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SUPPORTING THE ATTAINMENT OF FOOD SECURITY THROUGH THE REDUCTION OF POST-HARVEST LOSSES IN HORTICULTURAL CROPS

February 2025

SDGs:



Country:

Botswana

Project Code:

TCP/BOT/3901

FAO Contribution:

USD 179 000

Duration:

3 October 2022-31 December 2024

Contact Info:

FAO Representation in Botswana

FAO-BW@fao.org

Implementing Partner

Ministry of Lands and Agriculture (MoLA).

Beneficiaries

Farmers and agriculture extension officers.

Country Programming Framework (CPF) Outputs

CPF 2022-2026, Priority Area 2: Priority value chains in agriculture and natural resources strengthened to be more productive, competitive and sustainable, creating equitable and decent employment (Output 2.3: Increased capacity of value chain actors to comply with standards for product quality and safety as well as postharvest handling for enhanced market access).



BACKGROUND

More than half of the population of Botswana lives in rural areas, depending on subsistence farming, yet local production meets only a small portion of food needs, contributing three percent to the Gross Domestic Product, mainly through beef exports. Local horticultural production meets just 48 percent of national demand, with the rest imported. In 2009, Botswana's horticulture imports amounted to USD 2.9 million. The Government of Botswana identified food security as a key strategic goal in the agricultural sector (National Agricultural Policy, 1991). Various initiatives, such as the Arable Land Development Programme and the Integrated Support Programme for Agricultural Development, were implemented to achieve this goal. However, Botswana remains a net importer of food, particularly grains, vegetables and fruits. Most policies focus on increasing crop productivity, promoting environmentally sustainable systems, enhancing agricultural marketing, and integrating disadvantaged groups into agricultural programmes, but none address post-harvest food losses.

The Food and Agriculture Organization of the United Nations (FAO) recognizes post-harvest losses (PHL) as a significant cause of food insecurity in sub-Saharan Africa, including Botswana (FAO, 1996). A 2018 Southern African Development Community regional vulnerability report confirmed that Botswana faces food insecurity, with food losses affecting food security, nutrition, safety, the environment and economic development. While limited work has been done on PHL in Botswana, studies on losses in horticultural crops are lacking. Observations reveal that improper handling along the supply chain leads to substantial losses in fruits and vegetables, undermining food security efforts.

Against this background, the project was designed to address PHL as an urgent measure to combat food insecurity by tackling key inefficiencies within the value chain.

IMPACT

The project made a significant contributions to the CPF and related frameworks by promoting the adoption of PHL reduction techniques and building local capacity. Its alignment with CPF and United Nations Development Assistance Framework outcomes, national priorities and organizational results highlights the project's effectiveness in addressing key development goals, while contributing to sustainable agricultural and economic development. The project played a crucial role in advancing various SDGs by enhancing sustainable agricultural practices, improving food security and enhancing economic opportunities. Each component aligns with and supports multiple SDG targets, demonstrating a comprehensive impact on sustainable development.

Over time, the project is expected to drive the wider adoption of post-harvest management technologies, practices and systems, which will lead to increased productivity, efficiency and competitiveness, alongside a reduction in costs, while also improving food safety and quality. By empowering stakeholders with both knowledge and practical tools, the project laid a solid foundation for lasting improvements in post-harvest management. Ultimately, this supports the goal of reducing losses by 25 percent and enhancing food security nationwide.

ACHIEVEMENT OF RESULTS

The project successfully contributed to enhancing food security through improved post-harvest management of horticultural produce. Addressing key inefficiencies in the value chain laid the foundation for reducing PHL and fostering the adoption of best practices among stakeholders.

The project introduced technical solutions that were new to the beneficiaries and stakeholders. The raising of awareness on post-harvest management issues, development of survey tools, training on survey methodology, data analysis and reporting, as well as Training of Trainers (ToT) on post-harvest technology, are some of the technical expertise provided through the project.

A baseline study was conducted to assess the extent of PHL, identifying critical intervention points. Findings revealed losses ranging from 9.2 percent to 17.3 percent, with on farm losses being the highest. These insights guided targeted training efforts aimed at farmers and extension officers, ensuring that capacity-building initiatives directly addressed the most pressing challenges. In total, 242 individuals, including 192 farmers and 50 extension officers, were trained in post-harvest management, equipping them with practical knowledge and skills to minimize losses.

To ensure a structured and evidence-based approach, a technical working group (TWG) comprising experts from horticulture, plant health, academia and research institutions was established. This group played a pivotal role in shaping project activities, from developing survey tools to analysing findings and validating results. Additionally, a nationwide survey was conducted across various sectors, including farms, markets, schools and processing facilities. The data collected provided a comprehensive understanding of the factors contributing to PHL, informing the design of effective mitigation strategies.

Awareness-raising was a key component of the initiative. Educational materials, including posters, booklets and banners, were developed and distributed to stakeholders. Training workshops were conducted in five districts, reaching farmers, traders and government extension officers. These efforts significantly contributed to increasing awareness and knowledge of post-harvest handling techniques, reinforcing behavioural change across the horticulture sector.

Recognizing the importance of sustained capacity-building, the project adopted a cascading training model. Officers trained through the Botswana University of Agriculture and Natural Resources (BUAN) were tasked with disseminating knowledge to a wider audience. This approach ensured long-term impact by embedding post-harvest management expertise within local institutions and extension services.

Additionally, investments in communication equipment and logistical support strengthened data collection and reporting processes, enhancing the overall efficiency of project activities. The engagement of local institutions, such as BUAN, further reinforced practical learning by providing hands-on training and exposure to real world post-harvest management practices.

The groundwork was laid for continued efforts to reduce PHL. An ex-post assessment is recommended to measure the percentage reduction in losses and evaluate the long-term adoption of improved handling practices. The interventions implemented thus far serve as a crucial step toward achieving the end target of a 25 percent reduction in PHL, ultimately supporting national food security and economic sustainability.

IMPLEMENTATION OF WORK PLAN AND BUDGET

The project was executed successfully, with the main challenges effectively addressed through adaptive project management strategies and proactive problem-solving. Two no-cost extensions ensured the timely completion of activities and adherence to the project's objectives. All project activities were implemented within the agreed budget.

The project's risk management approach was highly effective, with regular updates, reviews and clear task delegation ensuring that risks were actively managed. The project also effectively managed both environmental and social risks, with minimal environmental impact and proactive handling of social risks.

FOLLOW-UP FOR GOVERNMENT ATTENTION

It is recommended that the government consider implementing PHL management practices through continuous capacity building for horticulture value chain actors. This should be conducted by technical officers trained during the project (ToT). Furthermore, the MoLA should develop training manuals on PHL in addition to the awareness materials already produced.

SUSTAINABILITY

1. Capacity development

The Botswana National Transformation Strategy prioritizes agriculture as one of the eight impactful sectors, and the MoLA's Transitional Strategic Plan (April 2023-March 2025) captures PHL reduction as a key area to be addressed. This means that the document's recommendations shall play a critical role in ensuring project sustainability.

The project demonstrated significant integration into organizational structures that enhance its potential for sustainability beyond its completion. The development of a baseline study and awareness materials, as well as the capacitation of technical officers of the MoLA through ToT, will contribute to the sustainability of the project.

The project effectively created and strengthened key partnerships and alliances crucial for its sustainability. Collaboration with the MoLA and other key stakeholders along the horticulture value chain was reinforced.

The project demonstrated a robust exit strategy, marked by the successful completion of all deliverables and integration into national standards and practices. Follow-up actions included continued training support by the government.

2. Gender equality

Rigorous efforts were made to mobilize participants equally and ensure proportional representation of women and men. The interventions successfully engaged both women and men, ensuring equitable participation in training and development activities. Women and men benefited equally. The project promoted gender equity by involving women in decision-making processes. However, further monitoring is needed to assess the impact on women's work burden and overall equitable access to resources.



3. Environmental sustainability

The project activities caused minimal to non-negative impacts on the environment as activities were mostly stakeholder engagements.

4. Human Rights-based Approach (HRBA) – in particular Right to Food and Decent Work

The project significantly advanced human rights by incorporating PANTHER principles. It ensured participation and transparency through comprehensive farmer training, and upheld accountability and empowerment by educating on the reduction of PHL. It supported the Right to Food Guidelines by enhancing sustainable agricultural practices. Additionally, the project is expected to create employment opportunities and improve labour conditions by encouraging skills development and adopting technologies that will minimize PHL, positively impacting rural youth, women and marginalized groups.

5. Technological sustainability

The post-harvest management technology introduced and promoted by the project through ToT and practical training consisted of locally adapted solutions that are appropriate and flexible for use by the value chain actors. The project significantly advanced local knowledge and practices by providing targeted training to 192 beneficiaries and 50 extension officers. This multifaceted approach enhanced local capacity and improved agricultural practices.

The project beneficiaries have the capacity to continue implementing the project activities, as they are supported by the government. The capacity of stakeholders and beneficiaries to pursue project activities independently appears robust, given the comprehensive training provided. The project effectively enhanced their technical expertise.

6. Economic sustainability

The project produced a report outlining the situational analysis, magnitude and mitigation measures for PHL, which can serve as a valuable tool for resource mobilization to address the identified gaps/challenges, both by the government and its development partners. The project's developed products and services, including the baseline study on PHL in horticultural crops and awareness materials, as well as training and documentation support, will assist beneficiaries in adopting best practices to minimize losses. However, initial costs for implementation may require external funding to further investigate other crops not covered and to conduct direct measurements from the field, rather than relying solely on questionnaires, as well as to vary the study seasons.

DOCUMENTS AND OUTREACH PRODUCTS

- ❑ **MoLA.** 2024. *Causes and Management of Pre and Post-Harvest Losses in Horticultural Production Value Chain- Booklets.* Gaborone (Botswana).
- ❑ **MoLA.** 2024. *Causes and Management of Pre and Post-Harvest Losses in Horticultural Production Value Chain- Poster A2.* Gaborone (Botswana).
- ❑ **MoLA.** 2024. *Causes and Management of Pre and Post-Harvest Losses in Horticultural Production Value Chain-Pullup Banners.* Gaborone (Botswana).

Social media posts:

- ❑ <https://bit.ly/4fnqNRb>; <https://bit.ly/3YMqAAf>;
<https://bit.ly/3Cjjj35>; <https://bit.ly/3OcQbx3>;
<https://bit.ly/4139qBd>; <https://bit.ly/4139sZR>;
<https://bit.ly/4fF52vW>.



ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

Expected Impact	Food security improved through sound post-harvest management of horticultural produce		
Outcome	Adoption of post-harvest handling practices to achieve food security		
	Indicator	Percentage reduction of PHL in horticultural crops.	
	Baseline	0	
	End Target	25 percent loss reduction.	
	Comments and follow-up action to be taken	A baseline study on PHL and potential remedial measures was completed. Awareness materials, including booklets, posters and pull-up banners were developed. Additionally, a total of 242 participants, comprising 192 farmers and 50 extension officers, across various horticulture value chain sectors received training on postharvest management. An ex-post assessment of postharvest loss reduction (percent) is warranted following project closure.	
Output 1	A document on post-harvest handling practices of horticultural crops produced and critical post-harvest loss points for intervention identified		
	Indicators	Target	Achieved
	Number of comprehensive assessment reports on problems, causes and remedies of PHL prepared.	1	Yes
Baseline	0		
Comments	A report was produced outlining the situational analysis, magnitude and mitigation measures for PHL. Key gaps contributing to these losses were identified, leading to capacity-building efforts for various stakeholders across the value chain. Follow-up actions will be implemented to ensure the adoption of technologies aimed at reducing losses, ultimately supporting the achievement of food security.		
Activity 1.1	Constitute a TWG		
	Achieved	Yes	
	Comments	A TWG was established, consisting of experts from horticulture, plant health, academia, and information and research Institutions. The diverse expertise of this committee played a crucial role in the success of the project through their valuable contributions.	
Activity 1.2	Conduct inception and Planning workshop		
	Achieved	Yes	
	Comments	At the outset of the workshop, the project objectives were shared with stakeholders to ensure a common understanding among all participants. This facilitated productive interactions and discussions, which in turn led to effective stakeholder training and the administration of questionnaires. The data collected from these questionnaires helped identify the gaps and assess the magnitude of the PHL.	
Activity 1.3	Develop survey questionnaire		
	Achieved	Yes	
	Comments	A survey tool was developed targeting various sectors, including on-farm operations, hawkers, retailers, wholesalers, schools, restaurants and processors. The survey proved highly valuable, as it allowed the MoLA to identify key gaps. This insight enabled a more focused approach to capacity building, ensuring that training content was tailored to address specific needs and deliver relevant material to the beneficiaries.	
Activity 1.4	Conduct workshop on questionnaire administration and data collection		
	Achieved	Yes	
	Comments	Thirty enumerators from the MoLA were selected and trained on the developed survey tool. The tool was also pre-tested prior to its administration to ensure accuracy and effectiveness.	
Activity 1.5	Procurement of communication equipment		
	Achieved	Yes	
	Comments	Communication equipment, including two laptops and one GPS device, was purchased. These items will continue to support the efficient completion and presentation of work moving forward.	
Activity 1.6	Conduct survey		
	Achieved	Yes	
	Comments	The exercise was conducted nationwide by the enumerators and consultants, targeting farmers, hawkers, retailers, wholesalers, schools, restaurants and processors.	
Activity 1.7	Analyze data and compile report		
	Achieved	Yes	
	Comments	After the survey was administered, the raw data was encoded, analysed, and a report was written.	

Output 2	Magnitude of PHL in horticultural crops assessed		
	Indicators	Target	Achieved
	Number of reports on magnitude of PHL in horticultural produce prepared.	1	Yes
Baseline	0		
Comments	The magnitude of PHL was determined through the assessment, which revealed that losses range from 9.2 percent to 17.3 percent across the value chain. On-farm losses were the highest at 17.3 percent, followed by retail losses at 12.5 percent, and hawker losses at 9.2 percent. These findings prompted targeted capacity-building efforts for farmers, focusing on strategies to mitigate these on-farm losses.		
Activity 2.1	Develop terms of reference for loss assessment		
	Achieved	Yes	
	Comments	Detailed Terms of Reference were developed as planned, with guidance from the Lead technical officer.	
Activity 2.2	Recruit consultants		
	Achieved	Yes	
	Comments	Consultants were recruited and involved in drafting the questionnaire for data collection. They participated in the survey exercise, collected all the raw data through the questionnaires, and subsequently analysed the data to produce a report.	
Activity 2.3	Conduct loss assessment training workshop		
	Achieved	Yes	
	Comments	A total of 50 extension officers were trained, including both horticultural and plant protection officers. These officers were designated as ToT and are expected to cascade the training to other stakeholders on various aspects of post-harvest technologies and loss prevention. The aim is for these officers to continue training actors across the value chain to address PHL, which is a significant barrier to achieving food security and self-sustainability.	
Activity 2.4	Conduct post-harvest loss assessment survey		
	Achieved	Yes	
	Comments	The PHL assessment exercise was conducted nationwide by enumerators and consultants, targeting farmers, hawkers, retailers, wholesalers, schools, restaurants and processors. The Division of Horticulture provided a list of commonly grown horticultural crops, both fruits and vegetables. Among vegetables, cabbage, potatoes, tomatoes, butternuts, carrots, beetroot, onions, rape and sweet pepper are produced in large quantities. In terms of fruits, citrus and mango are the most widely cultivated.	
Activity 2.5	Analyze data and compile report		
	Achieved	Yes	
	Comments	Following the survey, the raw data was encoded, analysed, and a report was generated. This report identified key gaps contributing to PHL, which were then addressed during the training sessions.	
Activity 2.6	Conduct validation workshop with key stakeholders		
	Achieved	Yes	
	Comments	A report was shared with the TWG prior to the validation workshop for review and corrections. The revised report was then presented for further scrutiny before being approved as the final version. The stakeholders validated the report, which was subsequently adopted as the official final report.	

Output 3	Awareness on post-harvest management created		
	Indicators	Target	Achieved
	Level of awareness on post-harvest management in target population.	50 percent awareness in target population.	Yes
Baseline	0		
Comments	Awareness materials on PHL and mitigation measures were developed, including banners, posters and booklets.		
Activity 3.1	Preparation of awareness materials		
	Achieved	Yes	
	Comments	Awareness materials were developed by the Plant Health Division in collaboration with the consultants, finalized, printed and distributed.	
Activity 3.2	Conduct workshop for key stakeholders and target beneficiaries		
	Achieved	Yes	
	Comments	Training on PHL in horticultural crops was conducted across five districts: Gaborone, Tutume, Tonota, Bobirwa and Northwest. A total of 192 participants were trained. This initiative was crucial in equipping farmers, extension officers and other stakeholders with the knowledge and skills needed to minimize PHL, which directly impacts food security and economic sustainability.	
Activity 3.3	Distribute and disseminate awareness materials		
	Achieved	Yes	
	Comments	Awareness materials were distributed to stakeholders, with ongoing efforts to reach a broader audience. The distribution will continue across key activities where large numbers of stakeholders can be engaged. Additionally, training sessions will persist to further capacitate stakeholders on PHL management, ensuring sustained knowledge transfer and effective implementation of mitigation strategies.	
Output 4	National capacity on post-harvest management developed		
	Indicators	Target	Achieved
	Percentage of targeted government staff with improved skills in post-harvest management.	100 percent targeted group with improved skills.	Yes
Baseline	0		
Comments	A total of 242 beneficiaries were trained in post-harvest management, with coverage across districts that have significant production. This capacity-building initiative is expected to continue through the trained officers, who will extend their outreach to a wider range of actors. The goal is to help improve the handling of fresh produce, thereby reducing PHL and enhancing overall efficiency in the value chain.		
Activity 4.1	Conduct ToT workshop		
	Achieved	Yes	
	Comments	The team played a crucial role in guiding, supervising and ensuring the quality of all capacity-building activities and the survey exercise, leading to high-quality results. A total of 30 officers were trained by the BUAN, while an additional 20 officers were trained by those previously trained at BUAN. This cascading training approach helped expand the reach and impact of the capacity-building efforts.	
Activity 4.2	Conduct training on post-harvest technology of horticulture		
	Achieved	Yes	
	Comments	The activity was revised following discussions with the MoLA, which suggested reallocating the funds to train officers locally, thereby benefiting a larger group rather than just three individuals. As a result, fifty extension officers were trained, ensuring a broader impact and equipping more personnel with the skills needed to address PHL effectively.	
Activity 4.3	Organize country tour to relevant institutions		
	Achieved	Yes	
	Comments	The BUAN was engaged in providing capacity-building training as the accredited institution and officers were taken on on-site visits for practical exposure.	

Partnerships and Outreach

For more information, please contact: Reporting@fao.org

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