

ASSESSMENT OF FOOD LOSSES AND WASTE AT THE TSHWANE MARKET AND SMALL SCALE FARMS

RAMUKHWATHO FR*, OELOFSE S*, MUSVOTO C* and POLASI LT*

*Council for Scientific and Industrial Research, Smart Places, Building 33, P O Box 395, Meiring Naude Road, Pretoria 0001, South Africa. E-mail: Soelofse@csir.co.za

ABSTRACT

Food losses and waste are issues of global concern as they contribute to greenhouse gas emissions. It is estimated that agricultural production and marketing contribute a large portion of food waste in the value chain. This paper reports on findings of a research study conducted in Tshwane Fresh Produce Market (TFPM) within the City of Tshwane Metropolitan Municipality (CTMM) and on small-scale vegetable farms in Limpopo province. The aim of the study was to assess food losses and waste in a small-scale production context and at a fresh produce market. Questionnaires were used to collect information on the amount of food wasted or lost, reasons for the wastage and methods employed to reduce waste. It was found that food loss varied depending on the crop, and even on the variety of produce. The main causes for food wastage at the farm level are weather conditions, damage from insects and birds. Sixty percent of farmers divert their food waste for animal feeding. On average five thousand tonnes of food is wasted every year in the Tshwane fresh produce market and the main cause of wastage is oversupply by farmers. The study concluded that the highest losses occur at the pre-harvesting stage and growers often have little control over how much produce is lost.

KEY WORDS

Food losses, food waste, fresh produce market, small scale farmers

INTRODUCTION

Currently food waste is one of the most challenging issues that the world is facing and it affects all stages of the Food Supply Chain (FSC) in both developing and developed Countries. Gustavsson *et al.* (2011) estimated that one-third of food is wasted worldwide annually yet 800 million people are food insecure (Food and Agriculture Organisation of the United Nations (FAO) *et al.*, 2015). In 2012, the United States Natural Resource Defence Council estimated that 40% of food that was intended for human consumption is wasted along the supply chain, from farm to the consumer (Gunders *et al.*, 2017). The large amount of food wasted has led to an increase in food waste studies across the world; this in an effort to quantify food waste, analyse and understand its drivers. A good understanding of food waste is critical for informing efforts to meet the Sustainable Development Goals (SDG's) of the United Nations, in particular the target 12.3 (of Goal 12), whose aim is to reduce food waste by 50% by 2030.

Oelofse and Nahman (2013) estimated that 4% of the food waste in South Africa occurs at the consumption stage, and as much as 26% on farm, 26% during post-harvest handling and storage, 27% during processing and packaging and 17% during distribution. Research on food waste in South Africa has focussed mostly on post-harvest losses, retail and consumer level waste with few studies quantifying food losses and waste in the early stages of the value chain through primary data collection.

It is hypothesized that consumers treat food as a disposable commodity, because they are far divorced from the realities of production at farm level. Greater awareness of the reality of food losses and waste on farm is likely to increase consumer food waste awareness and consequently drive a reduction in avoidable wastage. The Rethink Food waste through Economics and Data (ReFED) (2016) estimated that more than 9.2 million tonnes of food is wasted annually at farm level in the United States. A vast amount of food is left unharvested and is churned back into the ground. The first quality screening is done during harvest in the field. Produce not meeting market standards are simply not harvested. There are also certain economic thresholds that simply do not justify incurring the cost of harvesting the crops. Over supply at the market and consequent price drops is a case in point.

In 2014, FAO estimated that the economic costs of agricultural food waste were \$936 billion globally. The food losses and wastage on farms are the result of many different factors, some within the control of the farmer, and others not. Climate change results in the increased frequency and intensity of droughts, floods and hailstorms, which have a negative impact on agricultural production. Dry land farmers with limited resources are the most vulnerable (Hassan, 2006). This is an indication of the economic, environmental and social impacts of climate change (FAO, 2013). Food waste is a global concern due to its impacts on food security and climate change while data on food wastage in developing countries are still limited and estimates are largely based on assumptions.

This study reports on food waste at the Tshwane Fresh Produce Market, as well as on small-scale vegetable farms. The study aims to contribute data on food waste in the early stages of the supply chain. According to Sheahan and Barrett (2017), post-harvest losses differ by country depending on the type of crops produced, production processes, and climate in the specific region. Addressing post-harvest losses will not follow a one size- fits-all approach. A study by Le Roux *et al.*, (2018) found that in South Africa food is wasted at the farm due to either pests or diseases or crops that do not develop into a harvestable product during the growing stage or vegetables that are not marketable.

However, it is a different scenario in the case of the food wastage at the market. A study by Le Roux *et al.*, (2018), found that food wastage at the fresh produce market happens mostly due to rotting of crops that were not sold in time, especially in summer season. Some examples of such crops are carrots that were wasted due to their size; they were too short to be marketed, cracked, extremely thick or thin carrots. Cabbage and lettuce were also wasted due insect damage, rot or decay (Le Roux *et al.*, 2018). The Food Use for Social Innovation by Optimising waste prevention Strategies (FUSIONS, 2014), defined food waste at farm level/production as any food that is not harvested or used for composting. For the purpose of this study, food waste is defined as any food that is wasted or lost and is not consumed by humans.

METHODOLOGY

The study was undertaken at the Tshwane Fresh Produce Market (TFPM) located in the CTMM and on small-scale farms (ranging in size between 0.125 to 15 hectares) located in Sekhukhune district, Limpopo province. TFPM is a fresh produce market where fresh produce such as fruits and vegetables are traded to the mutual benefit of suppliers, buyers and consumers. It provides efficient and cost-effective infrastructure and services that comply with international standards. The market has a healthy image in the fresh produce industry and is known for its modern and clean facilities. It has a ripening centre of 6 377 m² floor space with 49 rooms and a capacity of 60 380 boxes per week. The cold rooms consist of lower cold rooms with 1 087,99 m² floor space and upper cold rooms with 2 115 m² floor space. The research team interviewed the Tshwane Fresh Produce Operations Manager using unstructured questions on the management of food wastage in the market and requested condemned and returned food waste data to be sent after the interviews. The condemned food waste data from the fresh produce market was analysed and is reported as tonnages.

The small-scale vegetable production farmers were interviewed in November 2019. Interviews were conducted using semi-structured questionnaires and a simple random sampling method of small farms for which contacts were available, and with respondents who were willing to participate in the study. Data was collected through on-farm-observations by researchers, a questionnaire and a focus group discussion with a group of farmers. Observations were made on 15 different farms and the questionnaire was administered to the farmer at each of these farms. The questionnaire covered factors such as the main crops produced, estimates of waste/loss for the three top selling commodities at different stages of the production and marketing cycle, namely pre-harvest, harvest, postharvest handling and packaging; transportation and marketing; including reasons for the losses. It also sought to find out about marketing arrangements and what was done with produce that was not sold. The focus group involved 10 farmers and issues covered in the focus group were based on the questionnaire. The farmers involved in the focus group did not participate in the questionnaire survey. The focus group was used to get a general perspective of the food waste situation.

The outcomes of the questionnaire gave both qualitative and quantitative information on the reasons for food wastage, estimated percentage of food wasted and methods employed to reduce food waste.

RESULTS AND DISCUSSION

Tshwane Fresh Produce Market

Detailed data on waste quantities recorded over five consecutive financial years was obtained from the TFPM. The waste at the TFPM is classified as either: returned to sender, or condemned food. Food not sold at the market is returned to the sender based on an agreement between the sales agents and the farmer. The market does not have any information on what the farmers do with the returned foodstuffs. Condemned food is food not sold at the market, and either voluntarily surrendered by the sales agent to be discarded or found to be unfit for human consumption on inspection by an Environmental Health Practitioner (EHP). The EHP issues an order of seizure for condemned food. The inspection by the EHP is a daily activity. The condemned food is currently sent to landfill for disposal and the TFPM pay for the collection and disposal of the food waste. The TFPM food waste is not sent to the biogas facility in Bronkhorstspruit due to the distance and high transport costs being prohibitive.

Figure 1 represents the results of the amount of condemned food that was recorded by the TFPM over a five-year period. On average five thousand tonnes of food waste is recorded every year by the TFPM. The main cause of the wastage is reported to be oversupply by farmers. The peak recorded in 2016/17 is as a result of oversupply of watermelons in December of that year. Supply exceeded demand due to the holiday season and people spending the holidays at the coast rather than in Gauteng. As a result, the TFPM management decided to limit the amount of produce accepted by the market agents from the farmers over the December period to keep disposal costs under control. This decision was successful in keeping the waste volumes at the market under control in the following years. It should however be noted that restrictions on supply to the TFPM, may only shift the wastage from the TFPM to the farm or other markets.

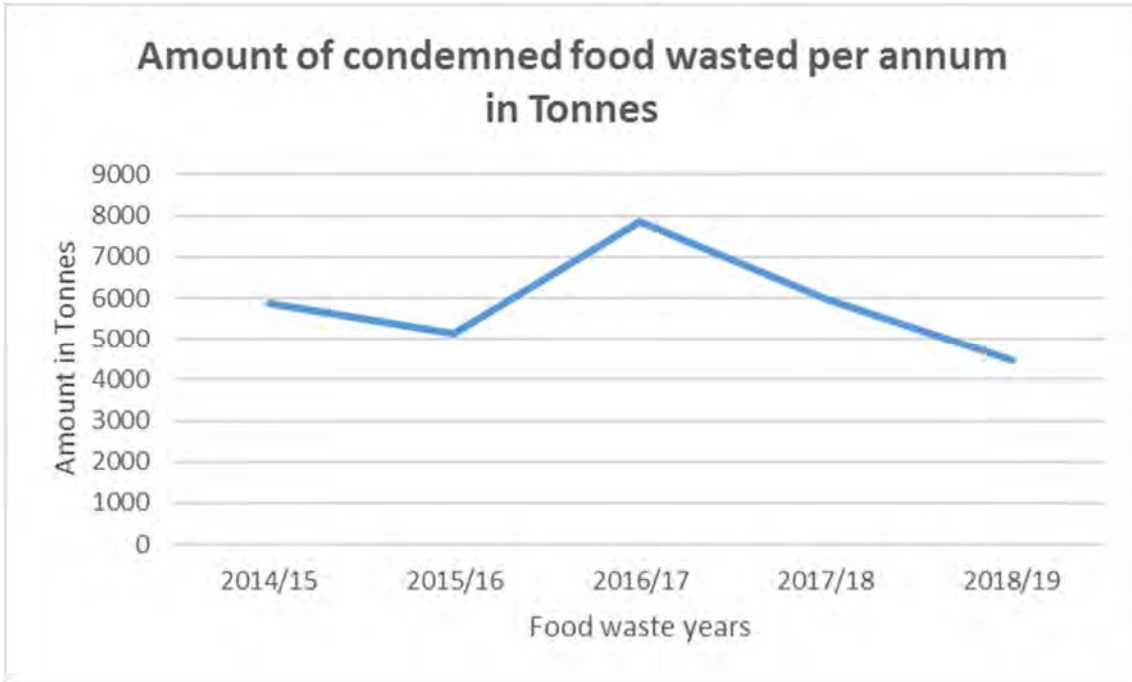


Figure 1: Amount of condemned food wasted per annum in Tonnes

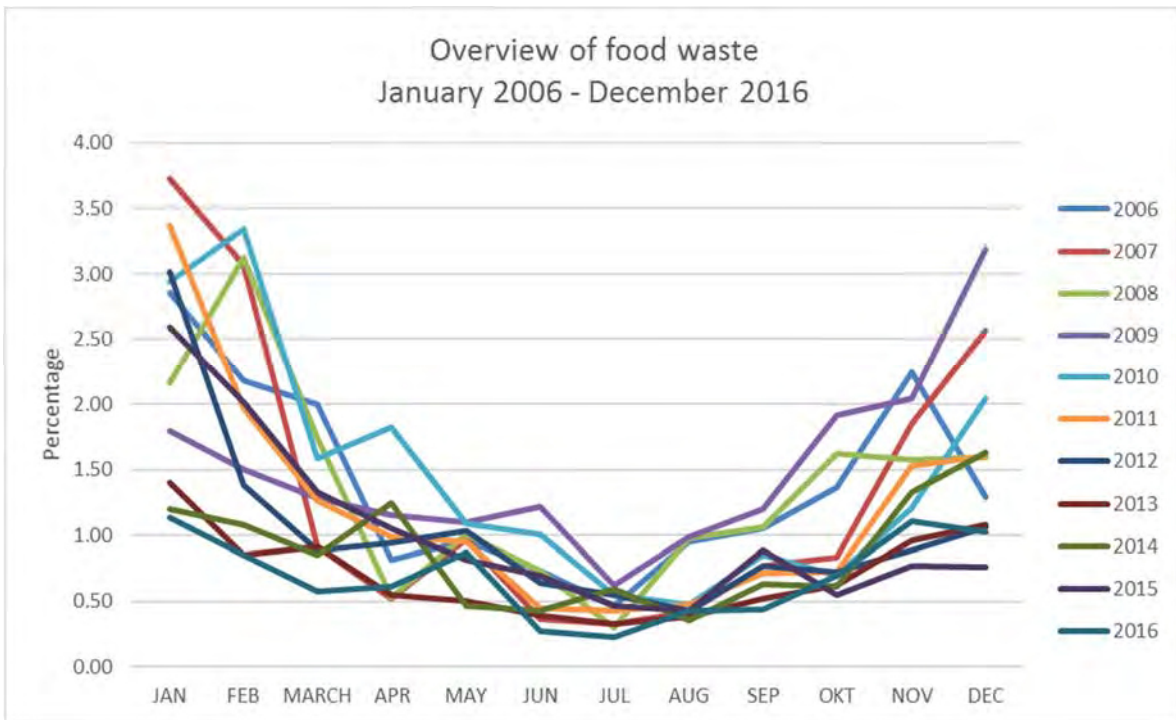


Figure 2: Mean monthly variability in percent food waste/loss at TFPM during the period Jan 2006 to Dec 2016 (Knowles, 2017)

The graph in Figure 2 clearly indicate seasonal variability in the food waste recorded at the TFPM with the most waste being recorded in December, January and February, which is the summer season. These months also coincide with the holiday season in South Africa with large numbers of people travelling to the coast and other holiday destinations outside of Gauteng. The interviews with the market staff clearly indicated that the reasons for food wastage at the market is two-fold: 1) supply and demand, and 2) behaviour of people. Examples include: the market agents moving more foodstuffs from the cold rooms to

the market floor than necessary, and market agents condemning food in agreement with suppliers, to reduce the returns of unsold stock to farm.

Small scale commercial farms

The farms included in this part of the study are all small-scale commercial farmers producing fruit and vegetables for local markets. The small-scale farmers operate on a farm that is less than 20 hectares under cultivation. It was found that a significant proportion of the food waste occurs at farm level. The degree of wastage that occurs at the agricultural production depends on factors such as the production methods used, weather conditions, pest and/or disease outbreaks and market demand. The first level handling occurs at the farm where the produce is graded and packed into boxes or crates and transported to the market.

Reasons for wastage at small scale farm level

There are numerous reasons for food loss and wastage at farm level as shown in Figure 3. The majority of the small farmers in Limpopo have indicated that they waste food due to climate conditions (48%). It is too hot or due to hail during rain times and/or due to drought when there is not enough water for irrigation. Although there is a lack of proper cold transportation by most small farmers interviewed, only 4% of the respondents were concerned about the wasted food due to lack of cold transportation. Twelve percent of farmers wasted food due to overproduction or producing the same produce as their competitors resulting in oversupply at markets and failing to sell their produce. The size, shape and colour of the produce play an important role when sending the produce to the market. The farmers reported a 9% wastage because of produce being rejected at the market and returned to the farm due to not meeting the market quality standards.

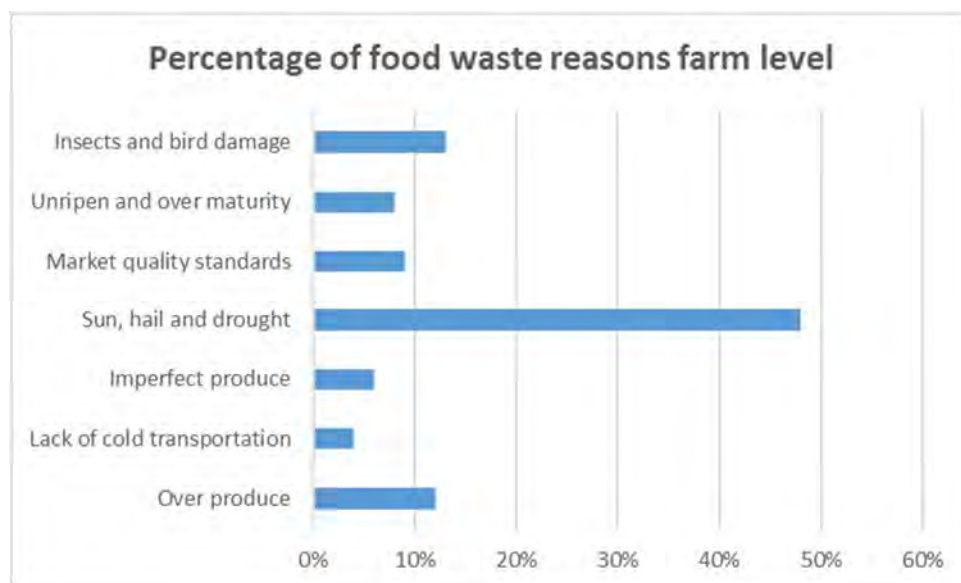


Figure 3: Reasons of food waste at farm level

Types of crops that are produced at the small scale farms but end up not harvested

Most of the small scale farms that were interviewed indicated that they plant tomatoes, lettuce, cabbage, peppers, lemons, beetroot and spinach. The percentage losses reported per crop type is presented in Table 1. Farmers indicated that they lose almost 5% - 50% of tomatoes due to not harvesting either caused by over maturity or unripen. Tomatoes are the crops with the highest wastage due to not being harvested, followed by cabbage and peppers with ranges between 15% - 40% and 5% - 25% respectively. Lemons were the crops with the least wastage at 1%-6% due to not being harvested.

Table 1: Types of crops produced by small-scale farm respondents

Types of crops	Percentage
Tomatoes	5% - 50%
Lettuce	10% - 20%
Cabbage	15% - 40%
Peppers	5% - 25%
Onion	1% - 6 %
Beetroot	1% - 20%
Spinach	5% - 10%
Butternut	8% - 30%
Mealies	2% - 18%

The percentage of crops that are lost during different stages of the food value chain from farm to the market

In terms of the food value chain, there are different stages that food is wasted before it reaches the final point. For this study at the agricultural stage, we focused on post-harvest handling, storage, packaging, transportation to the market and when the produce is returned from the market to the farmer as indicated in Table 2. The majority of the farmers indicated that food waste occurs mostly during postharvest stages with a range of between 4% and 26%. Followed by handling stage, storage, packaging and transportation with a range of between 0% and 11%.

Table 2: Percentage of produce lost from farm to market

Food value chain stage	Percentage
Post harvesting	5% - 25%
Handling	1% - 20%
Storage	1% - 10%
Packaging	1% - 5%
Transportation to market	1% - 3%
Return form market	1% - 5%

Alternative methods employed to reduce food waste disposal on farms

The majority of the farmers feed produce that were not sold to animals, while a few of them do composting as their alternative method to waste disposal. Donating food that is still fit for human consumption is also preferred by some farmers to reduce food waste. The study showed that sixty five percent of farmers divert their food waste for animal feeding including cattle, pigs, sheep and goats. Thirty percent of farmers donate their food produce which are still fit for human consumption to community feeding schemes. However only 5% of farmers composted their food waste for use on the farm. Some farmers added damaged produce to what the customer have bought as a gift i.e. buy two and get one free situation, while others lower the price of the damaged or low quality produce so that people can buy it at reduced cost.

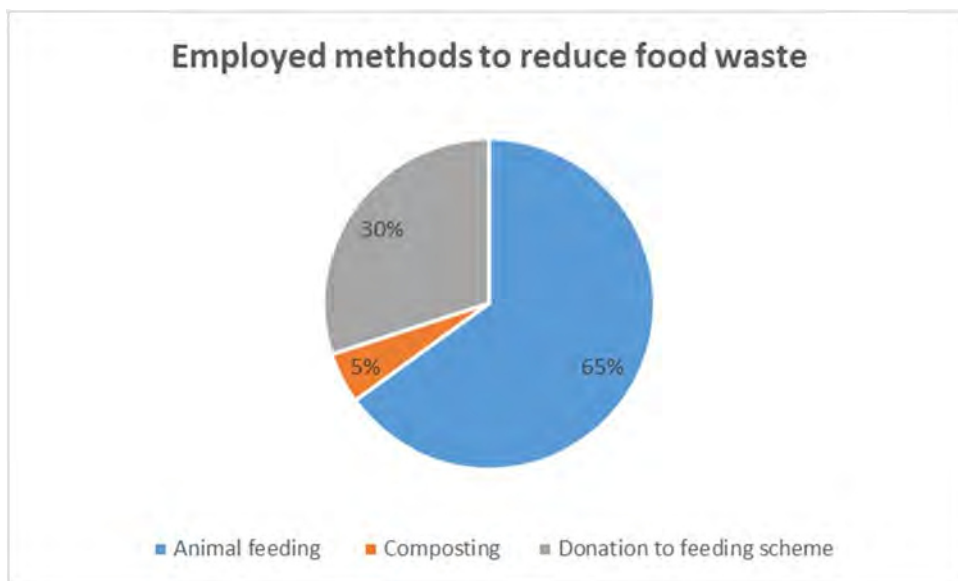


Figure 3: Three major alternative methods employed to reduce food waste

CONCLUSION

The study found that there is an average of five thousand tonnes of food that is wasted every year at the TFPM. There was no accurate amount of food waste data available at small-scale farm level. The main reasons for the wastage at the market are oversupply and poor handling practices by the market agents. The TFPM can play a role in waste reduction by raising awareness of the wastage with the market agents. Closer coordination between farmers and market agents can potentially assist in the reduction of food wastage at the market.

A lack of planning and coordination between small-scale commercial farmers leads to over supply at markets, which in turn drive prices down. The research has indicated that measures implemented at fresh produce markets to reduce the cost of disposal is likely to drive the surplus food and resulting wastage to the farm level. Such approaches will reduce food waste disposal at municipal landfill. Surplus food being retained at farm level or returned to farms, may result in better food waste management practices at the market. Donations of nutritious surplus food to rural food schemes, feeding animals, and producing compost on farm will contribute to food security. Feeding food waste to animals contribute to the production of protein for human consumption, and compost enhance soil quality and reduce the need for chemical fertilisers in preparation for new crop production.

It is clear that small-scale farmers could benefit from a more coordinated approach to crop selection and the area used for a specific crop production. A more coordinated approach will reduce oversupply, resulting in better prices driven by a better supply and demand balance. This approach will not only reduce food waste, but will increase the earning potential of the small scale farmers and diversify the crops being produced which in turn will improve the farmers' resilience to price fluctuations. Diversification of crops will also increase resilience to climate impacts. The study concluded that growers often have little control over how much produce is lost unlike with retailers and consumers.

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