



## Food loss analysis: causes and solutions

### Maize supply chain in Timor-Leste

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Maize (*Zea mays L.*) is the main staple crop in Timor-Leste, and particularly for 80 percent of the people in rural areas, where it is also a major source of livelihoods and employment. It is a commodity of strategic importance to the country's economy and food and nutrition security. Maize is a major source of carbohydrates, protein and fibre, and has high content of minerals such as calcium, phosphorus, potassium and magnesium. More than 96 000 smallholder farmers and a small percentage of medium scale farmers are engaged in maize production.

#### The maize supply chain

The supply chain was assessed in the sub-districts of Lospalos Villa, Lautem and Tutuala, Lautem district. It represents the predominant informal supply chain in these districts and is composed of smallholder farmers, traders, wholesalers, millers and retailers. The Lautem district is one of the major maize producing areas in which the government and other key stakeholders have invested much effort and resources to increase the domestic supply of maize for consumers. Observations, direct interaction with stakeholders and actual load tracking were done to provide estimates of the quantitative and qualitative losses and to identify critical loss points in the chain.

Approximately 95 percent of maize production of smallholder farmers is used for

home consumption. After harvesting (picking and dehusking), drying, shelling and temporary on-farm storage, about 5 percent of the farmers sell maize grains to traders (wholesalers), who in turn sell to retailers and to consumers. Some farmers also process small quantities of maize through village millers into products such as grits and powder and sell the products to local consumers. Most smallholder farmers (95 percent) sell maize grains directly to consumers at the farm gate, to neighbours and friends, as well as at village markets (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



FIGURE 1  
Drying maize.

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TABLE 1  
The maize supply chain, stakeholders, operations and loss points

Supply chain level	Production	→ Village market	→ Retail market	→ Consumption
Stakeholders	Farmers Input suppliers	Traders	Retailers Millers	Consumers
Operations	Harvesting (picking, dehusking) Drying Shelling Packaging On-farm storage	Transport Storage	Transport Milling Retailing	Buying Consumption
Quantitative loss (%)	10.5	1.25	1.25	
Loss Points (%)	Harvesting: 5.5 Drying: 2.5 On-farm storage: 2.5	Transport and storage	Transport, milling and retailing	

**TABLE 2**  
Costs and returns calculation for the use of mechanical harvesters by farmer groups

Item	Value/unit
Product quantity	140.8 tonnes/yr
Product value	450 USD/tonne
Loss rate	5.5%
Food loss	7.75 tonnes/yr
Economic loss	3 500 USD/yr
Total cost of intervention	3 250 USD/yr
Client cost of intervention	23.1 USD/tonne
Anticipated loss reduction	94.5%
Volume of loss reduction	7.32 tonnes/yr
Loss reduction savings	3 300 USD/yr
Profitability of the intervention	50 USD/yr

production chain where harvesting and subsequent on-farm operations are performed. The critical loss points occur during harvest, drying and on-farm storage which occur at the production stage of the supply chain (Table 1). Maize harvesting, which includes picking and dehusking of maize ears, is done manually and losses amounting to 5.5 percent occur due to grain spoilage and germination caused by delays in harvesting brought about by lack of labour and unfavourable weather conditions or rain. Drying loss of 2.5 percent is caused by unfavourable weather conditions which extend the drying period resulting in grain quality deterioration and mould growth. Traditional methods of on-farm storage predispose the grains to attack by insects and rodents as well as germination and mould growth which can lead to 2.5 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. Losses also reduce the volumes that can be sold that translates to reduced income. Furthermore, losses translate into 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 (picking and de-husking), drying, and on-farm storage result in high levels of post-harvest losses of maize due to spoilage and grain quality deterioration caused by unfavourable weather conditions, pest infestation and mould contamination. Maize grains are susceptible to attack by rodents, insects, and moulds due to poor packaging and unfavourable storage conditions. The lack of appropriate and feasible technologies coupled with poor knowledge and skills are the main constraints in 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 Timor-Leste.

### Recommendations to reduce losses and the economic benefits

Harvesting is the most critical loss point at the farmer's level. A loss of 5.5 percent is incurred due to delays in harvesting operations brought about by lack of labour. The delays coupled with unfavourable weather conditions cause grain spoilage and grain quality deterioration. Loss reduction of 95 percent can be achieved through mechanical harvesting, equivalent to savings of 3 300 USD per year. Smallholder farmers will reap significant benefits with the use of mechanical harvesters (Figure 2) in terms of improvements in productivity which means higher grain outputs, improved quality, and reduced labour costs. Since an individual smallholder farmer cannot afford the cost of buying and operating the mechanical harvester, a group of 30 farmers can invest and profitably operate a mechanical harvester, as shown in Table 2. Alternatively, adoption of mechanical harvesters can be enhanced if private suppliers or investors will provide harvesting services to individuals or groups of farmers on a rental basis as is being practiced in other countries in the region.



**FIGURE 2**  
Example of mechanical maize harvester  
(Source: [www.google.com/Local maize harvesters in Thailand](http://www.google.com/Local%20maize%20harvesters%20in%20Thailand))

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)).



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