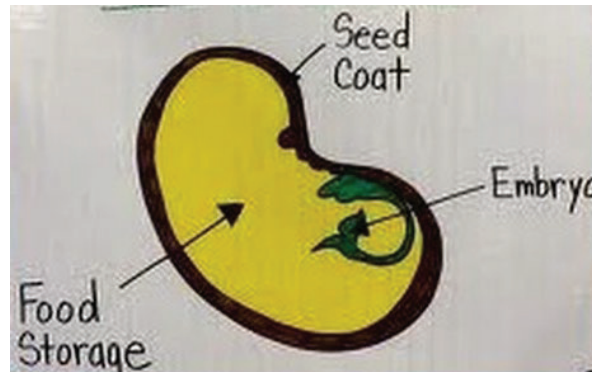
Seed Biology

Seeds are essential reproductive units carrying genetic information for plant growth. They consist of:

- **Seed Coat:** Protects the seed from external dangers.
- **Endosperm:** Provides stored food to nourish the developing embryo.
- **Embryo:** The plant in its earliest form, capable of growing into a mature plant.

Understanding seed biology helps optimize seed saving and ensures healthy future crops.

Seed saving transcends gardening; it is a commitment to biodiversity, cultural preservation, and sustainable agriculture. By continuing this practice, communities contribute to a resilient food system, safeguard traditions, and ensure a future rich in plant diversity.



Why is the embryo so important to the plant? The embryo is the part of the plant that is going to grow. The embryo is the living part of the seed that will grow into a fruit of vegetable or some other type of plant when given sunlight and water. Therefore care should be taken to avoid its damage.

Seed Dormancy and Germination

Seed Dormancy

Seed dormancy is a natural survival mechanism that prevents seeds from germinating under unfavorable conditions, ensuring their survival until the environment is suitable for growth. Dormancy may result from:

- **Chemical Inhibitors:** Compounds that suppress germination.
- **Hard Seed Coat:** Acts as a barrier to water and oxygen.
- **Environmental Triggers:** Specific temperature or light conditions required for germination.

Types of Dormancy

1. **Physical Dormancy:** Caused by an impermeable seed coat. Techniques like scarification (scratching or chemically treating the coat) help break dormancy.
2. **Physiological Dormancy:** Involves internal biochemical barriers. Stratification, which exposes seeds to cold and moist conditions, can overcome this type.

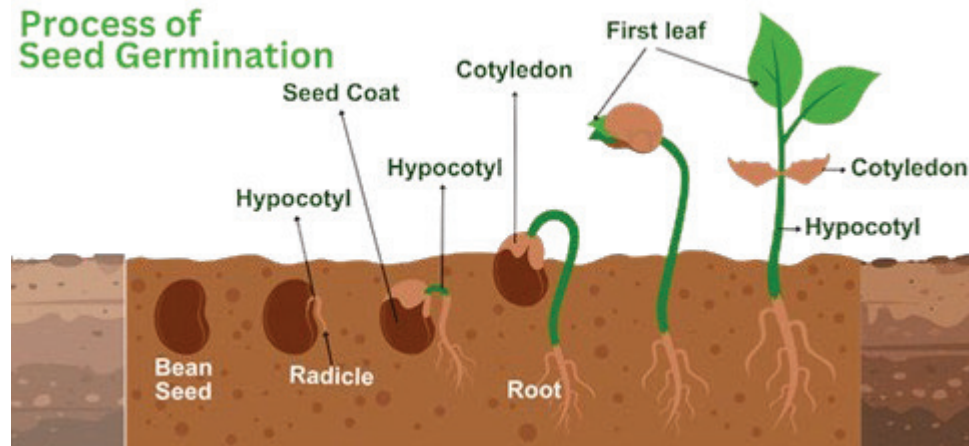
Germination

Germination is the process where a seed grows into a plant. Key stages include:

- **Imbibition:** The seed absorbs water, swelling and breaking the seed coat.
- **Radicle Emergence:** The root grows first, anchoring the seedling and absorbing water and nutrients.

- **Plumule Emergence:** The shoot develops, eventually performing photosynthesis.

Successful germination requires optimal conditions, including moisture, oxygen, and appropriate temperature.



Summary: Seed Viability, Longevity, and Plant Reproductive Biology

Seed Viability and Longevity

Seed viability refers to a seed's ability to germinate and grow into a healthy plant. Factors such as age, genetic quality, and storage conditions (cool, dry, and pest-free environments) significantly influence viability. While some seeds, like those from trees, can remain viable for decades, others, such as vegetable seeds, may lose viability within a few years. Proper understanding of seed biology ensures effective seed-saving practices for long-term plant preservation.

Plant Reproductive Biology

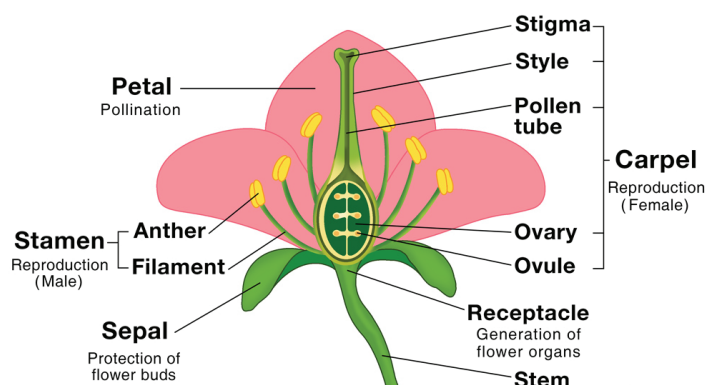
Plants reproduce either sexually or asexually to ensure species survival.

1. Sexual Reproduction

1. **Flower Structure:** Flowers are reproductive organs with male (stamens) and female (pistils) parts. Stamens produce pollen, and pistils house ovules.
2. **Pollination:** The transfer of pollen to a stigma occurs through wind, water, or animals:
 - *Self-Pollination:* Pollen fertilizes ovules on the same plant, reducing genetic diversity.
 - *Cross-Pollination:* Pollen from one plant fertilizes another, increasing genetic diversity.
3. **Fertilization:** Pollen germinates on the stigma, forming a pollen tube that delivers sperm cells to ovules. This fertilization forms a zygote, which develops into a seed.

A solid grasp of seed viability, longevity, and reproductive biology supports effective seed saving and promotes diverse, resilient plant varieties for future generations.

Parts of a Flower



Seed Development, Propagation, and Reproductive Biology

Seed Development and Pollination

1. **Seed Formation:** Fertilized ovules develop into seeds containing the embryo, food supply (endosperm), and protective coat. The ovary often forms a fruit, aiding seed dispersal.
2. **Pollination Types:**
 1. *Self-Pollination:* Fertilization occurs within the same flower or plant, producing plants similar to the parent (e.g., maize, tomatoes).
 2. *Cross-Pollination:* Requires pollen from another plant, enhancing genetic diversity (e.g., carrots, onions). Wind, insects, or animals often carry pollen.

Asexual Propagation

Plants can reproduce without seeds, ensuring genetic consistency with the parent plant. Methods include:

1. *Tubers:* Irish and sweet potatoes.
2. *Cuttings:* Sweet potatoes.
3. *Suckers:* Bananas.
4. *Runners:* Strawberries.
5. *Rhizomes:* Ginger.
6. *Bulbs:* Onions, tulips.

Seed Selection

1. Choose seeds from strong, healthy plants with desirable traits (e.g., pest resistance, high yield).
2. Remove diseased or weak plants to prevent pollination of undesirable traits.

Plant Breeding

Farmers can control pollination to combine desirable traits by transferring pollen manually or isolating flowers to prevent unwanted pollination.

Seed Quality

Key traits of healthy seeds include viability, vigor, size, and maturity.

Types of Plants for Seed Saving

1. *Open-Pollinated (OP) Varieties*: Produce true-to-type seeds if properly isolated.
2. *Self-Pollinating Plants*: Easy to save seeds due to minimal cross-pollination (e.g., tomatoes, peas).
3. *Hybrids*: Unsuitable for seed saving as offspring traits are unpredictable.

Importance of Reproductive Biology

Understanding plant reproduction helps improve cultivation, enhance crop yields, conserve biodiversity, and create new plant hybrids. Both sexual and asexual reproduction ensure genetic diversity, adaptability, and ecosystem health.

Ensuring Genetic Purity and Quality

1. **Isolation Techniques**: To prevent unwanted cross-pollination, especially with wind- or insect-pollinated plants, employ isolation techniques. These include physical barriers like row covers or netting and spatial isolation by planting different varieties at significant distances. Temporal isolation, where different varieties are planted at staggered times, can also be effective.
2. **Rogueing**: Regularly inspect plants and remove those that do not exhibit the desired traits. This helps maintain the genetic quality and purity of the seed stock.
3. **Diverse Collection**: Collect seeds from multiple plants to maintain genetic diversity. This enhances the resilience of future crops by ensuring a broader genetic base that can better withstand diseases, pests, and environmental changes.

Labeling and Record Keeping

Accurate labeling and record-keeping are essential. Include information such as the plant variety, date of collection, and specific characteristics or observations. This ensures effective tracking and informed decision-making in future growing seasons.

By carefully selecting plant varieties, maintaining genetic purity, and focusing on desirable traits, gardeners and farmers can create a sustainable, resilient seed bank that ensures successful harvests year after year. This mindful approach preserves valuable plant genetics and fosters a deeper connection to nature and agricultural traditions.

Selecting the Best Specimens for Seed Saving

Selecting the best specimens ensures future generations of plants inherit desirable traits, robust health, and true-to-type characteristics. Key considerations include:

1. Health and Vigor:

- Choose plants free from diseases, pests, and stress.
- Indicators include strong stems, well-developed roots, vibrant foliage, and abundant blooms or fruits.

2. Desirable Traits:

- High yield, good flavor, uniform size and shape, vibrant color, pest and disease resistance, and adaptation to local conditions.

3. Maturity and Quality:

- Harvest seeds from fully ripened fruits or pods to ensure viability.
- Dry seeds thoroughly in a cool, dry place to prevent mold and ensure longevity.

4. Diverse Collection:

- Collect seeds from multiple plants to ensure genetic diversity.

5. Labeling and Record Keeping:

- Clearly label each seed batch with the plant variety, date of collection, and specific observations to track performance and inform future decisions.

By focusing on health, desirable traits, and genetic diversity, gardeners and farmers can build a robust seed bank, enhancing crop quality and preserving valuable genetics for sustainable agriculture.

Seed Collection

Seed collection ensures harvested seeds are viable and healthy. This involves timing, effective collection methods, and proper handling.

1. Timing of Seed Harvesting:

- Harvest seeds when fully mature. Immature seeds may not germinate well.
- Indicators include visual cues (e.g., ripe fruits), color changes, and drying of pods or seed heads.

2. Methods of Collecting Seeds:

- **Dry Seeds:** Allow pods or seed heads to dry on the plant (e.g., beans, peas). Once dry, hand-pick and thresh to separate seeds.
- **Wet Seeds:** Extract seeds from ripe fruits (e.g., tomatoes, cucumbers). Rinse and ferment seeds to remove the gelatinous coating before drying.
- **Flowers and Herbs:** Collect seeds from dried flower heads by shaking or rubbing them over a container.

3. Handling and Processing:

- Clean seeds to remove debris or pulp.
- Dry seeds thoroughly in a cool, dry place to prevent mold.
- Label each batch with plant variety, date of collection, and specific notes.

Best Practices for Specific Plants:

- **Tomatoes:** Harvest from overripe fruits. Ferment seeds for a few days, rinse, and dry.
- **Beans and Peas:** Harvest dried pods. Shell to collect seeds.
- **Lettuce:** Wait for seed heads to dry. Shake seeds into a container.

Seed collection preserves genetic diversity and crop quality, contributing to sustainable and resilient agricultural systems.

Wet Cleaning

Wet cleaning is suited for seeds from fleshy fruits, such as tomatoes and melons. It separates seeds from the pulp, ensuring clean, viable seeds for storage or planting.

1. Steps in Wet Cleaning:

- **Harvesting and Extraction:** Select fully ripe fruits. Scoop seeds with surrounding pulp.
- **Fermentation:** Allow seeds and pulp to ferment in water for 2-4 days. Stir occasionally. Viable seeds sink while debris floats.
- **Rinsing:** Rinse seeds in a sieve under running water to remove residual pulp.
- **Drying:** Spread seeds on a paper towel or screen in a well-ventilated area until hard and brittle.
- **Storage:** Label and store seeds in airtight containers in a cool, dark, dry place.

2. Benefits of Wet Cleaning:

- **Improved Germination:** Removes germination-inhibiting coatings.
- **Disease Prevention:** Eliminates pathogens.
- **Quality Control:** Separates viable from non-viable seeds.

Proper wet cleaning ensures high-quality seeds, enhancing germination rates and preserving genetic diversity.

Drying and Curing Seeds

Proper drying and curing are essential for preserving seed quality and longevity.

1. Importance:

- ✓ Reduces moisture to prevent mold and pathogens.
- ✓ Prolongs viability and ensures better germination.

2. Steps:

- ✓ Initial drying: Dry seeds immediately after harvest using flat surfaces.
- ✓ Air drying: Keep seeds in a cool, well-ventilated area, avoiding sunlight. Stir seeds occasionally to ensure even drying.
- ✓ Final curing: Move seeds to a low-humidity environment for 2-3 weeks to remove residual moisture.

3. Testing Dryness:

- ✓ Seeds should be hard and brittle or snap cleanly. Moisture tests using salt or jars help confirm dryness.

4. Storage Preparation:

- ✓ Label seeds with variety and collection date.
- ✓ Store in airtight containers with desiccants to maintain dryness.



5. Storage Conditions:

- ✓ Keep seeds in a cool, dry, dark environment to preserve viability.

Seed Storage

Proper seed storage is essential for maintaining seed viability and ensuring successful germination. Key factors include controlling temperature, humidity, light, and pests.

Optimal Storage Conditions:

- **Temperature:** Store seeds in cool environments (32°F to 41°F or 0°C to 5°C), such as a refrigerator, to prevent premature germination and metabolic activity.
- **Humidity:** Keep humidity below 50% to avoid mold and rot. Use airtight containers and desiccants like silica gel to maintain dryness.
- **Light:** Store seeds in a dark place to prevent light-induced degradation and premature germination.
- **Pest Protection:** Use sealed containers and keep storage areas clean to protect from pests.

Labeling and Cataloging:

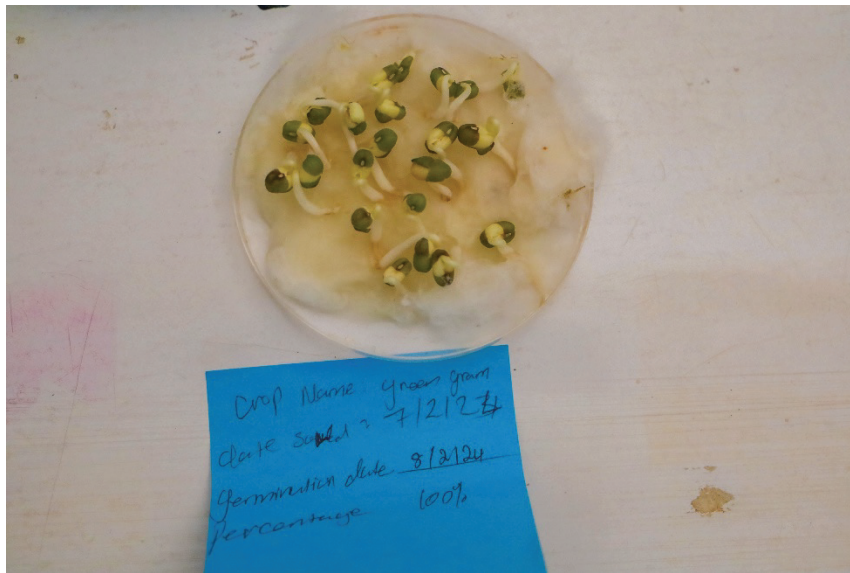
- Clearly label seed containers with variety, collection date, and notes for easy tracking. Maintain a seed inventory with germination test results and planting history.



QR Code Technology
For Cataloging

Seed Viability Testing:

- Regularly test seeds for germination rates to ensure viability. Periodically replenish seeds as needed.



Storage Techniques for Different Seed Types

- **Short-Lived Seeds** (e.g., onions, carrots): Store carefully under optimal conditions as they have a shorter shelf life.
- **Long-Lived Seeds** (e.g., beans, peas): These can remain viable for years if stored properly.

Best Practices for Containers

- **Glass Jars:** Ideal for long-term storage, providing airtight protection.
- **Plastic Containers:** Suitable for medium-term storage if airtight and opaque.
- **Paper Envelopes:** Good for short-term storage but should be kept in airtight containers with desiccants.



Emergency Preparedness:

- Consider backup storage in different locations or use local seed banks to safeguard against disasters.

MANAGEMENT OF SEED BANKS

Seed banks store seeds to preserve plant genetic diversity and protect species from extinction.



Mr. Samuel Nderitu inside the GBLACK seedbank

- **Purpose of Seed Banks:**
 - **Biodiversity Conservation:** Protecting endangered, rare, and endemic plant species to preserve ecosystem stability.
 - **Agricultural Sustainability:** Ensuring access to diverse crop varieties for breeding programs and resilience against pests, diseases, and climate change. Seed banks provide backup during crises like crop failures.
 - **Scientific Research:** Seed banks serve as genetic libraries for studying plant biology, evolution, and climate adaptation.
 - **Ecological Restoration:** Seed banks supply native plants for habitat restoration and combating climate change effects, promoting ecosystem health.

Seed banks are essential institutions that conserve plant genetic resources, supporting biodiversity, agricultural sustainability, scientific research, ecological restoration, and cultural heritage. They preserve the genetic diversity of plants, helping to address future environmental and agricultural challenges, ensuring resources for future generations.

TYPES OF SEED BANKS AND THEIR PURPOSE

Gene banks

Focus on agricultural crops and their wild relatives, storing seeds with traits like disease resistance and drought tolerance to ensure food security and develop new crop varieties.

Community seed banks

Operates at the local level, preserving culturally and agriculturally significant varieties, promoting biodiversity, and empowering farmers through knowledge exchange and seed-saving techniques.

Botanical garden seed banks

Conserve seeds of wild plant species, particularly rare or endangered ones, contributing to ecosystem stability and scientific research.

National seed banks

Government-established facilities that preserve a country's plant genetic diversity, supporting national food security and biodiversity. They collaborate internationally to share seeds and knowledge.

Global seed vaults,

Global seed vaults such as the Svalbard Global Seed Vault, serve as backup storage for seed banks, providing protection from natural disasters or wars. These vaults act as an insurance policy for the planet's agricultural heritage.

Research seed banks

They are linked to universities and research institutions, focusing on plant genetics and breeding new varieties to improve agriculture and conserve biodiversity.

Together, these seed banks form a comprehensive network that supports plant genetic conservation, sustainability, and cultural heritage, ensuring that plant resources are preserved for future generations.

In situ seed preservation

It involves conserving plant species in their natural habitats, allowing them to evolve and adapt to environmental changes. It maintains the dynamic relationships between plants and their ecosystems, supporting natural selection processes and enhancing resilience. This method is crucial for preserving genetic diversity, especially for endangered species and maintaining ecological balance.

Ex situ seed preservation,

in contrast to in situ , involves collecting seeds from natural habitats and storing them in controlled environments like seed banks. This method safeguards against threats like habitat destruction and climate change by ensuring seeds remain viable under optimal conditions. Ex situ conservation supports agricultural sustainability by preserving crop species and their wild relatives for breeding and research, complementing in situ efforts to protect plant genetic diversity.

Seed banking involves several key steps to preserve plant genetic diversity:

1. **Collection:** Seeds are gathered from diverse sources, ensuring genetic variety.
2. **Cleaning:** Seeds are cleaned to remove debris and ensure only healthy seeds are stored.
3. **Drying:** Seeds are dried to a specific moisture level to prevent spoilage and extend shelf life.
4. **Storage:** Seeds are stored in controlled conditions, often at low temperatures, to maintain viability.
5. **Monitoring and Testing:** Seeds are periodically tested for germination to ensure their health and readiness.
6. **Documentation:** Detailed records are kept of the seeds, including their origins and storage conditions.

Comprehensive documentation is crucial in seed banking, involving detailed records of species, collection details, and traits of interest. This ensures efficient management and provides valuable data for researchers and breeders. Seed banking, a carefully managed process, conserves plant genetic diversity through collection, cleaning, drying, storage, monitoring, and documentation, supporting biodiversity, agricultural sustainability, and scientific research for future generations.

SETTING UP A COMMUNITY SEED BANK

Setting up a community seed bank involves several key steps:

These steps help establish a sustainable seed bank that supports local agriculture, preserves biodiversity, and enhances food security.

1. **Community Engagement:** Involve local farmers and community members to assess their needs for seed diversity and availability.
2. **Planning and Organization:** Form a committee, define goals, and create a detailed plan with roles and resources.
3. **Funding and Resources:** Identify funding sources, secure a location, and acquire necessary equipment.
4. **Seed Collection and Documentation:** Collect, clean, and document seeds from local sources, ensuring quality and diversity.
5. **Storage and Maintenance:** Store seeds in optimal conditions, monitor viability, and keep seeds organized.
6. **Training and Education:** Provide training on seed saving and raise awareness about the seed bank's benefits.
7. **Distribution and Sharing:** Set guidelines for seed distribution and encourage seed sharing within the community.
8. **Evaluation and Expansion:** Regularly evaluate the seed bank's impact and consider expanding and collaborating with other organizations.

Community seed banking in Kenya faces several challenges including

1. Inadequate funding and resources, which hamper the establishment of proper storage facilities and long-term operations.
2. Many community seed banks lack the infrastructure to maintain optimal storage conditions, such as controlling temperature and humidity, which is crucial for seed viability.
3. Technical expertise in seed collection, cleaning, and storage is also limited, leading to potential mishandling of seeds.
4. Ensuring seed diversity is challenging due to logistical issues in collecting seeds from remote areas, and legal and regulatory frameworks add complexity to the process.
5. Additionally, engaging the community and ensuring active participation can be difficult due to cultural attitudes and varying levels of awareness. Sustainability and scaling of seed banks also remain long-term challenges.

CHALLENGES IN SEED PRODUCTION AND SAVING

1. Genetic Diversity and Quality:

- Modern agriculture's focus on uniform high-yield crops reduces genetic diversity, increasing vulnerability to pests, diseases, and climate change.
- Many farmers lack infrastructure and knowledge for proper seed selection, processing, and storage, leading to poor-quality seeds.

2. Technical and Knowledge Barriers:

- Specialized knowledge in seed production, breeding, and storage is lacking among small-scale farmers.
- Limited access to resources like drying equipment and storage facilities hinders effective seed preservation.

3. Economic and Market Challenges:

- Small-scale farmers struggle to access fair markets due to competition, poor infrastructure, and fluctuating prices.
- High costs of seed production make it difficult for farmers to sustain seed-saving practices.

4. Regulatory and Policy Issues:

- Complex seed regulations and certification processes exclude small-scale farmers.
- Intellectual property laws on plant varieties limit farmers' ability to save and exchange seeds.

5. Social and Cultural Factors:

- Traditional seed-saving practices are often undervalued, and integrating modern techniques with traditional knowledge is challenging.
- Community engagement is vital for initiatives like seed banks but can be hindered by mistrust and lack of awareness.

6. Climate and Environmental Factors:

- Unpredictable weather, such as droughts and floods, can reduce seed yield and quality.
- Pests and diseases threaten seed viability, requiring effective management practices.

7. Human and Resource Constraints:

- Limited knowledge and resources can hinder small-scale farmers.
- Lack of infrastructure and tools for proper seed processing and storage can compromise quality.

8. Cross-Pollination Risks:

- Preventing unwanted cross-pollination requires strict isolation measures.

Addressing these challenges involves education, access to resources, and the adoption of best practices to ensure the sustainability of seed production and saving efforts.

PRINCIPLES OF SEED BANKING:

1. Diversity:

- ✓ Preserve genetic and species diversity, including cultivated and wild plants, to ensure resilience against diseases and environmental changes.

2. Viability:

- ✓ Maintain high seed quality and ensure regular germination tests to confirm seed viability.

1. Storage Conditions:

- ✓ Store seeds at low temperatures (-18°C to -20°C) and low humidity (around 15%) to prolong viability.

2. Documentation:

- ✓ Keep detailed records on seed origins, genetic traits, storage conditions, and regular updates in databases for easy retrieval.

3. Regeneration:

- ✓ Periodically regenerate seeds to maintain viability, with controlled pollination to avoid genetic contamination.

4. Accessibility:

- ✓ Ensure seeds are accessible to farmers, researchers, and breeders, and promote equitable access, especially for marginalized communities.

5. Sustainability:

- ✓ Plan for long-term preservation and minimize the environmental impact of seed banking activities.

6. Collaboration:

- ✓ Collaborate with other seed banks and involve communities in seed-saving efforts to strengthen conservation practices.

7. Research and Development:

- ✓ Continue research to improve seed preservation techniques and enhance genetic diversity.

8. Legal and Ethical Considerations:

- ✓ Comply with national/international laws and respect indigenous rights, ensuring fair benefit-sharing.

Documentation and Record - Keeping in Seed Saving and Seed Banking:

1. Importance of Documentation:

- ✓ Preserve genetic diversity, monitor seed quality, and document cultural significance.

2. Key Elements of Seed Documentation:

- ✓ Record seed identity, harvest/storage details, germination tests, cultivation records, and phenotypic traits.

3. Record-Keeping Tools:

- ✓ Use manual logs, digital databases, proper labeling, and ensure data redundancy with backups.

4. Collaboration and Sharing:

- ✓ Work with community seed banks and networks to share knowledge and improve seed documentation.

DAILY ROUTINE MANAGEMENT OF A SEED BANK:

1. Seed Collection:

- ✓ Harvest seeds at maturity, label with relevant details, and ensure proper identification.

2. Seed Cleaning:

- ✓ Clean seeds manually and air dry to reduce moisture content.

3. Seed Storage:

- ✓ Store seeds in cool, dry environments in airtight containers.

4. Labeling and Documentation:

- Label containers clearly and maintain logs of seed details and storage conditions.

5. Routine Monitoring:

- ✓ Inspect seeds regularly for damage, and conduct germination tests to assess viability.

6. Seed Regeneration:

- ✓ Grow a small portion of seeds periodically to produce fresh seed stock.

7. Accessibility and Distribution:

- ✓ Develop a simple seed request system and engage in community sharing programs.

8. Basic Equipment Maintenance:

- ✓ Maintain tools and monitor storage environments.

9. Staff Training:

- ✓ Provide basic training on seed collection, cleaning, storage, and safety procedures.

10. Community Engagement:

- ✓ Host workshops and involve volunteers in seed banking activities to promote local participation.

Seed Record Template for a community seed Bank

Name of the farmer _____

Name of the group _____

Date _____

Date of delivery	Type of seed	Variety	Amount	Signature	Date collected	Amount	Balance	signature

Resources on Seed Saving

- ✓ *How to grow more vegetables - John Jeavons*
- ✓ *Ashworth, Suzanne. Seed to Seed*
- ✓ *Bubel, Nancy. The New Seed Starter's Handbook*
- ✓ *Deppe, Carol. Breed Your Own Vegetable Varieties*
- ✓ *Rogers, Marc. Saving Seeds*
- ✓ *Turner, Carole. Seed Sowing and Saving*
- ✓ *Rowe, Jack. <http://howtosaveseeds.com> - Vegetable Seed Saving Handbook*
- ✓ *Growing and saving seeds - Sam Nderitu*

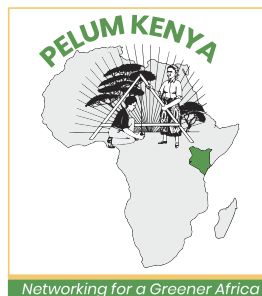


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