

The generation of food waste and food loss in the Estonian food supply chain



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Key messages

- Approximately 167 000 tonnes of food waste are generated in Estonia each year — that is, 127kg of annual food waste per capita in the country's entire food supply chain.
- Food loss, or so-called avoidable food waste, constitutes half of the total food waste (50%) or about 84 000 tonnes per year. The estimated total value of food loss in the whole food supply chain is €164 million per year.
- Households generate almost half of the total food waste in Estonia — that is, 81 000 tonnes of food waste annually, of which approximately 42% (34 000 tonnes) is food loss or avoidable food waste.
- The amount of food waste generated in food stores every year has significantly increased as approximately 20 000 tonnes of unsold food products are wasted in Estonia's food stores collectively.
- Primary production is responsible for 14% of total food waste or approximately 24 000 tonnes annually, of which 82% is food loss.
- Food waste from the food processing industry constitutes 19% of total food waste (approximately 32 000 tonnes annually), of which food loss comprises only 10%.

Background of the study

Food waste and food loss are an important part of the debate on climate change and the sustainable use of natural resources. An estimated 88 million tonnes of food waste are generated in the European Union (EU) each year (Stenmarck et al., 2016). Estonia is gradually catching up with the wealthier countries in Europe in terms of food waste generation. Food waste entails not only the waste of resources and the negative impacts on the environment but also high financial costs. Therefore, the environmental, economic and social impacts related to food waste and food loss are receiving increasing attention in Estonia and internationally, including at the level of the EU and UN.

The EU and EU member states are committed to meeting the Sustainable Development Goal 12.3 target to halve per capita food waste at the retail and consumer level by 2030 and reduce food losses along the food production and supply chains. This target should be reached by using the relevant integrated policy instruments.

SEI Tallinn conducted the study of food waste and food loss in Estonia's food supply chain during 2020–2021. The study provided an up-to-date overview of the proportion and material composition of food waste, both throughout and at different stages of

IMAGE (ABOVE): Food waste
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the food supply chain. It examined all stages of the food supply chain, which included households, catering establishments, food trade companies, the food industry and primary production (agriculture and fish farming). The study estimated the amount of food waste and food loss generated in each supply chain stage and analysed the causes. The survey analysis was based on the data collected in the detailed survey conducted in 2020 and the national Waste Reporting System (NWRS) data for 2019. The study was a continuation of the food waste surveys commissioned by the Estonian Ministry of the Environment in 2014 and 2015 (Moora et al., 2015a, 2015b) and was carried out using a similar methodology. Thus, comparing the results makes it possible to assess the developments related to food waste and food loss in Estonia.

Findings by stages of the food supply chain

Approximately 167 000 tonnes of food waste are generated in Estonia each year (see figure below) — that is, 127kg of food waste per capita per year in Estonia in the entire food supply chain. Almost half (48%) of the food waste is generated in households, 19% in the food industry, 14% in primary production, 12% in retail and 7% in the catering sector.

Food loss (i.e., edible food that becomes waste or so-called avoidable food waste) constitutes half of Estonia’s food waste (50%) or about 84 000 tonnes per year. The estimated total value of food wasted in the whole food supply chain is €164 million per year. Households generate the largest share of food loss (41%), and the food industry the lowest (4%).

Figure 1. Generation of food waste and food loss in Estonia’s food supply chain stages



Households

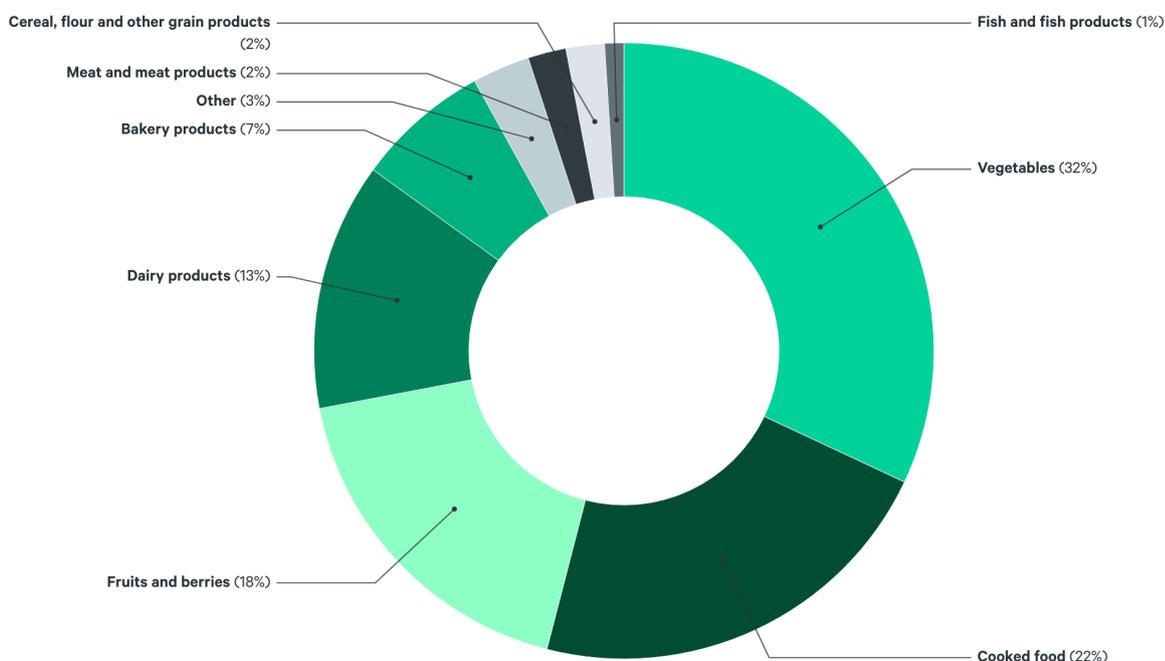
The study of households was undertaken in 104 homes. The detailed data were collected using a diary in which each family recorded the weight of the food, the type of food thrown away and the reasons for disposal over a two-week period. In addition, each household answered a structured questionnaire. The study included different types of households with various income levels and living arrangements.

The survey results allowed us to estimate that Estonian households generate a total of 81 000 tonnes of food waste per year, of which 42% (approximately 34 000 tonnes) is food loss or avoidable food waste. In total, households throw away about €98 million worth of food annually.

The more detailed results indicate that one person generates an annual average of 61kg of food waste, of which 26kg can be considered food loss. Calculations per household show that an average household generates approximately 149kg of food waste and 63kg of food loss annually, which in monetary terms translates to on average €180. Compared to the results of a previous study (Moora et al., 2015a), the food waste and food loss generated by households has increased considerably (by 13% and 33%, respectively). This indicates that with improved living standards and higher-income levels households in Estonia have become more wasteful.

Households discarded vegetables the most (32% of the total food loss), followed by cooked (ready-to-eat) food (22%), fruits and berries (18%), and dairy products (13%). Conversely, meat, grain, and fish products formed the lowest share of food loss (2%, 2% and 1%, respectively).

Figure 2. Proportions of avoidable food waste by food group in households



The main reason households threw away food was that it had become spoiled (49%). Other reasons cited for avoidable food loss included food being stored for too long (15%) or expiring (11%). Less avoidable food loss occurred due to too much being prepared (6%), people no longer liking the food (6%), or plate leftovers (5%).

Catering establishments

The study of catering establishments examined catering companies (restaurants/cafes, canteens, pubs/bars), school and kindergarten canteens, and a hospital canteen. As restaurants, pubs/bars and cafes were closed or restricted at several points during the Covid-19 pandemic, the analysis of detailed data gained on-site at the catering establishments was combined with an analysis of annual food waste data of selected companies received from the NWRS. The detailed on-site data were collected over five days and at four different phases — preparation, serving, consumption, and storage — to analyse the key causes of food loss in the catering sector. The food waste from the different phases was collected in separate containers and weighed at the end of each day. Moreover, data about the number and average weight of served portions was collected.

The results show the catering sector generates approximately 11 000 tonnes of food waste per year, of which 75% is generated in catering companies (restaurants, cafés, pubs/bars, canteens, etc.), 22% in school and kindergarten canteens and 3% in hospitals. Compared to the previous study (Moora et al., 2015a), food waste generation in the catering sector has decreased. This may be mainly because the research took place during the Covid-19 pandemic, when several catering establishments were operating under the restrictions. Inedible food waste (e.g., peels, bones, skin, etc.) is mainly generated during food preparation and accounts for about a quarter (26%) of food waste. Avoidable food waste generated in the serving, consumption, and storage phases can be considered food loss, which makes up 74% of all food waste. The main reason for food loss was plate leftovers (approximately 53% of food waste). The second reason was leftovers of unserved food. The study showed that spoiled food constitutes a relatively small amount of food waste in the catering sector.

The food trade sector

The study covered both the retail and the wholesale sectors. The study was based on the online survey among participants from the food trade companies, a detailed analysis of selected retailers, interviews with the wholesale companies, and the data received from the NWRS.

The detailed study was carried out in 15 different grocery stores (which included small, medium-sized and large outlets) across Estonia (both in major cities and rural areas). Food waste was estimated based on unsold goods/food in nine food product categories (fruits, vegetables, meat products, fish products, bakery products, dairy products, prepared foods, solids, and others). The survey and interviews included questions about the main reasons for food waste generation and the ways to prevent, reduce and manage it.

The data analysis reveals that 46 tonnes of food remain annually unsold in a large grocery store (supermarket and hypermarket), 11 tonnes in a medium-sized store, and 1.7 tonnes in a small store. At the same time, the stores donate about 12% of unsold food to Food Bank or other charity organisations, thus avoiding the unsold food becoming waste. Nonetheless, approximately 20 000 tonnes of unsold food products are wasted every year in Estonian food stores collectively. Furthermore, the generation of food waste in

food stores has significantly increased when compared to the results of a similar study undertaken in 2015, when it was approximately 12 000 tonnes (Moora et al., 2015b).

On the one hand, about half (49%) of the unsold food products were fruits and vegetables (27% and 22%, respectively). On the other hand, fish products and cereals are rarely unsold (2% and 1%, respectively).

The main reason for food waste generation in stores is inadequate sales planning and forecasting, which means that products exceed their shelf life due to too large orders. Also, consumers' purchasing and consumption behaviour (i.e., how much they buy and which products they choose) plays a significant role. Other reasons include food quality requirements (especially for the shape and size of fruits and vegetables), high food prices, the inability of employees to display food in shops correctly, and food safety and hygiene requirements (e.g., for ready-to-eat food).

The food industry

The study of the food industry involved seven food processing sectors: dairy, bakery, meat, fish, fruit and vegetable, and grain processing industries, as well as beverage producers. The amount of food waste generated in these industries was estimated based on NWRS data. In addition, the study consisted of an online survey and interviews designed to establish what type of food is wasted and why, and how companies avoid, reduce, and manage food waste.

The data analysis results imply that the food industry generates approximately 32,000 tonnes of food waste. Most food waste is inedible (unavoidable) food waste generated in production. The food industry's share of avoidable food waste (food loss) is approximately 10% (annually 3200 tonnes). This share is considerably lower compared to the other stages of the food supply chain described above.

The highest share of food waste is generated by fruit and vegetable processing (52%), meat processing (13%) and grain processing (9%). The percentage for other sectors is smaller. Compared to other sectors, the fish processing industry generates the least food waste.

There are various causes of food waste in the food industry. However, the companies interviewed mentioned the production process itself as the primary cause of food waste and by-products. Other reasons highlighted in the interviews included defective products, quality assurance of the finished product, poor quality of raw materials, requirements and sales strategies of distributors, food safety and hygiene requirements, food transport and product development.

Primary production

The estimation of the food waste generated in the whole primary production sector was based on a detailed study of three sub-sectors: dairy production, wheat cultivation, and aquaculture as well as the results of previous studies of nine primary production sub-sectors (Estonian University of Life Sciences, 2018). The detailed study conducted by the Estonian University of Life Sciences comprised an online survey among 165 agricultural and eight aquacultural producers.

The results indicated that approximately 24 000 tonnes of food waste were generated annually in primary production in Estonia, of which 82% was food loss. On the one hand,

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potato cultivation contributed the most (almost 60%) to the food waste in primary production. On the other hand, strawberry cultivation, aquaculture and fishing collectively contributed to less than 4% of food waste in the primary production sector. According to the survey, there was no food waste in cattle and pig farming and milk production in 2020, and only production loss occurred.

The detailed study showed that in milk production the so-called production loss amounted to 3.5% of the volume of milk production. The production loss occurred primarily during milking (mainly because the milk contained unwanted somatic cells and antibiotics) and cooling (due to a power failure or technical reasons). In wheat cultivation, 1.2% of production was discarded as food waste, mainly during pre-cleaning wheat (due to poor grain quality) and drying (due to power or equipment failures). In aquaculture, food waste accounted for only 0.1% of the volume of sold products. It occurred during the fish or crustacean farming phase (mainly due to natural mortality and injuries caused by predators).

Recommendations

For the prevention and reduction of food waste and food loss, policymakers should:

- create strategies and set political targets for food waste prevention and reduction at the state level;
- contribute to the further development of monitoring and measuring methodologies, especially accounting of animal by-products;
- promote food donation and support Food Bank and other similar organisations;
- increase motivation to donate food beyond the retail sector, particularly in the food industry, catering sector, and primary production;
- promote the prevention and reduction of food waste and support valorisation opportunities in food processing industries and the primary production sector;
- promote and support the recycling of food waste (e.g., composting); and
- support awareness-raising activities.

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