



REGIONAL ADVISORY NOTE

POST-HARVEST LOSS MANAGEMENT IN MOZAMBIQUE AND BENIN

Introduction

Post-harvest food losses are one of the largest contributing factors to food insecurity and under-nutrition in Sub-Saharan Africa (Capone et al., 2014). Post-harvest losses significantly lower the quality and volume of food available for consumption and sale, thus aggravating hunger and malnutrition, and reducing household income. **Appropriate policies and regulatory frameworks on reducing post-harvest losses in rural food supply chains are necessary** if food security of communities in Sub-Saharan Africa is to be improved.

The main products which contribute to household diets are grains and pulses. Grains are a source of energy, whilst pulses are an affordable source of protein. Improved handling and storage options through 'good post-harvest handling practices' (GPHHP) at community level will increase the availability and stability of grains and pulses, thereby benefitting smallholder farmers.

In studies done in Benin and Mozambique, no post-harvest loss management (PHLM) policies and standards that can be adopted at community level were found to be in place. There is also limited research related to PHLM at community level and no institutions effectively representing smallholder farmers.

Traditional PHLM practices in rural areas are normally managed by women – where the drying, winnowing, separation, building of mud silos and granaries, monitoring of food balance and rural processing, as well as the transport from the field to the storage facility, are all done mainly by women. Women make essential contributions to agriculture in developing countries, however, due to gender marginalization and right to ownership of land in most Sub-

Saharan Africa countries, female farmers typically have lower output per unit of land and are much less likely to be active in commercial farming than their male counterparts. Women, due to traditional norms, are often not given enough education on farming as farms are considered to belong to men. Due to this, women do not have adequate information on proper crop harvesting and handling methods, resulting in significant damage during storage and marketing, and as a result, the knowledge and ideas that they have gained on PHLM through experience, are not considered to improve the food security status of their communities.

Key Messages

- **Post-harvest food losses need to be reduced at community level** in Benin and Mozambique to ensure food security and prevent under-nutrition. To achieve this, government investment needs to be increased
- **Post-harvest loss management policies, regulations and standards need to be developed** so that they can be adopted at community level.
- **Gender needs to be taken into account** when post-harvest loss management is addressed, since women are the primary actors implementing post-harvest management practices.
- **PHLM technology promotion programs must be tailored to the specific context** in terms of the viability of the technology.
- **Quality awareness is an important aspect if PHLM projects are to be successfully adopted.** This can be achieved through use of media. Awareness should be for governments, ministries, institutions, farmers groups, and consumers.

Methodology

Studies were conducted in Benin and Mozambique aimed at identifying standards and policies related to PHLM and address the issue of gender in post-harvest management of crops.

In addition, studies incorporating cost-benefit analysis (CBA) of post-harvest technologies were conducted in both countries.

EXISTING POLICY FRAMEWORKS FOR FOOD STANDARDS AND NORMS RELATED TO PHLM OF CROPS

For the studies on existing policy frameworks and standards related to PHLM of grains and pulses in Benin and Mozambique, a literature review was undertaken on the standards/norms in the respective countries.

In addition, interviews were conducted with relevant stakeholders. National validation workshops were also convened to provide stakeholders with an opportunity to provide their input and confirm the findings.

GENDER AND PHLM OF CROPS

For the study that addressed the issue of gender in the post-harvest management of crops in Benin, two field surveys, one with farmers and another with policy and agricultural key informants, two focus group discussions, and a literature review were conducted. The literature reviewed focused on

dry cereals in Benin, agricultural policies, post-harvest management, gender promotion policy in the agricultural sector and documents covering the evolution of the consideration of gender in the post-harvest management of dry grains.

For the study in Mozambique, a review of national, regional, and global literature on PHLM, gender and social equity was undertaken, and interviews were conducted with key policy informants. National validation workshops were also convened to provide stakeholders with an opportunity to provide their input and confirm the findings.

COST-BENEFIT ANALYSIS OF POST-HARVEST TECHNOLOGIES

As a means to elucidate the viability of metal silos and hermetic bags as PHLM strategies, cost-benefit analyses (CBA) of these technologies were undertaken in studies in Mozambique and Benin.

Estimating the costs and benefits and constructing cash-flows

To undertake CBA, streams of incremental costs and benefits associated with the adoption of metal silo and hermetic bag technologies were constructed in MS Excel, based on the knowledge available on PHLM practices of farmers in Mozambique and Benin. Net cash-flows were calculated. The cash-flows were prepared based on the expected lifespans of



the metal silos and hermetic bags (20 years and two years, respectively).

In keeping with standard practice in CBA, the studies established both the counterfactual and treatment scenarios for smallholder, medium-scale and large-scale farmers involved in the production of various crops in Benin and Mozambique.

An assumption was made that farmers who chose to invest in a metal silo can derive benefits from reduction in post-harvest losses over the entire duration of the life of the metal silo (20 years). This was used as the project life. To standardize the period of comparison between the hermetic bags and metal silos, an assumption was made that farmers would invest in hermetic bags over the same period and derive benefits of the technology over a period of 20 years.

To establish the level of investment and incremental benefit, the CBA modelling exercise constructed modules which were based on the carrying capacities of the metal silos. A standard module of 500 kg metal silo was used and it was based on the information available concerning the average yields and average hectareage per farmer planted to maize. For cost-benefit analysis, a 500 kg metal silo module was matched with a 10 X 50 kg bag module for hermetic bags.

Two counterfactual scenarios were constructed based on production, marketing and storage practices found in Benin and Mozambique and the fluctuations in commodity prices on the market in the various regions of the two countries. Scenario 1 assumed that some of the farmers who lack modern PHLM technologies decide to immediately sell their produce at harvest time to avoid losses in storage. Scenario 2 assumed that some of the farmers keep the commodities for home consumption later in the season, and do not sell immediately after harvest because they fear that the market might not have the commodities at an affordable price to purchase back later in the season. The scenario assumes that such farmers are not aware that when they store they lose part of the product due to pest damage or decay in storage, and that it will be better to sell and salvage value from their production.

These two models were used for constructing the gains of PHLM technologies. Scenario 1 estimated the incremental

benefits by calculating the quantity of food lost in storage without technology, and then multiplying this by the price differential between the immediate harvest period and the lean season price. An assumption was made that metal silos and hermetic bags were 100% effective in preserving the quantity of food harvested until the lean season.

Discounting the cash flows

For each crop and model, the cash-flows comprising the cost of adoption of the technology and running costs of pesticides to treat the crop each year, and the benefits of improved storage technologies were computed for a period of 20 years for both metal silos and hermetic bags. These cash-flows were then discounted at a rate determined by the Ramsey equation or formula.

Viability indicators

To assess viability of the investments in PHLM technologies, five indicators were computed using the various scenarios of risk, farmer post-harvest management preferences and technology type, discussed above, but standardizing the module (quantity stored) as 500 kg. These indicators were:

- Net present value (NPV)
- Internal rate of return (IRR)
- Benefit-to-cost ratio (BCR)
- Payback period (PP); and
- Breakeven point (BP).

Sensitivity analysis

In order to accommodate the impact of variations in farmer types and capacity in the analysis, year on year variations in staple food prices, variations in the effectiveness of the technologies in reducing the post-harvest losses based on agro-climate conditions, differences in crop varieties, and variations in the workmanship of those manufacturing the metal silos and hermetic bags, on the estimated indicators of viability, the models were subjected to rigorous sensitivity analysis assuming the following four main scenarios:

- 20% less benefit from base case;
- 20% more benefit from the base case;
- 14% discount rate (assuming a riskier environment than base case of 12%); and
- 10% discount rate (assuming less risky environment).

Key Messages and Recommendations

The following key messages and recommendations were identified through the studies conducted in Benin and Mozambique.

Strengthening policies, regulations, standards and norms

Policies, regulations, standards and norms should be developed to facilitate adoption and implementation of good post-harvest handling practice options, thereby reducing post-harvest losses at community level.

As PHLM is an important part of the agricultural value chain, all new agricultural strategy documents should have a chapter on PHLM and should pay attention to gender mainstreaming in addressing PHLM and grain marketing issues.

Policy gaps identified could be closed by creating a working group with a function of re-organizing the standards. Involvement of all stakeholders in PHLM policy and standard formulation will quicken the process of adoption and allow the norms to be understood at all levels of the value chain. The working group should be composed of key players in policy formulation, that is, farmers, retailers, consumers, legislative bodies, etc. The activities should include clearly defining the role of agencies, clearly identifying the norms' contributions to post harvest management, updating existing obsolete standards, dissemination methods of standards to relevant stakeholders, and creating new policies and standards that cover PHLM subjects.

Research and extension

A value-chain approach in crop research, which starts at variety development and end at post-harvest management and nutritional uses, can enforce the inclusion of the PHLM considerations in agricultural research activities.

Governments must improve their statistical data collection and analysis tools in agriculture. They need to revise tools with gender aspects and ensure the availability of sex-disaggregated statistical data. There is a need to define a clear analysis methodology that will help to assess the real contribution and needs of men and women in PHLM.



With respect to research and studies, institutions that have been assigned with this mandate require redefining and revitalization. Their operations and performance should be supported with financial and human resources, as well as infrastructure. The research activities should be modelled to suit PHLM projects for smallholder farmers.

Gender and social equity should be taken into account in research methodologies. The reduction of drudgery of purely feminine PHLM activities should be taken into account during the development of equipment.

Extension methods must take into account both women and men and not only household heads, who are mostly men, as well as the social differentiation systems relevant to PHLM activities. Short courses can also be provided to smallholder farmers on post-harvest handling of grain and pulses. Non-governmental organizations who are working at the grassroots level, should support women in accessing equipment and technologies that will enable them to reduce the hardship of PHLM activities.



Promoting gender responsiveness in PHLM

Alternative PHLM technologies that can help improve livelihoods of women and of other disadvantaged people include mass dissemination of improved handling and good storage management practices including hygiene, use of cheaper improved tools, and low-cost improvements to their existing structures and systems. In the technology development process, taking gender considerations into account is crucial for the relevance of the innovations to all concerned people.

Technical and financial partners should finance and/or conduct training and advocacy activities on gender and social equity mainstreaming in PHLM to all relevant actors, such as researchers, professors, extension officers, producers' organizations, etc. Finally, relevant line

ministries should be encouraged to commit to gender sensitive budgeting and planning.

The institutionalization of gender and social equity should be supported through the provision of financial and technical support to the Ministries' Gender Focal Points.

Women involved in PHLM must be supported to access credit for PHLM activities, for example, the possibility of credit in kind, which allows for the acquisition of equipment whilst payment is made later. Another alternative may be to subsidize part of the acquisition of equipment or ensure that women access credit from microfinance institutions.

Awareness creation for enhanced uptake

Quality awareness is an important aspect if PHLM projects are to be successfully adopted. This can be achieved through use of media. Awareness should be for governments, ministries, institutions, farmers groups, and consumers.

Intensification of advocacy towards the elevation of PHLM to the higher agenda of governments is critical to stimulate action at various operational levels. A key message to be disseminated would be raising awareness on the cost-effectiveness and environmental sustainability of promoting post-harvest loss reduction, rather than increasing production to corresponding levels.

Awareness should be created on the importance of gender mainstreaming in PHLM at policy and institutional levels, and gender-sensitive policies and technologies should be advocated for. Gender budgeting should be advocated for and followed up on, in the context of the development of National Agricultural Investment Plans.

The payback period for investment in PHLM technologies is between two to seven years. Thus, PHLM promotion programs should be medium to long term in duration (four to seven years), with shorter periods for silos and longer periods for hermetic bags.

Support context-specific, cost-effective technology

PHLM technology promotion programs must be tailored to the specific context of the farmer or trader in terms of the viability of the technology. The results of the CBA in both Benin and Mozambique showed that both hermetic bags and metal silos were viable post-harvest management technologies from which farmers could reap significant benefits.

To sustainably increase the rate of adoption of hermetic bags and metal silos by farmers, the Governments of Benin and Mozambique should strengthen the supply chain of these storage technologies through awareness raising targeting farmers, traders, manufacturers and extension services, skills training, and access to finance.

In Benin and Mozambique, the initial capital investment cost for the metal silo is high. For this reason, post-harvest management programs seeking to promote adoption of improved storage technologies should consider the hermetic bag technology for wider reach with limited resources ahead of the metal silo, but actively promote the metal silo as a graduation pathway for hermetic bag

adopters. In Mozambique and Benin, the Governments should promote adoption of the metal silo technology for a period not shorter than three years to increase viability.

The Governments of Benin and Mozambique should promote hermetic bags for the storage of beans rather than for the storage of maize, since returns on investment in hermetic bags are superior for beans.

Translating financial investments into action

The Governments of Benin and Mozambique should increase investment in PHLM technologies so that all farmers in all provinces have access to these technologies. Reducing post-harvest losses should be given equal if not more weight than other investments in the short-term. Cost-benefit-analysis should be regularly undertaken and include a wider range of technologies in order to inform farmers and provide them with a wider choice of viable options which are context-specific and cost-effective.

Investing in selected segments of PHLM value chains, where technology can reduce workload usually left to women, by using mobile, easy to operate petrol powered machines, bought in instalments by richer farmers, with the mandate of being used both on cash and credit terms, may be a good initiative. Financial partners should go beyond funding the development of policy documents and action plans to ensure that implementation is done. It may be true that the funding of the implementation may seem to be an act of national sovereignty but given past experience of non-implementation of these action plans, the work done by these technical and financial partners may not yield the anticipated outcomes and impacts. The results of their funding come down to just “papers” and are not realized. It is therefore recommended that technical and financial partners of the agricultural sector accompany Ministries of Agriculture in the operationalization of plans.



References

- Capone, R., El Bilali, H., Debs, P., Cardone, G. & Driouech, N. 2014. Food system sustainability and food security: connecting the dots. *Journal of Food Security*, 2, 13-22.
- Croppenstedt, A., Goldstein, M. & Rosas, N. 2013. Gender and Agriculture: Inefficiencies, Segregation, and Low Productivity Traps. The World Bank.
- FANRPAN, 2017. Cost Benefit Analysis of Post-harvest Management Innovations Benin Case Study. Pretoria.
- FANRPAN, 2017. Cost Benefit Analysis of Post-harvest Management Innovations in Mozambique. Pretoria.
- FANRPAN, 2016. An Evaluation of gender roles, relationships, and social equity in post-harvest management in Benin and Mozambique. Pretoria.
- FANRPAN, 2015. Gender and social equity of post-harvest management of cereals in Benin report (2015).
- FANRPAN, 2015. Integrating gender-roles, social equity and post-harvest management policies to improve rural households' food security. Pretoria.

This publication is part of the regional project “Postharvest Management in Sub-Saharan Africa”, which is funded by the Swiss Agency for Development and Cooperation and implemented in a consortium between HELVETAS Swiss Intercooperation and the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), with the African Forum for Agricultural Advisory Services (AFAAS) and AGRIDEA as associated partners.



About FANRPAN

The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) is an autonomous regional stakeholder driven policy research, analysis and implementation network that was formally established by Ministers of Agriculture from Eastern and Southern Africa in 1997. FANRPAN was borne out of the need for comprehensive policies and strategies required to resuscitate agriculture. FANRPAN is mandated to work in all African countries and currently has activities in 17 countries namely Angola, Benin, Botswana, Democratic Republic of Congo, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

Copyright FANRPAN Regional Secretariat
141 Cresswell Road, Weavind Park 0184, Private Bag X2087, Silverton 014, Pretoria, South Africa
Telephone: +27 12 804 2966. Facsimile: +27 12 804 0600. Email: policy@fanrpan.org . Website: www.fanrpan.org