Prevention of food losses across the value chain in Africa

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FSP Best Practices 04
August 2021

A best practice is a method or technique that has been generally accepted as superior to any alternatives because it produces results that are superior to those achieved by other means or because it has become a standard way of doing things. This document is one of a series of reports from the Food Security Portal on best practices for emerging topics in agriculture and food security policy.

Introduction

Reducing food losses can contribute to food security and nutrition, especially in Africa where agriculture forms the main source of food and income for most of the population. However, for a long time, policymakers have focused on increasing agricultural production and productivity and have placed less emphasis on reducing food losses (Costa, 2014). In recent years, the issue of food losses has become the center of attention worldwide and was even included in the Sustainable Development Goals aiming to halve food losses by 2030 (Delgado et al., 2017; Flanagan et al., 2019). In Africa, the Comprehensive Africa Agriculture Development Programme and the commitment made under the Malabo Declaration aiming to halve post-harvest losses by 2025 show that governments agree on the need to reduce food losses. These losses are estimated by the FAO to account for one-third of the total food produced on the continent.

Reducing food losses not only guarantees income for producers and lowers prices for consumers but also preserves the environment by reducing pressure on natural resources (land and water) and ensures food and nutrition security (Flanagan et al., 2019). However, despite the importance of reducing food losses, the way in which the problem is treated differs as a result of several factors, including the methodologies used to measure losses and limited studies on different stages along the value chain. In addition, most interventions in Africa have focused on storage (Stathers et al., 2020), even though some studies (Affognon et al., 2015; Ridolfi, Hoffmann, and Baral, 2018; Vos, 2020; Delgado et al., 2021, and Malhotra, 2019) suggest that a substantial percentage of losses occur at the farm level and sometimes before harvest.

This work aims to provide evidence-based practices for food loss prevention across the value chain based on a review of practices that have been effective in the African context.

Identifying the stage, causes, and magnitude of losses

Any intervention aiming to reduce food losses will require an understanding of the value chain in terms of the critical points at which losses occur, as well as their causes and magnitude. Several studies and interventions focus on post-harvest losses and exclude information related to pre-harvest losses (Delgado et al., 2021). However, correct measurements along the entire chain are necessary, as only the factors that get measured get managed (Flanagan et al., 2019). A study conducted by the FAO, WFP, and IFAD (2018) in Uganda concluded that 3.3 percent of quantitative maize losses occur at harvest level and 10 percent occur during on-farm storage. Qualitative losses were estimated at 50 percent during the on-farm storage stage. Five percent quantitative losses occur during milling and 3 percent at the drying stage. In addition, Delgado, Schuster, and Torero (2017) estimated qualitative and quantitative losses across five value chains in six developing countries, including teff in Ethiopia, using three different methodologies that incorporate pre-harvest losses. These authors concluded that most quantitative and qualitative losses occur at the producer level and that these losses can reach 80 percent of the total losses along the chain in the case of cereal grains. Regarding fruits and vegetables in Africa south of the Sahara (SSA), the highest losses occur at wholesale and farm levels (Affognon et al., 2015). Losses at the producer level in SSA result from various factors, including incomplete or late harvests that are often conducted manually, lack of good harvesting practices and drying facilities, infestation by pests and insects, and spillage and spoilage during storage (Costa, 2014; Kiaya, 2014). In addition to direct losses, the absence of economic incentives also need to be taken into account, as these may indirectly contribute to post-harvest losses (Sheahan and Barrett, 2017).

Farmers' training and capacity-building

For any good practice to achieve the desired outcomes, farmers must have sufficient knowledge and control. A study carried out by Costa (2014) in Uganda and Burkina Faso revealed that farmers' knowledge represents a critical step in the process of reducing losses. Even if a reduction technology is good, it will be of little or no importance if it is not well applied or known. A study by FAO, WFP, and IFAD (2019) in Burkina Faso on maize, sorghum, and cowpea and the WFP Purchase for Progress (P4P) strategy highlighted that community sensitization on production process planning, strengthened technical capacities, and increased access to improved seeds were of paramount importance in reducing maize losses at the farm level.

The cost of technology

If the cost of interventions are too high, they will not be affordable and attractive to many smallholders who are more vulnerable to food losses along the value chain. Cattaneo et al. (2020) and Sheahan and Barrett (2017) recommend the evaluation of both the costs and benefits of interventions and the trade-offs between objectives. Generally, farmers, as rational economic agents, will only be able to invest in reducing losses if the marginal benefits of a given intervention are greater than the marginal costs. Ndegwa et al. (2015) concluded that Kenya's use of hermetic bags for maize storage, for example, had a benefit-cost ratio of 1.6, meaning that farmers could recover their capital by storing their produce for a period of four months. FAO, WFP, and IFAD (2018) carried out similar studies in Ethiopia, where the results showed that the use of hermetic bags, such as Purdue Improved Crop Storage (PICS) bags that are reusable for two or three seasons, made the storage of maize profitable.

Harvest

At the harvest stage, food losses occur when the crop is harvested too early before maturity (increasing the possibility of damage) or too late (increasing susceptibility to infestation by pests and insects). Losses can also occur when inadequate tools or harvesting methods are used. In their review of post-harvest loss reduction studies in SSA and South Asia, Stathers et al. (2020) found that the selection of maize cobs with tightly closed husks reduced insect infestation from 20 percent to 1 percent compared to cobs with open husks. WFP studies of maize value chains in Uganda and Burkina Faso highlighted the importance of moisture and at the harvesting stage Kumar and Kalita (2017). They argued that after it reaches physiological maturity, maize is susceptible to attack by pests. Thus, it is important that the harvest is done at the right time when the maturity moisture content is between 23 and 28 percent.

Drying

Cereals grains must be properly dried before storage to improve their conservation and reduce aflatoxin contamination. Although relatively cheaper, traditional techniques in SSA depend on natural conditions and are likely to aggravate food losses, estimated to be between 3.5 percent and 4.5 percent at this stage (Kumar and Kalita, 2017). FAO, WFP and IFAD (2019)'s study in Democratic Republic of Congo and Burkina Faso and Udomkun et al. (2020)'s study in Kenya, Burkina Faso and Uganda both recommended the use of *Allgate* dryers and inflatable solar dryers due to their effectiveness in reducing grain losses and their low cost. Mechanical dryers are also effective in reducing losses during the storage stage but are often not attractive to smallholder farmers due to their high initial cost and ongoing maintenance costs (Kumar and Kalita, 2017).

Storage

Around 10 percent of losses along the chain occur during storage (FAO, WFP, and IFAD, 2019), mainly due to poor storage infrastructure and the high cost of some modern technologies. Airtight or hermetic storage has been strongly recommended for grain storage. For example, Gitonga et al. (2020) assessed the impact of metal silos on household maize storage in Kenya and concluded that airtight metal silos protect maize from infestation by insects. However, Singano, Mvumi and Stathers (2019) found that while metal silos reduced insect infestation, they also drastically reduced seed germination rates in Malawi. They instead recommended hermetic bags, such as Purdue Improved Crop Storage (PICS) and Super Grain Bags (SGB), in climate-change-prone regions. Due to their relatively higher price, metal silos may also be more accessible for medium-sized farmers or associations.

Singano, Mvumi and Stathers (2019) analyzed the effectiveness of metal silos, PP bags, and hermetic bags (airtight storage) in preventing insect infestation, protecting grain quality, and reducing mycotoxins (aflatoxin and fumonisin) during maize storage in Malawi. The study concluded that hermetic storages reduced the incidence of aflatoxin compared to PP bags, regardless of initial moisture. Less than a 5-percent increase in aflatoxin per month was recorded in airtight storage; there was also a positive correlation between storage time, moisture, and aflatoxin using PP bags but not in airtight storage. No differences were recorded regarding fumonisin among all types of storage. Likewise, Walker et al. (2018) conducted a study in Kenya and found that airtight storage reduced insect infestation, as well as grain weight loss and discoloration; however, the study also recommended proper drying of maize prior to airtight storage. Baributsa et al. (2020) also recommended hermetic technologies for maize storage in Benin but warned about the need to train farmers in proper handling of hermetic bags. Among different hermetic storage options, Purdue Improved Crop Storage (PICS) is the most recommended in SSA, given its effectiveness in protecting against insect infestation, weight loss, and discoloration and in maintaining substantial germination rates at affordable prices.

Need for combined actions and proper measurement

In his study in Uganda and Burkina Faso, Costa (2014) demonstrated that combined interventions along the value chain can reduce losses by 98 percent regardless of crop or storage duration. Of particular importance was the impact of training in post-harvest management on household income and food security.

The reduction of food losses requires proper identification of critical loss points along the value chain, as well as adequate and accurate measurement and identification of their causes in order to design appropriate interventions with the potential to achieve the desired outcomes.

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