



Food loss analysis: causes and solutions

Rice supply chain in Timor-Leste

Rice (*Oryza sativa L.*) is the second most important staple crop, after maize, cultivated and consumed in Timor-Leste, hence it is a commodity of strategic importance to the country's economy, food and nutrition security. It is a major source of carbohydrates, protein and fibre, and has high content of calcium, phosphorus, potassium, magnesium, etc. More than 45 000 smallholder farmers and a small percentage of medium-scale farmers are engaged in rice production.

The rice supply chain

The supply chain that was assessed in the sub-districts of Baucau Vila, Vemasse and Laga, Baucau district in Timor-Leste represents the predominant supply chain in that area. It is composed of smallholder farmers, traders, millers and retailers. The Baucau district is one of the major rice producing areas in which the government and other key stakeholders have invested much effort and resources to increase the domestic supply of rice for consumers. 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 supply chain.

About 85 percent of paddy production of smallholder rice farmers is used for home consumption. After harvesting, threshing,

and temporary storage, farmers sell paddy to neighboring households usually in small volumes. About 15 percent of paddy is sold formally to traders/processors who sell milled rice to retailers. Rural households process their paddy through the village rice millers who provide milling services for a fee (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 13.5 percent occurs in the production chain where harvesting and subsequent on-farm operations are performed. Harvesting, threshing and storage are the critical loss points on farm, while milling at the rural market is the critical loss point in the marketing chain (Table 1). Rice harvest-

ing, which includes cutting, bundling and stacking operations, is performed manually and losses amounting to 3.5 percent occur due to grain shattering prior to field drying of paddy stalks before bundling, and grain spoilage and germination due to rain during harvesting. Farmers thresh rice using mechanical threshers and the improper set up and operation of the threshers results in loss due to grain spillage amounting to 5 percent. Quantitative losses amounting to 5 percent occur during on-farm storage in sacks or bulk containers such as 'hoka' that are prone to attack by rodents, insects, and moulds caused by inadequate drying of the grains. Village millers experience losses of 10 percent during milling because of poor machine conditions and improper operation of the rice mills which result in low milling recovery. The mixing of rice varieties of different grain sizes also contributes to low milling recovery.

Impact of post-harvest losses

Losses that occur at the farmer's level have a negative impact on the livelihoods of many smallholder and subsistence rice farmers who live on the margin of food insecurity. Rice losses reduce food availability at the house-

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

Supply chain level	Production	→ Rural market	→ Retail market	→ Consumption
Stakeholders	Farmers Input suppliers	Rural households Traders Millers/processors	Retailers	Consumers
Operations	Harvesting (cutting, bundling, stacking) Threshing Cleaning/winnowing Packaging On-farm storage	Transport Milling	Transport Selling	Buying Consumption
Quantitative loss (%)	13.5	11		
Loss Points (%)	Harvesting: 3.5 Threshing: 5.0 Storage: 5.0	Transport: 1 Milling: 10		

TABLE 2
Cost and returns calculation for the use of mechanical threshers by farmer groups

Item	Value/unit
Product quantity	224.4 tonnes/yr
Product value	400 USD/tonne
Loss rate	4.75%
Food loss	10.66 tonnes/yr
Economic loss	4 260 USD/yr
Total cost of intervention	2 000 USD/yr
Client cost of intervention	8.90 USD/tonne
Anticipated loss reduction	77.5 %
Volume of loss reduction	8.26 tonnes/yr
Loss reduction savings	3 300.00 USD/yr
Profitability of the intervention	1 300 USD/yr

hold level where 85 percent of the harvest is retained for consumption. Losses also reduce the volume that can be sold that translates to reduced income. Furthermore, losses represent wastage in labour and inputs utilized in rice production that negatively impact the resource-poor farmers.

The importance of good post-harvest handling practices

Traditional practices during harvesting (cutting, bundling and stacking) and on-farm storage result in high levels of post-harvest losses of rice due to spillage and grain deterioration. Improper operation and poor conditions of threshing and milling machines result in losses due to spillage, and



FIGURE 1
Traditional storage
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low milling yield and quality output. Paddy 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 the poor operational skills of users are the main constraints to the reduction of post-harvest losses in the rice supply chain. Food loss reduction measures should therefore be given high priority to raise incomes and improve food and nutrition security in Timor-Leste.

Recommendations to reduce losses and the economic benefits

Threshing is one of the critical loss points at the farmer's level. The poor machine set up and operational skills of the farmers result in losses of 5 percent equivalent to an economic loss of 4,260 USD/year. Delays in threshing operations due to the limited number of threshers and the lack of labour for manual threshing also contribute to losses. Loss reduction of 78 percent was achieved with the use of an improved mechanical thresher equipped with a cleaner resulting in savings of 3 000 USD per year. The availability of more improved mechanical threshers (Figure 2) will provide significant benefits to farmers in terms of higher grain output of improved quality. Since an individual smallholder farmer cannot afford the cost of buying

and operating the thresher, a group of 25 farmers can profitably invest and operate a mechanical thresher, as shown in Table 2. Alternatively, the adoption of mechanical threshers will be enhanced if private investors or suppliers will act as threshing service providers to individuals or groups of farmers on a rental basis as is being practiced in other countries in the region.

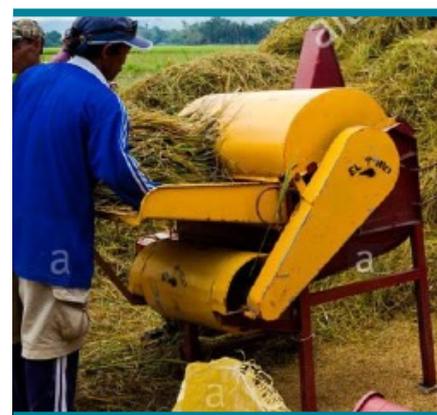


FIGURE 2
Example of mechanical rice thresher
(Source: www.google.com/Local rice mechanical thresher in Thailand)

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).

