

Knowledge about food waste prevention and management practices: Perspectives from Restaurants in Novi Sad

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Abstract

Food waste attracts attention from academics and practitioners globally as it challenges economic, social, moral, and environmental issues. In the context of Food Waste this paper provides insights into food waste prevention and management practices from restaurants in Novi Sad. In addition, this paper applies the Food Waste Hierarchy Principles and contributes to addressing theoretical implications. Besides that, the research task was to apply the survey from previous researches which indicates that it is a useful tool for finding out how much management and head chefs knew about the Food Waste issue in their kitchens. Also, structured interviews were conducted with 10 managers and chefs. The main result of the research is that education as an important aspect of developing this topic and from a complete training course, staff, be they junior, sous chefs or chefs. The contribution of the research is also identified an equally important role of other components of practice theory i.e., corporate influence, and knowledge of Food Waste among chefs can be reinforced by the corporates.

Keywords: food waste, restaurant, prevention and management practices, chefs, Novi Sad

1. Introduction

Food waste management has been investigated from many perspectives, and it indicates a critical global problem, yet food service operations remain under-researched. In the subject literature, the need to research the interest of Food Waste from the aspect of hospitality and tourism has been emphasized by a greater number of researchers (Filimonau et al., 2021b; Filimonau et al., 2023; Papargyropoulou et al., 2023; Wang et al., 2017; Kattiyapornpong et al., 2023; Bharucha, 2018; Vizzoto et al., 2020). According to the authors' knowledge, based on the analyzed literature, that no similar research activities have been conducted so far in Novi Sad, Republic of Serbia, except for certain studies which refer to management model for sustainable development in hotels (Rajić et al., 2022), sustainable food waste management in Serbia (Ivanović et al., 2025), empirical analysis of tourists' intentions regarding food waste in Serbian hotel industry (Glišić et al., 2025), food waste production on Serbia's economic prospects (Gajić et al., 2024), influencing factors of food waste in restaurants (Blešić et al., 2021), assessment of restaurants food waste (Lazić et al., 2022) and attitudes of hotel managers on sustainable tourism through Green practices (Dauti et al., 2024), which provides space for further research. This study aims to research knowledge about food waste prevention and management practices in restaurants in Novi Sad, Republic of Serbia.

The recent review of hospitality food waste (Filimonau et al., 2021b; Filimonau et al., 2023; Papargyropoulou et al., 2023; Wang et al., 2017; Kattiyapornpong et al., 2023; Bharucha, 2018; Vizzoto et al., 2020) emphasis the complexity of the hospitality sector impacting distinct food waste management practices. Theoretically, Food Waste Hierarchy Model is applied widely in waste management, but only a few studies in hospitality food waste management (Sirijuntrapun et al., 2022). Therefore, one of the tasks of the research is to compare the results with theoretical model and as well as the application in practice through a corporate social responsibility.

In the subject literature, the need to research Food Waste knowledge, perceptions and behaviors of consumers and managers (Vizzoto et al., 2020; Vizzoto et al., 2021) and employees have been under examined (Goh et al., 2019). Kitchen

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staff, especially Chefs and Sous chef, his replacement, are responsible for the kitchen processes (Chawla et al., 2020) and these processes account for up to 70% of Food Waste in foodservice provision (Filimonau et al., 2022). This suggests that dedicated research should focus on chefs as they play a major role in Food Waste prevention (Batat, 2020). Another research task is to examine how chefs (dis)engage in food waste prevention in kitchens by using semi-structured interviews. This study aims to fill the above research gaps by exploring and examining different aspects and levels of sustainable food waste management practices in the hospitality industry.

The main research task in this study was to apply the survey from previous researches which indicates that it is a useful tool for finding out how much management and head chefs knew about the Food Waste issue in their kitchens.

The next section provides a brief overview of existing research on Food Waste in hospitality and introduces the theoretical basis of the current study.

2. Literature review

2.1. Food waste management and waste hierarchy model

The main causes of food waste are overproduction, consumer behavior, food safety regulations, staff (dis)engage and economic factors. Overproduction is a major problem as cooks often produce more meals than is needed. In addition, inefficiencies in the supply chain, such as poor logistics, transportation problems and inadequate storage facilities, can cause food to spoil before it reaches the consumer. Consumer behavior also plays an important role. Impulse buying, inadequate meal planning and misunderstandings about meals can all contribute to too much food being thrown away. Portion sizes in restaurants and at home can lead to food not being eaten and leftovers that cannot be consumed later. Consumers' lack of awareness of proper food storage, the use of leftovers or the interpretation of food labels can also lead to increased waste. Food safety regulations can also result in perfectly good food being thrown away if it does not meet certain standards such as appearance, size, labeling or minor packaging defects (Filimonau et al., 2021b; Kattiyapornpong et al., 2023; Ivanović et al., 2025; Blešić et al., 2021; Batat, 2020).

The waste hierarchy principles by European Commission (European Commission. Directivex, 2018) include prevention, reuse, recycling, recovery, and disposal, ranging from the most preferable to the least options. Many relevant organizations, researchers and practitioners have developed and adapted this model as waste prevention and sustainable waste management guidelines (Papargyropoulou et al., 2017; Kilibarda et al., 2019; Camilleri, 2021). There are some principles of this particular model, and most of them overlap around these four essential foundations: prevention/reduction (to re-duce food surplus/loss and avoidable food waste at source); reuse (edible food for hu-man consumption); recycle (feeding animal, compost) and recover (creating energy); and disposal (landfill/incineration), which prevention and reduction are much more appropriate and effective in food waste management by reducing food loss at the source and maximising food use (Sirijuntrapun et al., 2022; Papargyropoulou et al., 2017; Kilibarda et al., 2019).

2.2. Food waste management in food service operations

In the subject literature, there is still a need to bridge a gap between sustainable innovations and recycling practices in hospitality (Filimonau et al., 2021a; Filimonau et al., 2023; Papargyropoulou et al., 2023; Wang et al., 2017; Kattiyapornpong et al., 2023; Bharucha, 2018; Vizzoto et al., 2020) in the context of developing and transitional economies (Filimonau et al., 2019). Interestingly, Ivanović et al. 2025. and Blešić et al. 2021. highlights that most food waste in Belgrade has been disposed of in landfills, the last effective option of the food waste hierarchy model. The waste disposal practice is the same in Novi Sad. Hence, this study aims to fill the gaps by exploring and examining different aspects and levels of sustainable food waste management in the hospitality industry using food waste hierarchy-guided questions to understand to what extent the restaurants in Novi Sad pursue the best current practices in sustainable food waste management.

Past research highlights good food waste management practices and sustainable initiatives by responsible food service operations. The authors point out that hotel can redesign a new kitchen process at the planning stage to reduce food waste (Duursma, 2016; SRA 2010). At the handling stage, storage should be regularly checked to ensure the First-In-First-Out (FIFO) stock method is implemented, has been confirmed in previous research (Kilibarda et al., 2019; Filimonau et al., 2019; Charlebois et al., 2015; FAO 2015; WRAP 2017). The same authors point out that unused, unsold or excess food is redistributed by selling it at a lower price or donating it to staff and other needed organisations or reusing it by cooking it for employee consumption at the staff canteen. At the restaurant operations, a la carte service should be offered rather than buffets (Gossling et al., 2011).

2.3. Food waste in food service operations

The need to research the interest of Food Waste from the aspect of food service operations has been emphasized by different determinants incorporate business model. On the one hand, business-related determinants, indicates that buffet

foodservice wastes more food than a la carte foodservice (Papargyropoulou et al., 2016), independent restaurants generate more Food Waste per guest served than large, chain-affiliated businesses (Filimonau et al., 2021a) and owners/managers and their sustainability orientation influence how much food is wasted in restaurants and how this Food Waste is managed (Principato et al., 2018). While, on the other hand, consumer-related determinants, indicates that females and regular restaurant guests waste more food compared to males and less frequent restaurant customers (Vizzoto et al., 2021a), the extent of consumer religiosity influences Food Waste occurrence on customer plate (Principato et al., 2018) and resourceful cooking should become an integral element of hospitality teaching curriculum and chefs' training (Filimonau et al., 2023).

Despite this, the determinant as a business model on the one hand as an external factor, but the staff as a determinant is an internal factor, on the other hand. Past research highlights the dynamics of Food Waste in food service operations, as an internal factor, and they point out the conclusions, which are: top-end restaurants waste excessive amounts of food in the kitchen and fine dining restaurants apply stricter standards to the visual appearance of dishes (McAdams et al., 2019), the competencies of chefs in resourceful cooking are often limited while corporate policies and procedures discourage resourcefulness in the kitchen (Filimonau et al., 2023), Food Waste practices in implementing sustainable food waste management and practices in hotels' restaurants (Kattiyapornpong et al., 2023), chefs reject plates which are not comply with their aesthetics requirements (Charlebois et al., 2015) and process of food preparation, chefs using only the foodstuffs of premium quality are used in cooking and chefs discard the ingredients of insufficient freshness (Hennchen et al., 2019).

In the subject literature, the interest of Food Waste from the aspect of food service operations has been analyzed by different research. The authors point out that meal preparation, such as pre-treating, trimming, and cutting, but also meal cooking that includes boiling, frying, and portioning, it makes food waste (Ball et al., 2003). Also, overstocking which is fuelled by demand forecasting errors is one of deficiencies (Filimonau et al., 2020) as well as FIFO approach has long been accepted, but it is not always effectively applied (Charlebois et al., 2015). Practice theory could explain the extent of chefs' (dis)engagement in Food Waste prevention in kitchens of fine dining restaurants (Filimonau et al., 2023) while pre- and post-consumption food waste, respectively kitchen and plate waste, mostly due to its impact on profitability and high costs of disposal (Filimonau et al., 2020).

According to everything from this paragraph, the need for similar research is obvious. In addition, it is necessary to investigate the resourcefulness of chefs in food service operations. Authors (Filimonau et al., 2023; Thompson et al., 2017; Filimonau et al., 2021b; Principato et al., 2018) point out that resourceful cooking as a means of preventing Food Waste occurrence while food is environmentally, socio-economically, and morally unacceptable in presence of climate change and poverty.

3. Materials and methods

Fieldwork for this study was carried out in Novi Sad in the Republic of Serbia. Novi Sad, the main city of AP Vojvodina, is located on the Danube River in the Pannonian Plain. With their history, cultural assets and high quality accommodation facilities, Novi Sad host many domestic and international events. Thus, they are mostly considered cultural regions. Along with a cultural heritage deeply rooted in history, the city offer opportunities for their visitors to see administrative, economic, political and cultural across the cities (Vuksanović et al., 2019).

3.1. Research method

The primary recruitment criteria for restaurant selection and identification of key informants were the level of engagement in sustainability practices and active involvement in food waste management initiatives. Restaurants were purposively selected among the Top 10 ranked establishments on TripAdvisor within the defined geographic area, as this ranking reflects customer evaluations, market visibility, and operational performance. This approach ensured inclusion of prominent restaurants with established reputations and demonstrable engagement in sustainability-related activities, thereby increasing the relevance and analytical value of the collected data.

The research was conducted from February to April 2025. Referring to Munir's recent systematic literature review on sustainable food waste management strategies in hospitality and food services (Munir, 2022), most qualitative-related research includes a range of 1–45 restaurants/hotels.

This qualitative research applies an exploratory approach by conducting structured in-depth interviews with 10 managers and head chefs from restaurants to achieve the study aim. Structured interviews were selected due to their flexible design appropriate to collect detailed data from nuanced practices among these selected restaurants (Filimonau et al., 2023; Kattiyapornpong et al., 2023; Bharucha, 2018; Vizzoto et al., 2020). This exploratory qualitative research method is appropriate for this study as it seeks to understand food waste management practices through the management and head chef's experiences and perspectives (Filimonau et al., 2023; Kattiyapornpong et al., 2023; Carrillo Ocampo et al., 2021; Creswell et al., 2013).

Questions were adapted from past literature (Filimonau et al., 2023; Kattiyapornpong et al., 2023; Sirijuntrapun et al., 2022; Filimonau et al., 2019; Papargyropoulou et al., 2017; Camilleri, 2021) on food waste management regarding related policy, planning process, storage, handling, operations, donations, recycling, resources, local partnership, and cooperation. The questionnaire (as checklist) for 10 managers was used by Kattiyapornpong et al. 2023., which is adapted from previous research (Filimonau et al., 2023; Kattiyapornpong et al., 2023; Sirijuntrapun et al., 2022; Filimonau et al., 2019; Papargyropoulou et al., 2017; Camilleri, 2021). The questionnaires were translated into Serbian, used as such, and were later translated into English when entering the data into Nvivo.

Two teams participated in the interview, one with manager and the other with the head chef. To contribute to this project, interviews were supplemented with on-site observations performed by the research team in kitchens. In-kitchen observations were performed by strictly adhering to the related health and safety protocols. As part of Food Waste audit and disposal, the research team weighed the amounts of wasted food and categorised Food Waste in line with its character (for example, vegetables or meat) and reasons for occurrence (for instance, over-preparation or cooking errors). To this end, the guidelines provided by Kattiyapornpong et al., 2023. and Papargyropoulou et al., 2017. were followed.

3.2. Sampling

The studied sample is 10 restaurants to achieve the study aim. Table 1 presents the respondent's profile.

Table 1. Respondent's profile

Hotel	Type of Restaurant Ownership	Restaurant size (seats)		No. of available seats	World guide
		Small (<40)	Medium (41–60) Large (>60)		
Restaurant 1	self-managed	Small		40	Gault and Millau
Restaurant 2	self-managed	Small		40	Gault and Millau
Restaurant 3	self-managed	Small		40	Gault and Millau
Restaurant 4	self-managed	Large		62	Gault and Millau
Restaurant 5	self-managed	Large		108	Gault and Millau
Restaurant 6	self-managed	Large		82	Gault and Millau
Restaurant 7	self-managed	Medium		58	Gault and Millau
Restaurant 8	self-managed	Large		96	Gault and Millau
Restaurant 9	self-managed	Small		40	Gault and Millau
Restaurant 10	self-managed	Small		40	Gault and Millau

Source: Author's research

The interview with 10 managers was the first. Table 2 summarises the checklist of the food waste practices based on structured interview questions made by Kattiyapornpong et al. 2023. and adopted from previous research (Filimonau et al., 2023; Kattiyapornpong et al., 2023; Sirijuntrapun et al., 2022; Filimonau et al., 2019; Papargyropoulou et al., 2017; Camilleri, 2021). The checklist demonstrates different aspects and levels of food waste management practices at regardless of the types of ownership and size.

Table 2. Summarised the checklist of the food waste practices

Practices	Description	Rest 1	Rest 2	Rest 3	Rest 4	Rest 5	Rest 6	Rest 7	Rest 8	Rest 9	Rest 10
		1	2	3	4	5	6	7	8	9	10
Food waste management Policies	Having general policies on food waste management.			x			x	x			x
	Having policies on encouraging customers to reduce food waste			x			x	x			
	Having policies on educating employees on food waste reduction	x	x	x	x	x	x	x	x		
	Having policies on collecting food waste data			x			x	x			
	Promoting food waste management to employees	x	x	x	x	x	x	x	x		x
	Promoting food waste management to customers			x			x	x			x
	Promoting food waste management to partners.			x			x	x	x		x
	Promoting local communities' quality of life regarding food waste management.			x	x	x	x	x	x		x
	Organising food waste management seminars/training for employees.	x	x	x	x	x	x	x	x	x	x
	Organising food waste management seminars/training for customers.										
	Organising food waste management seminars/training for partners							x			

Source: Author's research

Table 2. Continued

Practices	Description	Rest 1	Rest 2	Rest 3	Rest 4	Rest 5	Rest 6	Rest 7	Rest 8	Rest 9	Rest 10
Food service planning, procurement, and storage	Planning on reducing food waste.			x			x	x			x
	Planning on stocking raw materials with suitable quantities.	x	x	x	x	x	x	x	x	x	x
	Planning on purchasing raw materials with fewer leftovers.			x			x	x			x
	Arranging food with first in, first out (FIFO).	x	x	x	x	x	x	x	x	x	x
	Storing food at an adequate temperature and location to delay food spoilage.	x	x	x	x	x	x	x	x	x	x
	Checking expiration date regularly.	x	x	x	x	x	x	x	x	x	x
Food waste handling and operations	Trimming food materials with fewer leftovers	x	x	x	x	x	x	x	x	x	x
	Asking for cooperation in reducing food waste		x				x	x			
	Using nearly expired food for cooking			x	x	x			x		
	Food cutting to make new food products.							x			x
	Giving excess food to employees.										
	Offers doggy bags to customers.							x			x
Food waste management through reusing, recycling, donations, and disposal	Selling food waste as animal feed							x			x
	Donating excess food to external organisations.						x	x			x
	Donating excess food to staff for free.										
	Donating food waste for animal feed							x			x
	Using food waste to make compost										
	Using food waste to make bio-fermented water.										
Food waste budget and resource allocation	Using food waste to ferment into biogas.										
	Recycling the hotel/restaurants' kitchen oil										
	Having a budget to manage food waste in the hotel/restaurant.						x	x			x
	Having equipment(s) to manage food waste in the hotel/restaurant.							x			
	Having technology applications to manage food waste in the hotel/restaurant.										

Source: Author's research

The studied sample included 10 head chefs in restaurant of various sizes (Table 3). We start interviews by establishing how head chefs knew about the Food Waste issue in their kitchens and how they felt about its occurrence (with open-ended questions about theory as prevention). Interviews lasted, on average, 27 min; they were conducted face-to face using an on-site questionnaire. In-kitchen observations were performed by strictly adhering to the related health and safety protocols. The study informants were aware of Food Waste and able to identify the most wasted food fractions alongside the main causes of wastage. When asked about Food Waste (with open-ended questions about practice as management), all chefs claimed they did not measure the amounts of wasted food in their kitchens describing measurements. Each data set runs word count and word cloud using Nvivo to compare (see Figure 1).

Table 3. Study informants (n = 10)

Role	Age	Work experience in restaurant (years) in any capacity	Work experience in fine dining restaurant specifically in the capacity of a chef (years)	Cuisine (Type)	Restaurant size (seats) Small (<20) Medium (21–50) Large (>50)
Head Chef 1	50	20	10	Fusion	Small
Head Chef 2	45	13	5	Fusion	Small
Head Chef 3	48	19	12	Mediterranea	Small
Head Chef 4	38	17	7	Burger house	Large
Head Chef 5	43	13	5	Traditional	Large
Head Chef 6	41	15	10	Fusion	Large
Head Chef 7	44	15	10	Pizza	Medium
Head Chef 8	37	13	5	Fusion	Large
Head Chef 9	27	5	3	Mediterranean	Small
Head Chef 10	32	7	5	France	Small

Source: Author's research

waste for recycling, and using food with maximum efficiency” (Dauti et al., 2024, p.8). Research has concluded that effective prevention of Food Waste in hotels requires an understanding of all determinants of Food Waste generation, but also necessitates their careful analysis within the specific context of food consumption.

The typical food waste practices are providing food waste management seminars and training to their employees, planning on reducing food waste, stocking suitable quantities of raw materials, purchasing raw materials with fewer leftovers, implementing a First-In-First-Out storage approach, storing food at the right temperature and location to delay food spoilage, checking expiry date regularly, handling food with fewer leftovers in the kitchen, asking staff cooperation in reducing food waste, using nearly expired food for cooking for staff canteen, reusing food cutting to make new food products/menus, giving excess food to employees, offering doggy bags to customers when request.

Chefs have access to professional equipment enabling them to waste less food. However, the competencies of chefs in resourceful cooking are often limited while corporate policies and procedures discourage resourcefulness in the kitchen. The study’s findings suggest that resourceful cooking should become an integral element of hospitality teaching curriculum and chefs’ training. Management policies and procedures of restaurants should be streamlined to encourage more active engagement of chefs in food waste prevention. Management policies and procedures can have a positive and negative but, most importantly, overarching role in linking the different components of practice theory. For example, knowledge of Food Waste among chefs can be reinforced by the management. This can be achieved via training provision which can be designed to promote resourceful cooking, thus enhancing competencies of chefs in Food Waste prevention. The management can also invest in tools for Food Waste prevention, such as smart technology, thus contributing to practice theory.

This study has some limitations while warrants the theoretical contribution of the Food Waste Hierarchy Principles model and knowledge about food waste prevention and management practices at restaurant in Novi Sad, Serbia. The first limitation is the nature of exploratory research that cannot be generalised. Second, the limitation is that number of restaurants. Lastly, there can be the key informants involved in food waste management.

The one of aim of this project are restaurants but they need to be expanded with similar investigation in other restaurant categories. The analysis of chefs can be supplemented with an analysis of the experiences of other restaurant employees, especially waiters, given that miscommunication. Future studies should look at restaurants specialising in different types of cuisines, thus offering a more nuanced perspective underpinned by the potential influence of cultural habits of chefs and national cooking traditions.

5. Conclusions

This study examined the knowledge about food waste prevention and management practices in Food Waste prevention in restaurants in Novi Sad, Republic of Serbia. In addition to filling a general gap in research on this topic in Republic of Serbia. The research results indicate the need to supplement the theoretical and practical part of food waste. From theoretical point of view, contributes are addressing and filling the gaps in sustainable food waste management practices in restaurants. Based on the Food Waste Hierarchy Principles as waste hierarchy model, it exhibits different aspects and levels of food waste management practices with the food waste practical operation in the hospitality industry. Education is an important aspect of developing this topic and from a complete training course, staff, be they junior, sous chefs or chefs, will improve their culinary skills and have more knowledge to understand each ingredient and make changes to waste it less. Lastly, the research contribution is also identified an equally important role of other components of practice theory i.e., corporate influence, as knowledge of Food Waste among staff can be rein-forced by the corporates.

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