



Food loss analysis: causes and solutions

Maize supply chain in Ethiopia

Maize (*Zea mays L.*) is one of the main staple food crops produced in Ethiopia hence it is a commodity of strategic importance to the country's economy, food and nutrition security. Moreover, its importance has been growing over time because of the increasing trend in the utilization of maize as poultry feed. Maize is a major source of carbohydrate, protein and fibre, and has high content of minerals such as calcium, phosphorus, potassium and magnesium. Over 8.7 million smallholder farmers depend on maize production for their livelihood.

farm storage is the critical loss point of the supply chain. (Table 1). Poor conditions of used bags and poor sanitation of grain stores predispose the grains to insects and rodents infestation which lead to 6.9 percent loss.

Impact of post-harvest losses

Losses that occur at the farmer's level have a negative impact on the livelihoods of many smallholder maize farmers who live on the margin of food insecurity. Maize losses reduce food availability at the household level where 80 percent of the produce is retained for consumption. Reduction in the volume that can be sold due to losses also translates to reduced income. Furthermore, losses mean wastage in labour and inputs utilized in maize production that negatively impact the resource-poor farmers.

The importance of good post-harvest handling practices

Traditional practices in harvesting, stacking/drying, and on-farm storage result in high levels of post-harvest losses due to spillage and grain quality deterioration caused by unfavourable weather conditions, pest infestation and mould contamination. Maize

The maize supply chain

The supply chain in Burka Golu Kebele, Deder Woreda district in Oromia Regional State in Ethiopia was assessed. It includes smallholder farmers, rural assemblers, traders, wholesalers, millers and retailers. The supply chain handles the marketable surplus of maize hence its improvement could greatly benefit consumers in terms of price and quality. Observations, direct interaction with stakeholders and actual load tracking were done to provide estimates of the quantitative and qualitative losses, and identification of the critical loss points in the supply chain.

Maize production is dominated by smallholder farmers who cultivate 0.2 hectare per household which represents more than

65 percent of total average landholdings. The majority of the farmers produce improved maize varieties. After harvesting, stacking/drying and shelling, the maize grains are sold by farmers to rural assemblers who in turn supply the woreda or zone traders. The zone traders then supply the wholesalers. Retailers and millers source the grain from wholesalers and sell it to consumers (Table 1).

Critical loss points in the supply chain

Post-harvest begins where production ends, that is at harvest. The highest level of quantitative loss of 10.5 percent occurs in the production chain where harvesting and subsequent on-farm operations are done. On-

TABLE 1

The maize supply chain, stakeholders, operations and loss points.

Supply chain level	Production	→ Collection centre	→ Wholesale market	→ Retail market	→ Consumption
Stakeholders	Farmer Input suppliers	Rural assemblers Zone traders	Wholesalers	Retailers Millers	Consumers
Operations	Harvesting Stacking/Drying Picking/Dehusking Shelling Packaging Farm storage	Transport	Transport Storage	Transport Milling Retailing	Buying Consumption
Quantitative Loss (%)	10.5		1.75	4.0	
Loss Points (%)	Harvesting: 1.0 Piling: 2.1 Threshing: 0.5 Storage: 6.9		Transport and storage:		

TABLE 2
 Costs and returns calculation for the interventions

Item	Metal silo	Triple bag
	Value	Value
Product quantity, tonne/yr	0.47	0.47
Product value, USD/tonne	252.4	252.4
Loss rate, %	6.9	6.9
Food loss, tonne/yr	0.03	0.03
Economic loss, USD/yr	8.2	8.2
Total cost of intervention, USD/yr (10 year lifetime for silo; 3 years for bag)	16.5	3.5
Client cost of intervention, USD/tonne	35	7.4
Anticipated loss reduction, %	75	75
Volume of loss reduction, tonne/yr	0.02	0.02
Loss reduction savings, USD/yr	6.15	6.15
Profitability of the Intervention, USD/yr	-10.4	2.65

grains are susceptible to attack by rodents, insects, and mould due to poor packaging and inadequate storage conditions. The lack of appropriate and feasible technologies is the main constraint for the reduction of post-harvest losses in the maize supply chain. Food loss reduction measures should therefore be given high priority to raise incomes of smallholder maize farmers and improve food and nutrition security in Ethiopia.


FIGURE 1
 Metallic silo for grain storage
 (Source: www.cgiar.org/wpcontent/upload_grains-silos)

Recommendations to reduce losses and the economic Benefits

On-farm storage is the most critical loss point at the farmer's level. A loss of 6.9 percent is incurred due to poor packaging (use of old bags and inadequate storage conditions) that predispose maize grains to attack by insects, rodents and mould growth. With traditional storage, economic losses equivalent to 8.2 USD/year are incurred. A 75 percent reduction in losses, can be achieved through storage in metal silos, which is equivalent to savings of 6.15 USD per year. Metal silos (Figure 1), if properly managed, effectively protect stored grains from rodents, birds and moisture migration that results in mould growth in the grains. Smallholder farmers could benefit from higher grain output and improved quality. However, in the context of Ethiopia, it was found that owning one metal silo is not profitable for one farm household despite the reduction of losses (Table 2). Since an individual smallholder farmer cannot afford the cost of buying and operating a metal silo, the adoption of metal silos will be profitable if purchased by cooperative unions and private suppliers who can provide storage rental services to individuals or groups of farmers. Individual farmers can also make use of triple layer bags, such as PICS bags (hermetic bags) as an option, given their effectiveness in

protecting grain from damage by storage insect pests. With a loss reduction of 75 percent, savings of 6.15 USD/year can be realized with the use of triple layer bags, generating a profitability of 2.65 USD/yr (Table 2).



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This information sheet summarizes the results of the study on Food Loss Analysis: Causes and Solutions, Case Studies in Small-scale Agriculture and Fisheries Subsectors of the Food and Agriculture Organization (FAO) of the United Nations. *For more information:* Global Initiative on Food Loss and Waste Reduction (www.fao.org/save-food).



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