



# Food loss analysis: causes and solutions

## Teff supply chain in Ethiopia

Teff [*Eragrostis teff* (Zuca) Trotter] is the most important dietary staple food crop in Ethiopia hence it is a critical commodity for income, food and nutritional security. It is a major source of carbohydrates and fibre, has high content of calcium, phosphorus, iron, potassium, thiamine and contains no gluten. More than 6.5 million resource poor households are engaged in teff production.

until the farmer is ready to thresh. Attack by animals, insects (termites), rodents and birds leads to 6.3 percent loss (Table 1). Farmers thresh teff using animals to trample it resulting in quality loss due to contamination of the grain with soil and waste from trampling animals. Quantity loss occurs due to animals feeding on the grains while threshing and from grains that spill on the floor.

Wholesalers and retailers experience losses during transport because of poor packaging wherein leakage occurs when old bags are used and when the bags are not handled properly during loading and unloading. Teff grains are stored in sacks or in bulk in storage structures with concrete floors but the common storage structures are made of mud-plastered walls and floors. Rodents are the major pests and cause excessive grain loss. Grain spoilage occurs also due to excessive moisture that leads to mould growth that not only reduce quality but may also pose health risks.

### Impact of post-harvest losses

Losses that occur at the level of the farmer have an immediate and significant impact on the livelihood of many smallholder and marginal farmers. Many farmers live on the margin of food insecurity. Teff losses reduce food availability at the household level where

### The teff supply chain

The supply chain that was assessed in Machakel Woreda in Amhara Regional State in Ethiopia represents the farmer group supply chain which is composed of smallholder farmers' multipurpose cooperative, consumer's cooperative and traders. The supply chain is promoted by the government because of greater benefit to consumers in terms of price, quality and traceability. Observations, direct interaction with stakeholders and actual load tracking were done to provide an estimate of the quantitative and qualitative losses, and identify the critical loss points in the chain.

Teff production is dominated by smallholder farmers who cultivate one hectare per household accounting for more than 90 percent of total average farm holding. Farmers use traditional or local technologies to produce the crop. After harvesting and threshing, farmers sell teff either to rural assemblers or zone traders who then supply

the wholesalers. The latter temporarily stores the crop and negotiates with other buyers until the produce is sold. Retailers and millers source the grain or the flour from wholesalers and sell it to the consumers (Table 1).

### Critical loss points in the supply chain

Production ends at harvest and post-harvest starts at harvest. The highest quantitative loss of 22.8 percent occurs in the production chain where harvesting and subsequent on-farm operations are done. Harvesting, stacking/piling and threshing are the critical loss points at the production stage while transport and storage at the wholesale and retail markets (Table 1). Teff harvesting is done manually and losses amounting to 5.6 percent occur due to seed shattering when the grain is very dry, head breakage, and spoilage due to excessive moisture. The harvested crop is then piled near the threshing ground

**TABLE 1**  
The teff supply chain, stakeholders, operations and loss points

Supply chain level	Production	→	Collection centre	→	Wholesale market	→	Retail market	→	Consumption
Stakeholders	Farmer		Rural assemblers Zone traders		Wholesalers		Retailers Millers		Consumers
Operations	Harvesting Stacking/piling Threshing Packaging On-farm storage		Transport		Transport Storage		Transport Milling		Buying Consumption
Quantitative Loss (%)	22.8		2.2		8.5		7.4		
Loss Points (%)	Harvesting: 5.6 Piling: 6.3 Threshing: 7.7 Storage: 3.2				Transport and storage:		Transport, storage and milling:		

**TABLE 2**  
Budget calculation for the use of thresher of individual farmer

Item	Value/unit
Product quantity	1.22 tonnes/yr
Product value	814.67 USD/tonne
Loss rate	7.68 %
Food loss	0.094 tonne/yr
Economic loss	76.6 USD/yr
Total cost of intervention	238.1USD/yr
Client cost of intervention*	195.16 USD/tonne
Anticipated loss reduction	75 %
Volume of loss reduction	0.075 tonne/yr
Loss reduction savings	57.75 USD/yr
Profitability of the intervention	-181 USD/yr

**TABLE 3**  
Budget calculation for the use of 500 kg metallic silo

Item	Value/unit
Product quantity	1.22 tonnes/yr
Product value	814.67 USD/tonne
Loss rate	3.2 %
Food loss	0.039 tonne/yr
Economic loss	31.8 USD/yr
Total cost of intervention	16.5 USD/yr
Client cost of intervention*	13.5 USD/tonne
Anticipated loss reduction	75 %
Volume of loss reduction	0.0293 tonne/yr
Loss reduction savings	23.9 USD/yr
Profitability of the intervention	7.4 USD/yr

70 to 80 percent of the produce is left for consumption. Losses also represent wastage in labour and inputs of resource-poor farmers that go in teff production. Reduction in volume that can be sold due to losses translates to reduced income.

### The importance of good post-harvest handling practices

Traditional post-harvest practices during stacking/piling, threshing, packaging and storage result in substantial post-harvest losses of teff due to the very tiny nature of the grains that

are easily lost if spilled. Teff grains easily deteriorate after harvest when environmental conditions during storage are not favourable. Threshing with the aid of animals that trample on the grains leads to grain damage and contamination with soil and animal waste. Packaging using old bags coupled with rough handling aggravates the losses during transport. Well-maintained storage structures are absent or simple storage technology that can be readily adopted by the stakeholders are lacking. The lack of appropriate and feasible technologies represents the main constraints in the reduction of post-harvest losses in the teff supply chain. Food loss reduction measures should therefore be given high priority to combat hunger, raise incomes and improve food security in Ethiopia.

### Recommendations to reduce losses and the economic benefits

Threshing is one of the critical loss points at the farmer's level. Threshing with the aid of animals that trample on the grains not only lead to losses of 7.7 percent and contamination but is also labour-intensive. Traditional threshing method requires 20 to 30 days of human labour and 10 oxen-days per hectare. With traditional threshing, loss of 7.68 percent occurs which is equivalent to 76.6 USD per year. Loss reduction of 75 percent can be achieved with the use of thresher equivalent to savings of 57.5 USD per year. The mechanical thresher with cleaner will provide significant benefits to farmers based on gains in productivity, that is higher grains

recovery, improved quality and reduced labour costs. However, as shown in Table 2, the use of mechanical thresher is not profitable for one farm household despite the reduction in losses. Smallholder farmer cannot afford the cost of buying and operating the thresher. Adoption of mechanical threshers will be profitable if private suppliers and co-operatives buy it and they will provide services to individual or group of farmers on a rental basis similar to what has been practiced in other regions.

Grain losses result from poor quality storage facilities that are often made of mud-plastered walls and floors exposing the grains to excessive moisture and rodent infestation. Metallic silos effectively protect stored grains from rodents, birds and moisture migration that results in growth of moulds in the grains. With proper management of metallic silos (Fig. 1), the grains can be stored for longer periods than the traditional method without loss of quantity and quality. With loss reduction of 75 percent, savings of 23.9 USD per year can be achieved with a profitability of 7.4 USD per year. Farmers, wholesalers and retailers who practice storage will all benefit from this type of storage. Storage in silos will eliminate the use of chemicals to control pests assuring safety of the grains.



**FIGURE 1**  
Metallic silo for grain storage  
(Source: www.cgiar.org/wpcontent/upload\_grains-silos)

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](http://www.fao.org/save-food)).

