Technical Report Under The CGIAR Nature Positive Solutions Initiative

Nature-Positive Post-Harvest Seed Practices for Sustainable Community Seed Bank Development in Kenya

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Rationale

Community seed banks (CSBs) are local institutions that conserve and distribute seeds, particularly traditional or indigenous crop varieties, within a specific community. They are key players in in-situ conservation and provide vital support to smallholder farmers, who often operate with limited land and resources, by offering access to a diverse range of affordable, locally adapted seeds. This access helps farmers maintain resilience in the face of challenges such as climate change, limited diet diversity, economic pressures, and environmental degradation.

CSBs empower smallholder farmers economically and foster community cooperation. By maintaining genetic diversity and promoting local adaptation, they contribute to sustainable agriculture and food sovereignty at the grassroots level. Furthermore, CSBs play a crucial role in preserving traditional knowledge and cultural heritage associated with local seed varieties.

In Western Kenya, CSBs like Nyando CSB, Vihiga Nutrition and Community Seed bank, and Kabudi-Agoro Women's Seed bank have collectively served over 10,000 smallholder farmers. They offer a variety of crop cultivars grown in the region, including cereals (sorghum, maize, and finger millet), legumes (beans, groundnuts, green grams, and rice beans), sweet potatoes, cassava, and traditional leafy vegetables (TLVs).

Despite their positive impact, these CSBs face challenges to their sustainability. A primary concern is their inability to generate sufficient income, leading to limited financial resources. This constraint hinders investment in essential infrastructure, such as adequate storage facilities, equipment, and training, which are crucial for sustainable operations and preventing seed deterioration and loss.

Equipment and Facilities

The non-tropical drylands in Sub-Saharan Africa (SSA) fall within the geographically mandated regions of the International Center for Agriculture in Dry Areas (ICARDA). Through various initiatives, ICARDA is working with national and international partners to address the unique challenges faced by the smallholder farmers in Africa and beyond.
In collaboration with the Alliance of Bioversity International and CIAT under the CGIAR's Nature Positive Initiative, ICARDA has strengthened three community seed banks (CSBs) in Western Kenya. This support included:

- **Improved seed storage:** Providing 310 hermetic jars of different sizes to ensure safe and effective seed preservation.
- **Value addition equipment:** Supplying small-scale threshers, seed cleaners, and conventional and solar-powered dryers for processing seeds and vegetables. This equipment was installed and tested on-site, and farmers received training on its operation.
- **Construction of processing facilities:** Financing the construction of processing facilities at Vihiga CSB (100% funded by ICARDA) and Nyando CSB (50% funded by ICARDA) and complemented by the Ministry of Agriculture, Fisheries, Food Security and Nature of the Netherlands.

This support enables the CSBs to enhance their operations, improve seed quality, and better serve smallholder farmers in their communities.

Post-Harvest Facilities Delivery and Operationalization

The delivery and operationalization of three new processing facilities took place from September 9th to 11th, 2024, at the Vihiga, Kabudi-Agoro, and Nyando Community Seed Banks (CSBs) in Western Kenya (Annex1). Each event included a mini-seed and food fair to celebrate and promote the facilities (Fig1 to 7). These events were aimed at:

- Raising awareness: Increase the visibility of the CSBs and their new processing facilities within the farming communities.
- Improving access to nutritious foods: Enhance access for both farmers and communities to highly nutritious, indigenous, and underutilized crops and their value-added products.
- Promoting value-added products: Create momentum for marketing opportunities for value-added products generated by farmers.
- Fostering collaboration: Identify opportunities for synergy and collaboration among stakeholders to ensure the long-term sustainability of the seed banks.
- Facilitating knowledge sharing: Create a space for seed knowledge exchange, learning, and appreciation for seed diversity among farmers.

Figure 1. Kabudi-Agoro CSB receiving Equipment from ICARDA

Figure 2. Thresher & seed cleaner at Kabudi-Agoro CSB

Figure 3. The Vihiga CSB receiving solar powered driers for seed and vegetables

Figure 4. Madam Joy Mugisha, guest farmer from Uganda, displaying one of her bean cultivars

Figure 5. Hermetic jars provided by ICARDA

Figure 6.*Nyando seed processing facility*

Figure 7. Vihiga seed processing facility

The delivery event was well-attended by 293 participants (127 male and 166 female), including policy makers. The event was held across three locations: Vihiga (108 attendees), Kabudi-Agoro (102 attendees), and Nyando (83 attendees).

These events were honored by the presence of:

- Guest farmers
- Members of the CSBs
- County Agricultural officers
- Members of the local administration
- Farmers from neighboring communities
- ICARDA staff, led by Dr. Abdoul Aziz and Dr. Seid Kemal
- Alliance of Bioversity and CIAT staff, led by Dr. Carlo Fadda and Dr. Gloria Otieno
- Staff from other development partners, such as Seed Savers Network
- Ministers of Agriculture from the County governments of Vihiga and Kisumu
- Officials from the Kenya Agricultural Research Organization (KALRO), led by Dr. Desterio Nyamongo, the Director, Genetic Resources Research Institute (GeRRI)-KALRO, Kenya.

The strong representation from government officials and agricultural organizations demonstrates a commitment to, and support for the established partnerships.

Capacity Development Support to Farmers

ICARDA provided extensive capacity building to 32 farmers (17 male, 15 female), focusing on key aspects of seed production and plant health (Fig 8).

Seed Production:

Dr. Aziz Niane provided comprehensive training on seed production, covering the following areas:

- **Seed Biology:** Farmers learned about seed viability, germination, and vigor, as well as the factors that influence these processes. They gained an understanding of the benefits of planting new seeds and the importance of proper growth conditions for germination.
- **Seed Storage:** Dr. Aziz explained how seed germination and viability are affected by temperature and relative humidity. He emphasized the importance of low temperatures and low relative humidity for maintaining seed quality, providing crucial information for seed store managers. He also highlighted the different storage requirements for orthodox and recalcitrant seeds.
- **Seed Multiplication:** Farmers learned about the challenges of maintaining seed quality in open field production, including factors like outcrossing, mechanical mixtures, and pest and disease attacks. They were taught control measures such as separation distance, proper cleaning of equipment, and seed treatments.
- **Seed Processing:** Training covered the entire seed value chain, from harvesting and drying to threshing, cleaning, grading, treatment, packaging, marketing, and distribution.
- **Marketing:** Farmers were introduced to the 4Ps of marketing (Product, Price, Place, and Promotion) and learned how to effectively market their seed products by ensuring availability, accessibility, and affordability.

Plant Health:

Dr. Seid Ahmed Kemal led training sessions covering a wide range of topics related to plant health, including:

- **Disease Management:** Farmers learned about disease-causing agents, their survival mechanisms, host ranges, and integrated pest management strategies.
- **Good Agronomic Practices (GAPs):** Dr. Seid emphasized the importance of close monitoring for early disease detection and timely prevention. He also covered topics such as wide area coverage, mixed cropping, proper fertilizer use, and the benefits of compost for soil health and drainage.
- **Sanitation and Prevention:** Training included proper sanitation practices as a disease control measure, such as using clean seedlings, cuttings, and tubers for planting. Crop and variety diversity were also highlighted for their role in disease control.
- **Threshing and Storage:** Farmers learned proper threshing techniques, including removing moldy seeds to avoid contamination. They also gained knowledge about storage insects and how to prevent infestations.
- **Mycotoxins:** Dr. Seid educated farmers about mycotoxins in cereals, the damage they cause, and how GAPs can help reduce their impact. He emphasized proper seed drying and timely harvesting as preventive measures.

This comprehensive training program equipped farmers with the knowledge and skills necessary for successful seed production and plant health management, ultimately contributing to improved agricultural practices and livelihoods.

Figure 8. Post-harvest training by Dr. Abdoul Aziz in Nyando CSB during the facility launch

Farmers' Capacity Development Outcomes

At the end on the training, a structured questionnaire has been formulated and distributed to the participants to anonymously evaluate the training effectiveness. The results of the questionnaire analysis is below.

The training successfully equipped farmers with comprehensive knowledge and skills in key areas affecting seed production and quality. Participants anonymously reported gaining new skills (Figure 9) in the following areas:

- **Seed Biology and Quality:** This included understanding seed dormancy types, the impact of seed quality attributes on yield, and how to maintain seed quality throughout the production process, including pre- and post-harvest practices.
- **Environmental Impacts:** Farmers gained a better understanding of how environmental conditions affect seed longevity.
- **Disease Management:** Participants learned strategies to minimize the impact of seed-borne diseases on yield and quality.
- **Marketing:** The training covered key marketing principles, including product pricing and promotion.

By gaining knowledge and skills in these topics, participants are now better equipped to:

- Meet market demands for high-quality seed.
- Enhance their productivity through improved seed management and plant health practices.
- Increase their income by producing and marketing higher-quality seed.
- Contribute to sustainable agricultural practices.

The effectiveness of the professional interaction between trainers and participating farmers was evaluated through participant feedback (Figure 10). This feedback, categorized into three levels (Average, High, and Very High), was collected from four beneficiary groups: Nyando, Vihiga, Kabudi and Aggregated Farms.

Key Findings:

- **Overall Positive Response:** Across all groups, the interaction with trainers was rated positively, with the majority of participants assigning "High" or "Very High" ratings.
- **Regional Variations:**
  - **Nyando:** While 20% of participants rated the interaction as "Average," a combined 80% found it "High" or "Very High," indicating a generally positive experience.
  - **Vihiga:** With 38% "Average" ratings, Vihiga had the lowest percentage of positive responses compared to other regions, suggesting potential areas for improvement. This is attributable to the fact that Vihiga CSB focuses more on TLVs which are more difficult to handle than the other traditional field crops.
  - **Aggregated Farms:** This group showed the most favorable response, with 100% of participants rating the interaction as "High" or "Very High," highlighting its effectiveness in this context.
  - **Kabudi:** Kabudi displayed highly positive feedback similar to Aggregated Farms, with all participants giving "High" or "Very High" ratings.

Capacity development outcomes:

The trainer-participant interaction was particularly effective within the Aggregated Farms and Kabudi groups, where participants found the interactions extremely useful. While the overall feedback was positive, the Vihiga group's responses indicate a potential need to further improve interaction quality in that region.

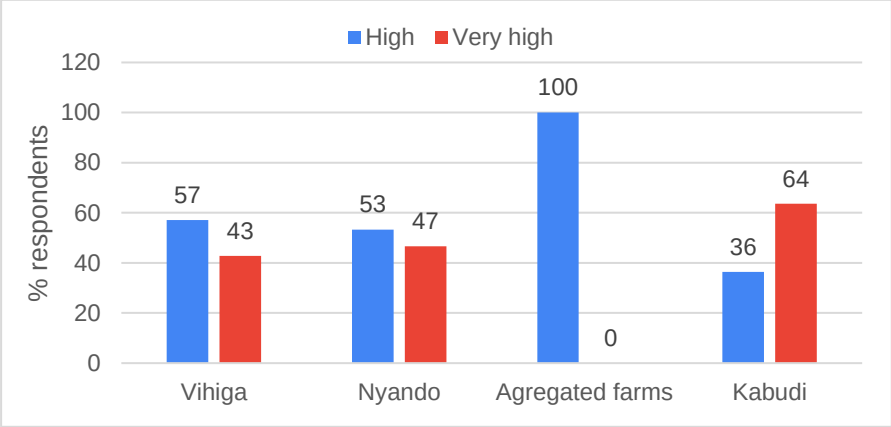

Figure 9. Levels of knowledge gain among different target groups in the training

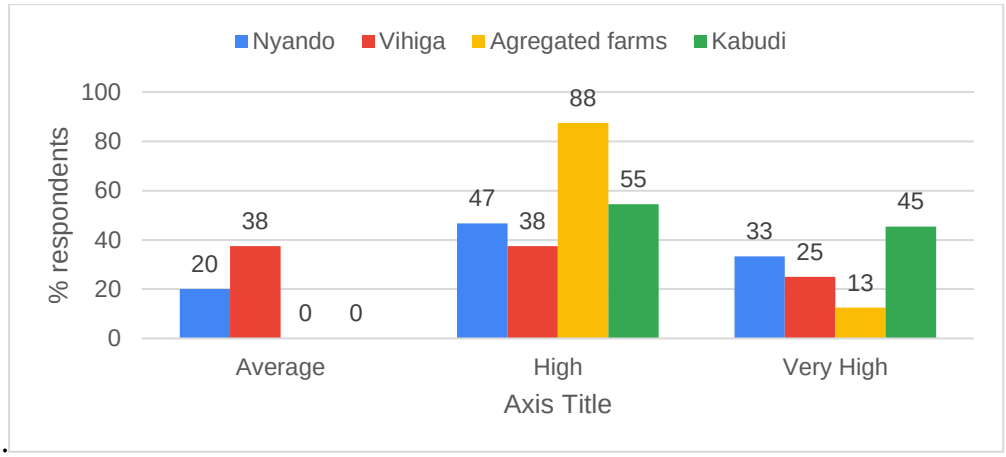

Figure 10. Usefulness of the professional interaction among the participants, and with the lecturers

Conclusions

Investing in seed processing facilities is crucial for the success of Community Seed Banks (CSBs). These facilities enhance seed quality, extend shelf life, and improve germination rates, leading to healthier crops and increased agricultural productivity. They also play a vital role in preserving seed varieties and promoting sustainable agricultural practices.

The training program significantly benefited farmers by equipping them with essential skills and knowledge in:

- **Seed longevity and quality:** Farmers gained a deeper understanding of how to maintain seed quality and viability.
- **Disease management:** Participants learned effective strategies to minimize the impact of seed-borne diseases.
- **Marketing:** Farmers gained insights into product promotion and pricing strategies to enhance their market access and profitability.

This enhanced knowledge empowers farmers to:

- Improve seed production and reduce post-harvest losses.
- Produce high-quality seeds that meet market standards, increasing income opportunities through formal seed sales.
- Make informed decisions throughout the production process, fostering sustainable agricultural practices.

By strengthening the capacity of farmers, CSBs contribute to:

- Conserving agricultural diversity.
- Improving food security.
- Increasing the economic resilience of rural communities.

Recommendation

Continued investment in farmer training and seed processing facilities is essential to further strengthen CSBs and support sustainable agricultural development.

Communication of outputs: A blog on Community Seed Bank has been produced and published (Community Seed Banks)
Community seed bank support.mp4
https://drive.google.com/file/d/1DkeEWc8g4O4o66tmUMtdMM2GJirSKIsQ/view

Acknowledgments

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Annex 1. Illustrative photos for the wide participation to delivery and operationalization events

Figure 11. The event for opening facilities, delivery and operationalization in Vihiga

Figure 12. Drs Carlo Fadda of Alliance of Bioversity and CIAT; Aziz Niane and Seid from ICARDA, interacting with the seed exhibitors in Vihiga

Figure 13. Dr. Carlo Fadda of Alliance of Bioversity and CIAT, addressing guests at Kabudi-Agoro processing facility launch

Figure 14. Dr. Gloria Otieno of Alliance of Bioversity and CIAT; Dr. Abdoul Aziz of ICARDA, and Dr. Desterio Nyamongo, Director, Genetic Resources Research Institute (GeRRI), addressing farmers and guests during the Nyando processing facility launch

Figure 15. Representatives from Seed Savers Network; Madam Gladys Nyanchama, SCAO Nyakach Sub- County, and Mr. John Ogejo, farmer representative Nyando CSB addressing farmers and guests during the launch of Nyando processing facility