Practice Note 7:

Post-harvest losses in the value chains for cowpea leaves and African nightshade in Teso South, Kenya

Education and Training for Sustainable Agriculture and Nutrition in East Africa

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Introduction

Roughly one-third of the food produced for human consumption is lost or wasted globally[1]. Reducing food losses could make an important contribution to increasing availabilityand access.

Little is known on food losses in vegetable value chains – even though these are often critical sources of nutrition for rural populations. Vegetables are often thought to have the highest post-harvest losses due to their perishable nature, but knowledge on the magnitude of post-harvest losses is scarce.

Definition:

Food loss is the decrease in the quantity or quality of food resulting from decisions and actions by food suppliers in the chain(FAO, 2019).

Therefore, researchers from the EaTSANE project conducted a study on post-harvest losses in two value chains for vegetables with high nutritional potential: African nightshade and cowpea leaves. These are widely consumed green leafy vegetables in Teso South, Kenya, where our study took place in early 2020. This practice note offers guidance on:

- Where in the value chains for nightshade and cowpea leaves is food lost and what are the causes?
- What is the extent of post-harvest losses in the value chains for nightshade and cowpea leaves?

Understanding post-harvest losses

Post-harvest losses include the food loss across the value chain from the moment of harvesting until its consumption. Losses can not only occur at farm level but along the entire value chain and highly depend on the type of crop, agro-ecological conditions, technology and socioeconomic conditions.

We distinguish between physical, economic and nutritional post-harvest losses. Physical losses emerge when the amount of food measured in weight decreases, e.g. due to spillage or pests. This also decreases the monetary value of crops and constitutes an economic loss. Economic losses can equally occur when the quality of a crop decreases, e.g. through wilting, change in colour, texture or flavour, which reduces its value. Quality downgrading can also result in nutritional losses, i.e. the loss of micronutrients in food.

The value chains for African nightshade and cowpea leaves

African nightshades (*Solanum* spp.) are green leafy vegetables which grow in the low and high- land areas of West and East Africa. Cowpea (*Vigna unguiculata*) is an annual herbaceous legume which is mostly cultivated in eastern Kenya. As a multi-purpose crop, it is grown for its seed and its edible green leaves. Both nightshade and cowpea leaves are rich in vitamins A and C and minerals such as iron and calcium.

1 Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R., & Meybeck, A. (2011). Global food losses and food waste. Food and Agriculture Organization of the United Nations (FAO), Rome.

African nightshade , transport and trading of green leafy vegetables in Busia, Teso South , Kenya
(Fotos: T. Hilger, K. Strecker)

Nightshade and cowpea leaves are commonly cultivated on a small-scale, for own consumption and to sell surplus on local markets. Women tend to be responsible for all stages of the value chain, from cultivation and harvesting to post-harvest handling and marketing. Freshly harvested crops are immediately brought to nearby markets due to the high costs of transport, lacking adequate storage facilities and the high perishability of the crops. Thus, whatever is harvested is sold – and consumed – on the same day.

Post-harvest losses for African nightshade and cowpea leaves

Physical losses

For both nightshade and cowpea leaves, the measured physical losses during harvesting and post-harvest handling were below one percent. This was because harvesting, usually of small quantities, was done early in the morning before full sun exposure and the leaves were washed very carefully. Physical losses were also minimal during transport, unless there were holes in the sacks. While the physical weight diminished by 4-5% during transport, this was because the vegetables were packed quickly after being washed, leaving not enough time for all the water to drip off completely. The measured loss of drip water was therefore not included in our aggregate calculations. Finally, we observed hardly any physical losses during marketing, as farmers either sold their entire produce or took the remaining crops home for dinner or gave it to relatives and neighbours (Fig. 1).

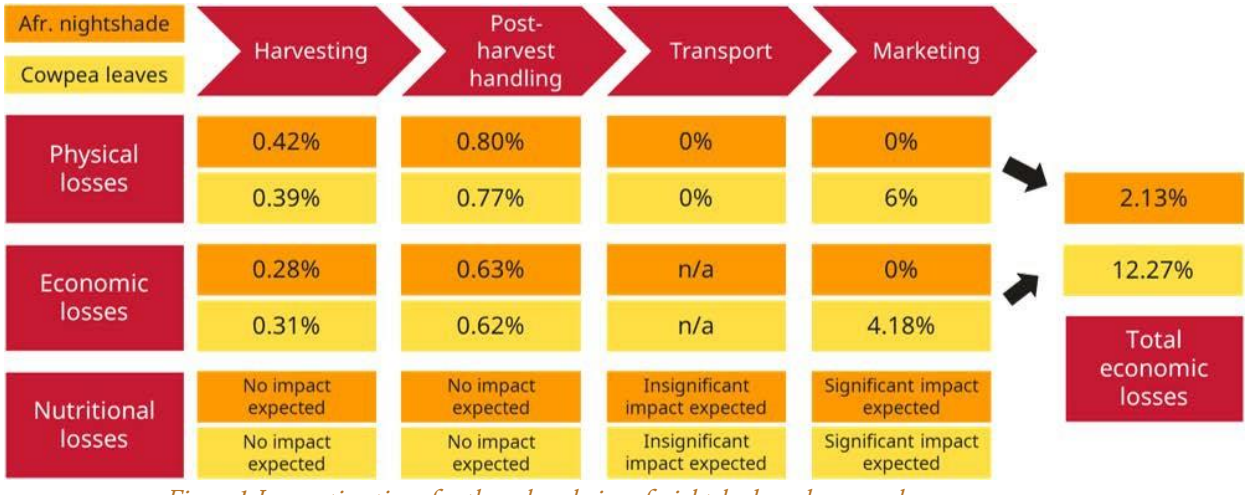

Figure 1. Loss estimations for the value chains of nightshade and cowpea leaves

Economic losses

We calculated the financial loss based on the value of the physical losses, divided by the maximum value of produce (the highest price that farmers could have potentially obtained for their entire produce). As the price of a bundle of nightshade and cowpea leaves was fixed at local markets, the maximum value of produce was based on the weight of the bundle .

Table 1 shows that there is a huge difference in what can be obtained for one's agricultural produce. For cowpea leave bundles, the lowest weight was only 0.366kg (=most profitable) and the highest weight was 0.599kg (=least profitable). This is a difference of more than 60%. With nightshade, variations in the weight of bundles are even more pronounced, ranging from 0.466kg (=most profitable) to 1.202kg (=least profitable).

Table 1. Difference in economic value by weight of bundles

	Price per bundle	Average weight of a bundle	Lowest potential weight of a bundle	Highest potential weight of a bundle
Cowpea leaves	20 Kenyan shilling	0.457kg	0.366kg	0.599kg
Nightshade leaves	10 Kenyan shilling	0.719kg	0.466kg	1.202kg

The weight range is thus more than 258% – which shows economic losses for farmers can be considerable, depending on the weight of the bundle. The weight of bundles is determined by:

1. The quality of the produce (fresher looking leaves are sold in lighter bundles);
2. Selling location (bundles weigh more at farm gate than at markets located further away);
3. Selling time (bundles tend to increase in weight towards the end of market days); and
4. The type of customers (consumers often receive smaller bundles than traders).

Nutritional losses

Farmers handled their crops very carefully and swiftly during harvesting, post-harvest handling and transport. This suggests that the risk of nutritional losses is low during those stages. Nutritional losses could be higher at the market stage of the value chain due to weather conditions. While farmers sold their produce fairly quickly, most of their produce was sold to traders who generally stayed in the market all day, which increased exposure of crops to sunlight and high temperatures. The dehydration of the vegetables likely resulted in a high loss of vitamin C. The exact level of nutritional loss was not measured, but depends on time and intensity of exposure to unfavourable conditions. Nutritional losses were also likely to occur during food preparation. In Teso South, consumers often cooked nightshade and cowpea leaves for extended periods of time, causing nutrients to be leeched.

Our research found that post-harvest losses for African nightshade and cowpea leaves were very limited in Teso South, Kenya, and much lower than what previous studies would suggest. We find the following explanations for the low post-harvest losses:

- ✓ African nightshade and cowpea leaves are cultivated on a small scale, which allows farmers to handle the crop carefully.
- ✓ Limited post-harvest handling is conducted (only washing of the leaves) and handling is done very carefully.
- ✓ Farmers only harvest and handle the quantities that they expect to sell on that day.
- ✓ The value chains are very short, comprising only few steps within a geographically confined space. Harvesting, marketing and consumption take place on the same day.

Yet, the main explanation seems to be that the research was carried out in the dry season. This reduces post-harvest losses due to poor weather conditions, which can affect harvesting, post-harvest handling, transport and marketing. Moreover, during rainy season, there is an oversupply of green leafy vegetables which reduces demand for cowpea leaves and nightshade, and increases food losses. By contrast, during the dry season, fresh vegetables are relatively scarce, resulting in few physical and economic losses for farmers and traders.

While our study only gives indicative findings which should be verified by a large study, we are able to show that post-harvest losses, even of perishable crops and despite lacking storage and processing facilities, are not necessarily high in sub-Saharan Africa.

Key recommendations

- ✓ Agricultural extension should promote African nightshade and cowpea leaves as dry season crops in view of very limited post-harvest losses and the crops' potential to contribute to healthy diets and support rural incomes.
- ✓ Promotion should focus specifically on women, as they tend to be the ones cultivating and marketing nightshade and cowpea leaves.
- ✓ Agricultural extension should go hand-in-hand with nutrition advice for adequate food preparation, to avoid high nutritional losses during the consumption stage.
- ✓ Farmers should be sensitised on the economic losses that may occur due to the large differences in the weight of bundles and should be supported to develop marketing strategies.

About the EaTSANE project

The EaTSANE project is an interdisciplinary research project on diversified agriculture, nutrition, and value chains, implemented by research and development institutions from Kenya, Uganda, Germany and the Netherlands in the period from 2018 until 2021. The main objectives are to develop more sustainable farming practices and improve diets of households in Teso South, Kenya and Kapchorwa, Uganda by diversifying the food system with a participatory action research approach. The research teams identified practical implications across the project activities, which led to a set of practice notes.

Further reading and training materials can be found: https://www.eatsane.info/publications

Colophone

This Practice Note is based on the research by Lieke Oudenaller, conducted for EaTSANE:

Oudenaller, L. 2020. Food loss and waste in nutrition-sensitive value chains of cowpea leaves and black nightshade in Teso South, Kenya. MSc thesis, University of Amsterdam, the Netherlands.

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