

Chapter 41

Relevant Methods for Reducing the Phenomenon of Food Waste in the HORECA Sector in the Romanian Mountain Regions



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Abstract Food waste is a generalized process that affects both the environment and resources (natural, financial, sanitary, etc.). The negative effects are felt both at the individual level (household budget) and at the society level, being difficult to combat. From the quantitative and qualitative analyses, it was observed that food waste at the household level represents over 50% of its total volume, although food waste is produced throughout the supply chain. Some economic sectors, by the nature of their activities, have a greater predilection to waste food, such as the HoReCa sector or large stores. Advanced solutions for diminishing the food waste take on different forms of manifestation, from awareness of the phenomenon itself to the sizing of portions, the promotion of good practices, innovative packaging, etc. Considering the aforementioned, this article seeks to contribute to a better knowledge of the phenomenon of food waste and to identify some viable solution by which this phenomenon can be combated.

Keywords Food waste · HoReCa · Sustainable development · Natural resources

41.1 Introduction

The process of food waste affects both the environment and resources (natural, financial, sanitary, etc.). The negative effects are felt both at the individual level (household budget) and at the societal level, and they are difficult to combat.

Studies have shown that food waste at the household level represents over 50% of the total volume, although food waste is produced throughout the supply chain. It is also observed that some economic sectors, by the nature of their activities, have a greater predilection to waste food (e.g., HoReCa, large retail stores, etc.). Solutions

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to reduce this phenomenon take different forms of tackling, from awareness of the phenomenon itself to rethinking portions, promoting good practices, innovative packaging, etc.

Considering the above-mentioned situation, this article aims to review a number of conceptual and practical approaches to food waste. The analysis aims, in particular, to evaluate food waste in the HoReCa sector. Furthermore, an effective way to reduce the waste phenomenon is proposed, with the help of smart packaging.

41.2 Literature Review

According to the Explanatory Dictionary of the Romanian language, waste represents the reckless use of material or monetary goods, an immeasurable expense, but also a destruction, ruin, shattering, having as a synonym wasting. Different things can be wasted, from material things to money or immaterial aspects (e.g., time).

Waste can be caused by certain defects (caused by: incomplete specifications, lack of training, poor process control, improper maintenance of equipment etc.); costs: associated: cost of waste, quarantined stock, re-inspection, rescheduling and loss of capacity, customer satisfaction; overproduction (the most expensive form of waste) which generates other wastes, such as: large number of employees, extra costs in storage and transport due to excess stock; causes: wrong sales forecasts, full capacity production to maximize machine/personnel utilization, overcoming problems caused by fluctuating peak orders, optimal production lot (lowest total cost). To these, food waste can be added caused by waiting time (poor flow of materials and/or components, production in large batches, capacity bottlenecks, machine downtimes, material shortages, long production changeover times, lack of a production plan, etc.), over-processing or improper processing, inefficient transportation (waste is caused by: inadequate transportation equipment/techniques, misplacement of machinery, management of large batches, long distances between processes), etc.

In a series of specialized studies carried out by FAO, food waste represents a global phenomenon to reduce the mass of edible food. The food loses during the production, post-harvest and processing level in the food supply chain, till to the end of the food chain (retail and final consumption) and referring to trader behaviour (Parfitt et al., 2010).

According to the FUSION-EU project, food waste can, at some point, turn into “edible products, intended for human consumption”, this being defined as “food or parts of food resulting from the entire production chain, which can be recovered or processed”. This includes: raw or cooked food thrown into the trash, food scraps resulting in all stages of the preparation meal in the household and waste food resulting from manufacturing, distribution, retail and service process, products in the form of shells of vegetables, eggs, meat side dishes and excess ingredients or cooked and discarded food, but also bones, carcasses, organs, edible, and inedible food scraps (Chirsanova & Calcatiniuc, 2021).

Globally, the composition of food waste is different from one state to another, regions or nations, being correlated, in particular, with the level of economic and social development (Cánovas et al., 2018). Thus, in middle- and high-income countries, food is wasted, even if it still corresponds consumption at household level (the significant food losses occur early in the supply chain). In lower-income countries, losses occur mainly in the early stages of the food supply chain (less food at the consumer level) (Belletti & Marescotti, 2020).

Around 40% of food waste occurs after harvest in developing countries and in developed over 40%. Supermarket promotions encourage food waste (discounted products can be bought even if they are not necessarily needed).

Although the amount of waste (of food) is increasing, currently, there is no overall perspective on its situation and evolution, both in the European Union and in Romania, due to as a result of the non-existence of statistical data and information. According to estimates, the sources of food waste are similar between European countries, the only identified differentiation being given by the specifics of the product (its properties).

Regarding the evaluation of the phenomenon of food waste, there is still no common methodology. However, based on the existing information in the specialized literature, there are a number of criteria and indicators that can be used to develop policies and strategies to prevent food waste (De Laurentiis et al., 2020).

The evaluation methods that can be taken into account must be based on the life cycle of the products and on the relevant principles of Circular Economy (Aschemann-Witzel et al., 2017).

41.3 Methodology

The methodology used in the paper consists in the analysis of statistical data and their interpretation in the sense of identifying a global assessment of food waste in the HoReCa sector in Romania and presenting the results of some international projects that support and promote innovative packaging, as one of the most effective methods of preventing waste feeding.

41.4 Analysis/Results Interpretation

General estimates made at the national level show that around 73% of restaurants face food waste, and 30% is represented by prepared meals. Furthermore, between 5% and 15% of food cooked in restaurants is thrown away, and 50% of food thrown away is about to expire. However, it was discovered that 55% of operators had already implemented measures (e.g., donated to staff, donated to animals, stocked short term, invested in storage area or prepared only to order).

Food waste in the HoReCa sector was evaluated in various specialized studies carried out at the national level,¹ the results being mainly questionnaires and interviews. Therefore, this paper proposes an assessment of food waste in the HoReCa sector in the mountain area, based on the specific indicators existing in the national statistics and in Eurostat. Thus, a first indicator is related to the number of one-night and 3-night trips. Taking in account Eurostat data, the number of one-night trips to mountain agro-pensions in Romania was, in 2019, 19.4 million trips, and the number of those who stayed 1–3 nights was 11.14 million trips. For both indicators, an upward trend can be observed compared to 2014. Therefore, there is a clear tendency to develop this sector, and implicitly also an increase in the phenomenon of food waste, corresponding to a greater number of tourists. Other analysed indicators are those from the national statistics (NIS), which show the evolution of the HoReCa sector in the mountain area. According to NIS data, the tourist capacity of mountain areas (year 2021) was 2492 tourist accommodation structures, which represents 27.25% of the total at the national level. About 52.85% of the total are agro-tourist guesthouses, followed by tourist guesthouses (17.47%), tourist villas (8.47%), and hotels (7.95%). Most are three stars and are agro-tourist guesthouses. There are 66,374 accommodation places in the tourist accommodation structures in the mountain area (with an average of 27 places per tourist unit). About 32% of places are in agritourism guesthouses, followed by hotels (26.58%) (Antonescu et al., 2022).

The mountain tourist structures had an average degree of occupancy in 2021 of 42.5%, the most sought after/occupied being hotels (52.8%), followed by tourist villas (36.5%). Mountain agro-tourist guesthouses had an occupancy rate of 23.1%, while tourist guesthouses were occupied in proportion to 26.2%.

Taking into account the information presented previously, the most food waste is produced in hotels in the mountain area (95.8 tons annual maximum and 57 tons minimum), followed by agro-tourist guesthouses (36 tons maximum and 21 tons minimum, for the analysed period of time).

According to estimates, the units in the total HoReCa sector show that there are more than 250,000 tons of food waste thrown into the landfill annually (12%–15% of total). Compared to the total value estimated for the HoReCa sector, the food waste in the mountain area has a relatively small size, it represents 0.014% of the estimated 250,000 tons (the maximum value of the waste in the mountain area).

In conclusion, starting from these general estimates, it is obvious to the authors that a real assessment of the quantities of food waste in Romania is necessary, which takes into account each sector of activity separately. Moreover, a standardization of the amount of waste for each sector is necessary, so that the estimate is as close as possible to the real situation.

¹ Study on food waste in the local HoReCa industry, carried out by Edenred Romania, in partnership with the Employers' Organization of Hotels and Restaurants in Romania (HORA) and Mastercard, April–August 2022, on a sample of 97 food establishments.

41.4.1 Model for Combating Food Waste through Innovative Packaging

The packaging process is vital in maintaining the quality and safety of food, but also to extending the life of the food and reducing food waste. However, packaging represents a product with a short life cycle; therefore, its incorrect management can lead to negative effects on the environment. Also, the food waste affects the environment and causes unwanted additional costs.

Packaging has a direct link to the circular economy (Williams et al., 2012). From a circular economy perspective, the food chain includes three important stages: food production, food consumption, and food waste generation, including food surplus management.

Currently, the food journey “from farm to consumer” shows the need for the new packaging systems that reduce the food waste. Some forms of packaging, such as reusable boxes and pallets, offer a solution that minimizes product handling. Food and packaging have a unique relationship. By using food packaging correctly, household food waste can be minimized and the environmental burden caused by food overproduction would be eased.

Many specialized studies show that packaging is an interesting and attractive topic because people have become more aware of packaging waste than food waste, underestimating the amount of food waste produced.

The form and nature of pack is considerate one of the most studied methods of reducing food waste. For example, the shift to single-serving formats in certain food categories may result in more packaging per unit mass of food, and the generation potential is reduced. It becomes essential to recognize and investigate the trade-offs between packaging consumption and food waste in order to produce the best environmental outcome (Wikström et al., 2014).

In practice, the type of packaging is selected according to the packaged product (Crenna et al. 2019):

- Bags, satchels, sacks for grain, seeds, sugar, and bakery products
- Bottles and flasks for bottling pasteurized milk, deformable tubes for mustard, mayonnaise, purees, tomato paste, etc.
- Small capacity container for certain products (yoghurt, creams, fresh cheese, ice cream, mayonnaise, etc.)
- Drums and barrels for the transport of milk and dairy products (cream, fresh cheese, ice cream, etc.)
- Trays for fish, pieces of meat, vegetables, and fruits

These types of packaging must comply with certain specific quality conditions for the entire duration of both transport and the life of the food products, their quality deteriorates, thus affecting people’s health and generating important material and financial losses.

A survey-based estimate showed that packaging-related food loss/waste contributes 20–25% to the total amount of household food waste (Table 41.1).

Table 41.1 Types of food waste caused by packaging damage

Stage	Types of food waste caused by packaging damage	
Food in the supply chain	Post-harvest handling and storage	Product damage caused by contaminants, sharp edges or chips from storage containers
	Processing and packaging	Filling process; difficulties Sealing difficulties; Marketing difficulties
	Distribution	Inappropriate packaging material, poor stability, damage to the barcodes on the packaging
Food in households		Packaging difficult to open; Packaging difficult to empty; Improper package size

Source: https://iba-riscuriambalaje.ro/wp-content/uploads/2020/09/Strategie_risipa_final.pdf

Table 41.2 The packing and the smart technology

Improved packaging properties (mechanical, thermal, barrier, etc.)
The quality of biodegradability
A type of active packaging that helps to extend the life of product
Smart packaging follow the connection with the environment
Bioactive compounds to keep the product fresh (for example, vegetable oils)
Packaging to warn of the approaching expiration date
Packaging with nano sensors, to indicate the quality of food, the amount of micro-organisms
Product information: Nano-barcode, product authenticity

Source: Love Food Hate Waste (2018) A–Z of food storage

According to the European Regulation 450/2009, the main design criteria of an ideal package are: zero toxicity, easy handling, adequate mechanical strength, firm closing characteristics (such as resealing), moisture control, and appropriate labeling. The main benefits of reducing food waste by using innovative packaging are (Caldeira et al. 2019):

- Savings in money by reducing over-purchasing and waste disposal costs; tax benefits through food donation
- Reducing pollution
- Supports efforts to reduce hunger and poverty and reduce health problems

The food packaging technology has a permanent evolving process. Table 41.2 presents the smart and innovative technologies to prevent food waste, from the perspective of packaging.

The role of the pack must change from a passive one (a simple container that protects the contents from moisture, air, microbes, vibrations, shocks, etc.) to an active one (interacting with the product). In these conditions, nanotechnology can be an innovative tool for the development of active food packaging. An example is the Nano Pack project (<https://www.nanopack.eu/>). Nano Pack films are able to extend the life of bread without additives till 20 days.

High barrier packaging materials (plastics and metallized films) can be used because they provide an important mechanical barrier and are resistant to

environmental factors (water, pathogens, etc.) (Study on Food Waste in the Local HoReCa Industry, Carried Out by Edenred Romania 2022).

Another project that can be mentioned is RefuCoat² (financed by EU funds), which proposes the development of two new models of bio-based packaging for food:

- (1) A fully recyclable active packaging for metallized foils (that used in packs for cereals, crisps, salty snacks etc.)
- (2) A fully biodegradable package for chicken products.

An innovative packaging model follow YPACK program of EU³ (2017). The project develops a fully recyclable and fully biodegradable packaging. The related pack film forms a passive barrier and has active antimicrobial properties, able to prolongue the life of products.⁴

Materials that are considered derived from non-renewable resources are the following: composite material from aluminium foil, from polyethylene and/or polypropylene paper, polypropylene - PP, polyvinyl chloride - PVC, polystyrene - PS, etc. Stopping this waste is done with the help of legislation. Therefore, in Romania, there is Law no. 87/2018 concerning the management of waste. The law prohibits the sale of certain categories of plastic bags (thin plastic bags with handles 50 microns thick). But to reduce the whole phenomenon an ecological tax is necessary.⁵

In order to align national legislation with European objectives in the field, the minimum rates of recycling/utilization of packaging waste in Romania will be increased by 5% (January 1, 2025, respectively, January 1, 2030).

Conclusions In conclusion, the reduction of food waste in Romania must start today, given the potentially positive effects it can generate, as follows:

- Economic and social effects – according to the Institute of Food Bioresources, the relationship between the national level of food waste and existing financial resources is confirmed.
- The effects on the environment (reducing food losses have an positive effect upon land, water, energy, raw materials and the environment, and, implicitly, to the reduction of CO₂ emissions and pollution).
- Reduced costs at the level of companies - by complying with the measures to make economic operators responsible and the hierarchy for reducing food waste, the costs related to the collection of biodegradable waste are reduced, by reducing the quantities, and a part of the food will be recovered through donation, recovery through composting or their transformation into biogas.

²<https://www.refucoat.eu/>

³<https://www.ypack.eu/>

⁴<https://www.ypack.eu/>

⁵ 2 fees are paid for plastic bags, regardless of whether they have a handle or not. The first tax is 0.15 lei/pc + VAT and is called the ecotax. The second fee is the packaging fee, which is also 2 lei/kg, as with classic packaging (source: <https://www.pungi-biodegradabile.com/2019/10/25/ce-taxe-se-achita-pentru-ambalaje-si-pungi>)

At the HoReCa field, there are many ways to reduce food waste, of which here are the most relevant:

- (1) Carrying out a food waste audit and perfecting the food waste strategy in tourist guesthouses
- (2) Using food waste patterns
- (3) Limiting the number of menu options or reducing their quantity
- (4) Communicating with suppliers about seasonal produce and purchasing and menu planning
- (5) Management of stock in refrigerators, warehouses, and freezers
- (6) Using attractive beautiful crockery and cutlery to enhance the presentation and enjoyment of food
- (7) Educating about why reducing food waste is important to any business
- (8) The presence of suitable storage containers and jars so that food can be stored safely
- (9) Labeling and storing food in accordance with food safety guidelines
- (10) The food containers and innovative packaging
- (11) Selective collection of food waste

Taking into account the fact that sustainable development objective 12 (SDG 12) aims a 50% drop in food waste (in retail and consumer stage), but also to diminish food waste throughout the supply chain, in Romania, there is an urgent need to collect separate and estimate the phenomenon of food waste as close as possible to real.

A national strategy for the prevention of waste and food waste is necessary, in parallel with a more accurate estimate of the phenomenon itself, because it burdens the waste management systems and pollute the environment, not to mention the ethical potential of this reduction (there are people who are at the bottom line of subsistence).

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