

GUEST EDITORIAL

Post-harvest Losses and Food Waste: The Key Contributing Factors to African Food Insecurity and Environmental Challenges

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Why Africa urgently needs to act now on food losses and waste

Food losses and waste are becoming increasingly critical to the African farmer and threats to sustainable food and environmental security. Analysis of the current food situation shows that almost 1.2 billion people are going hungry in the world and one-third (1/3) are found in Africa with many being farmers [1]. About 1.3 billion tonnes of food waste has also been reported to be produced annually around the world at a direct economic cost of \$750 billion [2, 3]. A report by Food and Agriculture Organization [2] shows that while about 54% of the world's food waste occurs 'upstream' during production, post-harvest handling and storage, only 46% happens 'downstream,' at the processing, distribution and consumption stages. Food losses and waste are, therefore, not only causing major economic losses but also wreaking significant harm on the natural resources that humanity relies upon to feed.

Going by the most recent estimates from Food and Agriculture Organization (FAO) that, 842 million people in the world do not eat enough to be healthy implies that one in every eight people on earth goes to bed hungry each night [4]. It is projected that the world population will rise to 10.5 billion by 2050 [5] with more than half of this growth expected to come from SSA where about one quarter of the population is already undernourished. This also implies that SSA needs to feed about 33% more human mouths with the greatest demand in the poor communities. To fill the gap between food demand and supply by 2050, food supplies would need to increase by about 70% [6,7] and 65 million hectares could be saved by reducing food waste in the value chain (excluding consumer food waste) by 2030 [8] if proper attention is paid to it by all the stakeholders.

African food production, supply and consumption systems are not yet functioning to optimal efficiency. Many countries in Africa are being challenged by limited land, water and increased weather variability, post-harvest losses and food waste are making it difficult to secure adequate food for the growing population. Post-harvest losses at any level still remain a major drain on food production and food security (Figure 1). Food losses in sub-Saharan Africa (SSA) alone exceeds 30 percent of total crop production and represents more than USD\$4 billion in value every year [9]. In a recent estimate, SSA lost between 30 to 80% of their perishable foods (fruits, vegetables, root crops) before consumption, and with these enormous losses, wasted a lot of the land and water, fertilizer, labor and money that went into food production [10].

Managing limited or surplus food produced efficiently in Africa is, therefore, critical. Food losses in fresh produce chains are most prevalent in the continent where close to 70% of fruit and vegetables produced is lost along the supply chain. Large amounts of food in SSA also go to waste as a result of inappropriate storage. Total food losses in SSA alone have been estimated to be worth over \$4 billion per year, an amount which could be used to meet the minimum annual food requirements of at least 48 million people and are roughly equivalent to the value of annual cereal imports in the region [11]. African annual post-harvest due to inefficiencies across the agricultural value chain on cereals and legumes have been estimated to be as high as 14% of the total crop harvested; 15-20% for oilseeds and pulses; 15-30% for roots and tubers; and 30-40% for perishable products such as harvested fruits and vegetables [12, 13]. In addition, physical grain losses prior to processing range from 10 to 20 per cent of annual production and worth \$27 billion in Africa [9, 14]. The high post-harvest losses and food waste therefore are major obstacles in achieving sustainable African food supply chains since insecurity is not just about insufficient food production, availability and intake but has to do with post-harvest losses as well.

Discussions on post-harvest losses and food waste are imperative now because Africa needs to pay proper attention to them as these factors hinder food security and directly impact the lives of millions of smallholder farm families every year on the continent. Reduction in post-harvest losses and food waste should be an integrated approach of realizing agriculture's full potential, improving productivity on existing farmland, and sustainably bringing additional acreage into production.

Post-harvest food loss or food waste?

Post-harvest food loss (PHL) is any loss in quantity (such as physical weight losses) and quality (loss in edibility, nutritional quality, caloric value, consumer acceptability) that occurs between the time of harvest and the time it reaches the consumer (see Figure 1), while food waste is a subset of the food losses [15] and is the loss of edible food due to human action or inaction such as throwing away produce, not consuming available food before its expiry date, or taking serving sizes beyond one's ability to consume [16]. Parfitt *et al.*, [17] distinguishes between food losses and food wastes, arguing that the former relates to early stages of the food supply chain (FSC) and refers to a system which needs investment in infrastructure. Food waste is applied to later stages of the FSC, and generally relates to behaviour of food suppliers and consumers.

Post-harvest food losses occur during harvesting and handling due to grain shattering, spillage during transport and biodeterioration at all steps in the post-harvest chain. The principle agents of biodeterioration can be moulds, insects, rodents and birds.



Figure 1: Example of maize grain loss to moulds

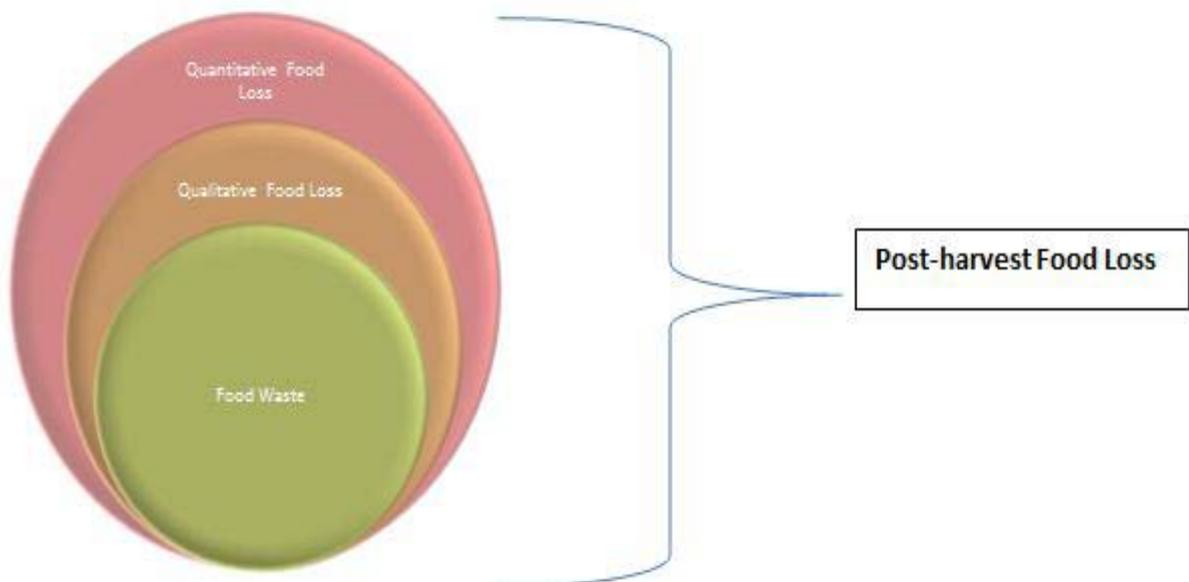


Figure 2: Post-harvest food loss components



Figure 3: Typical ranges of weight losses for various links in the post-harvest chain Source: [14].

Factors contributing to African post-harvest food losses

In many African countries high food losses are due to a number of factors. These include: lack of resources, poor processing facilities/ use of outdated technology, damp weather at harvest time, poor production practices/planning, transportation facilities, grading, lack of infrastructure, consumer preferences/attitudes, unavailability of financial markets, premature harvesting, lack of access to good quality packaging materials and technology, inadequate market systems [18]. Harvest and post-harvest losses of roots and tubers can be physiological (caused by the effect of environmental conditions), pathological (cause by the attack of pathogens, such as fungi, bacteria, insects and so on.) and endogenous (caused by endogenous processes like respiration, transpiration and sprouting). Exposition to extreme temperatures (high, low) during pre- and post-harvest and rough handling does not only reduce the value of the crop through damage created in appearance, it also leads to invasions of pathogens causing decay of the attacked crop in the storage [19].

Options for reducing African post-harvest food losses

Technologies aimed at reducing harvest and post-harvest losses exist but they are not sufficiently adopted by farmers in most African countries. Even though a number of these technologies have proved to be successful in Asia, more research and piloting are needed to identify interventions that are adapted to local environments on the continent. To succeed, interventions must be sensitive to local conditions and practices, be viewed within a value chain lens, and ensure that appropriate economic incentives are in place. Technologies that have taken off in Asia, such as small-scale rice-drying and the

introduction of pedal threshers and rice mills have been successfully adopted in some parts of Africa. In addition, there is need to adopt the modern post-harvest technologies even more in Africa, given that high population migration, aging farming populations, and high rates of HIV/AIDS infection are reducing the available labour and thus raising wages. Fresh cassava tubers, once harvested have a short shelf life of 3-5 days before they undergo internal oxidation and begin to blacken; they should, therefore, be left unharvested until needed as the technology for its storage still remains scarce. Sweet potatoes and yams that exhibit a period of dormancy, storage life can be extended by curing.

Effects of post-harvest losses and food waste

Agricultural production uses 2.5 trillion m³ of water per year and over 3% of the total global energy consumption and estimated food losses of about 30-50% of total production translates to wasting 1.47-1.96 Gha (global hectares or 4931 million hectares) of arable land, 0.75-1.25 trillion m³ of water and 1% to 1.5% of global energy [20]. This shows that food losses have negative environmental impacts on land, water and non-renewable resources such as fertilizer and energy that are used to produce, process, handle and transport food that no one consumes. Post-harvest loss reduction will increase food availability without increasing the use of land, water and agricultural inputs.

Losses after harvest of both quantity (weight losses) and quality deprive farmers of the full benefits of their labour. Food losses do not merely reduce food available for human consumption but also cause negative externalities to the society through costs of waste management, greenhouse gas production, and loss of scarce resources used in production [21]. Food losses contribute to high food prices by removing part of the food supply from the market. Post-harvest food losses significantly endanger the livelihoods of stakeholders across the value chain by reducing valuable incomes and profitability. The benefits to consumers from reducing losses include lower prices and improved food security. In addition, post-harvest activities such as processing and marketing can create employment.

What should Africa do to ensure sustainable food and environmental security?

High harvest and post-harvest losses are still imminent to poor subsistence farmers who still dominate food production in most African countries. Majority of the small-scale farmers still rely on traditional technologies rather than modern systems that produce limited food losses. Research findings show that a reduction of just one per cent in post-harvest food losses leads to a gain of USD 40 million annually. African countries need to urgently pay attention on how to reduce post-harvest losses at the farm, retail and consumer levels, which constitute a threat to food shortages, food insecurity and environmental problems rather than increasing the level of production. African policy makers should go beyond the target set by the European Commission on reduction of food losses and food waste by 50% comes 2020 by tackling the underlying causes now.

Specific and well-targeted policy interventions are needed to educate the farmers on how to reduce post-harvest food losses and waste. The continent needs to focus on

adoption of better post-harvest practices and new marketing arrangements such as collective marketing. Cooperation is also needed among the farmers, marketers and consumers to share the costs of investment in new technologies as well for learning from each other. Farmers need to know and experience that a new technology is significantly superior to the existing system, and can provide a secure income. Post-harvest technologies for poor farmers should be built on the traditional approaches with the utilization of locally available materials as much as possible.

Governments can help by creating an enabling environment; reduction of market transaction costs through investment in infrastructure (such as roads, electricity and water), and strengthening of agricultural research and extension by identifying where losses occur along the food chain and how to tackle them.

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