

DETERMINING THE FOOD WASTE AWARENESS OF CHEFS WORKING IN HOTEL KITCHENS

Determinación de la conciencia sobre el desperdicio de alimentos de los chefs que trabajan en las cocinas de hoteles

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ABSTRACT

Reducing food waste in hotels is of importance for the successful management of operational inputs. For that reason, the present study determines the awareness of food waste of chefs working at hotel kitchens. 979 chefs who work at the kitchens of various hotels in Turkey were included in the research. The data was collected with a structured questionnaire. Exploratory factor analysis was performed to determine the construct validity of the scales used in the research. When the chefs' awareness increases, their caring for the faults and omissions causing food waste also increases. There is a significant relationship between the chefs' levels of awareness and their care for faults and omissions causing food waste and taking of measures regarding the prevention of food waste at the enterprises. Reducing food waste may decrease the hotels' expenses. This may be reflected on the consumer as lower sales prices, and on the enterprise as higher profitability. The relationship between the awareness of hotel kitchen staff and their care for faults and omissions was revealed as a means to decrease food waste at sectoral level. Thus, food waste can be reduced through strategies to enhance consciousness of food waste among the employees of the sector.

Palabras clave: cocina, servicios de comida y bebida, seguridad alimentaria, desperdicio de alimentos.

RESUMEN

La disminución del desperdicio de alimentos en los hoteles es de importancia para la gestión exitosa de los insumos operativos. Por esa razón, el presente estudio determina la conciencia sobre el desperdicio de alimentos de los chefs que trabajan en cocinas de hoteles. La investigación incluyó a 979 chefs que trabajan en las cocinas de varios hoteles en Turquía. Los datos fueron recolectados con un cuestionario estructurado. Se realizó un análisis factorial exploratorio para determinar la validez de las escalas

utilizadas en la investigación. A medida que aumenta la conciencia de los chefs, también aumenta su preocupación por los fallos y omisiones que provocan el desperdicio de alimentos. Existe una relación significativa entre los niveles de conciencia y la atención de los chefs hacia las faltas y omisiones que causan el desperdicio de alimentos y la toma de medidas relativas a la prevención del desperdicio de alimentos en las empresas. Gracias a la disminución del desperdicio de alimentos, los costos pueden reducirse al disminuir los gastos de los hoteles. Esto se reflejará en precios de venta más bajos para el consumidor y en una mayor rentabilidad para la empresa. La relación entre la sensibilización del personal de cocina del hotel y su atención a los fallos y omisiones se reveló como un medio para disminuir el desperdicio de alimentos a nivel sectorial. Así, se sugiere disminuir el desperdicio de alimentos a través de estrategias que fomenten la concientización entre los empleados del sector.

INTRODUCTION

Food waste has become one of the greatest financial, environmental, and social difficulties of society (Block et al. 2016). In many developed countries, the food service industry is responsible for 12 to 14% of food waste (EEA 2020). This implies wasting one of seven meals (Benson 2019). Considering its significant effects on both business income and public health, the sustainability and economic difficulty of food waste (Filimonau and De Coteau 2019, Okumus et al. 2020) should be addressed critically (Filimonau et al. 2019).

In the tourism sector, where there is the pressure of being more sustainable, but which is operating with low margins, food waste is a financial problem as much as being an environmental and social problem (Filimonau et al. 2018, Boluk et al. 2019, Filimonau et al. 2019). There is a positive correlation between the food waste levels in hospitality sector and tourism activity. Namely, increasing number of tourists causes higher amounts of food waste. This circumstance indicates that urgent actions are needed to prevent or reduce food waste in hospitality sector (Curtis and Slocum 2016, Gretzel et al. 2019). Filimonau and De Coteau (2019) reported that 73 to 79% of food waste in hospitality sector is avoidable.

Studies in different countries such as Denmark (Marthinsen et al. 2012, Halloran et al. 2014), Egypt (Ball and Taleb 2011), Malaysia (Kasavan et al. 2019, Papargyropoulou et al. 2019), the Republic of Malta (Camilleri-Fenech et al. 2020), Singapore (Joshi and Visvanathan 2019), Slovenia (Juvan et al. 2018), Sri Lanka (Kularatne et al. 2019), Sweden (Engström and Carlsson-Kanyama 2004), Switzerland (Betz et al. 2015), UK (Williams et al. 2011, WRAP 2013), USA (Okumus 2019), Vietnam (Han et al. 2018), and Turkey (Okumus et al. 2020) were performed with regards to the problem of food waste in hospitality

sector. Unfortunately, the current literature is falling short in providing specific strategies for reducing food waste in hotels (Okumus 2019).

Food service in the tourism sector makes the third biggest contribution to global food waste, coming right after the agriculture sector along with household and relevant food processing industries (Stenmarck et al. 2016). Food wastes in tourism sector generally cover all the food wastes generated during storage, preparation, production, and consumption (Filimonau and De Coteau 2019, Dhir et al. 2020). Food waste arouses a significant concern due to their effects on both food security and ecosystem (Pirani and Arafat 2016, Dhir et al. 2020). Tostivint et al. (2016) emphasized that food waste in tourism sector is becoming a significant concern. The hospitality sector causes 3 million tons of food waste in UK (WRAP 2013) and WRAP estimates that 12% of food waste comes from hospitality and food services (WM 2025). The annual financial cost associated with food waste in the EU is 143 billion dollars (EC 2019). Dubai is losing 3 billion USD each year due to food waste (Dennehy et al. 2017). Camilleri-Fenech et al. (2020) stated that plate waste in hotel establishments on the island of Malta is approximately 0.21 kg/person for lunch and approximately 0.16 kg/person for dinner, and this figure increases to 0.48 kg/person for open buffet dinner.

Various strategies for preventing and/or reducing food waste in hotels have drawn attention in recent years. Gretzel et al. (2019) emphasized kitchen and plate wastes due to their effects on profitability level and their high costs at hotel enterprises; Leverenz et al. (2021) analyzed the food planning practices at hotel kitchens; Gandhi et al. (2019) explored the food waste management at hotel food services; and Okumus et al. (2020) focused on the main preventive points regarding food waste at hotel enterprises. Tomaszewska et al. (2021) analyzed how to reduce

and prevent food waste by influencing the behaviors of hotel personnel and guests, and Dolnicar and Juvan (2019) emphasized that food waste is caused by employees making compromises on quality to keep operating costs low.

The hotel enterprises may not recognize the effects and benefits of operational practices such as food waste management on obtaining competitive edge (Rahman et al. 2012, Kucukusta 2017). The food operations in question directly affect the main elements of business strategy at hotel enterprises (Sandaruwani and Gnanapala 2016, Bondzi-Simpson and Ayeh 2017, Ettinger et al. 2018). For that reason, food operations should be effectively managed for decreasing the costs, gaining environment-friendly customers, increasing stakeholder satisfaction, minimizing the pressure, and ultimately creating competitive (Radwan et al. 2012). As the food waste affect the financial, environmental, and social performance of hotels, they play a significant role at national and global level (Juvan et al. 2018). As in many countries, studies conducted in Turkey show that the reasons for food waste in hotel operations include food and beverage practices implemented by hotels (Okumus et al. 2020, Temizel et al. 2024) and errors by employees and guests (Özdemir and Güçer 2018, Temizel et al. 2024).

Executives should develop procedures for decreasing food waste, and they are required to follow the new trends and practices on this subject (Okumus 2019). Tomaszewska et al. (2021) stated that interference with food waste behaviors among hotel personnel must be achieved through training. The guests should be informed regarding the social, environmental, and financial consequences of food waste. According to Dolnicar and Juvan (2019), investigating guests' habits, knowledge, and culinary traditions regarding food waste by nationality is very important for determining and preventing food waste.

This study aimed to determine the level of awareness of kitchen chefs at five-star hotels operating in different regions of Turkey regarding food waste. In addition, it is planned to determine the effects of chefs' food waste awareness on their levels of care for faults and omissions that cause food waste.

MATERIALS AND METHODS

Structured questionnaire and scale

The data was collected through a structured questionnaire. The questionnaire questions were prepared by the researchers and adopted from the relevant literature (Silvennoinen et al. 2015, Principato et al.

2018, Rasool et al. 2021). The questionnaire form consisted of three sections.

- 1) Demographic data of the participants (4 questions)
- 2) Food waste awareness scale (32 expressions)
- 3) Scale of caring for the faults and omissions causing food waste (16 expressions)

The questionnaire was administered through a pilot study involving 60 chefs working in the sector, in accordance with the study's scope, which allowed for reviewing unclear questions and expressions.

The scale was a 5-point Likert scale (5 points = I totally agree, 1 point = I totally disagree), and the scoring of negative expressions (7 out of 32 expressions were negative) was reversed. The scale of caring for the faults and omissions causing food waste at the enterprise consisted of 16 expressions and was scored on a 5-point Likert scale (5 points = it is cared about too much, 1 point = it is never cared about).

In this study, an exploratory factor analysis (EFA) was conducted to assess the adequacy of the sample and to ensure that the variables were sufficiently correlated to yield meaningful factors. In SPSS software, the sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) value, and the factorability of the correlation matrix is assumed if Bartlett's test of sphericity is statistically significant (i.e., $p < 0.05$) and the measure of sampling adequacy (MSA) value exceeds 0.50 (Hair et al. 2006). The food waste awareness scale's KMO value was 0.993, and its X^2 value within the scope of Bartlett's test was 79822.014, indicating statistical significance ($p < 0.05$). Accordingly, the normality condition was ensured. Based on the results of the KMO and Bartlett's test, it was concluded that the data were suitable for factor analysis. Exploratory factor analysis was performed to determine the food waste awareness scale's construct validity (**Table I**).

According to the factor analysis results, the scale's factor loadings range from 0.800 to 0.976 and comprise 32 items. The factor's rate of explaining the total variance was calculated to be 92.494%. Moreover, as the Cronbach's Alpha coefficient was 0.997 (**Table I**), it was concluded that the scale was highly reliable. In the factor analysis performed for the scale of caring for faults and omissions causing food waste, the KMO value was 0.983. Accordingly, the sample sizes are suitable for factor analysis (KMO > 0.500). Within the scope of Bartlett's test, the X^2 value was calculated as 36294.848 and was found to be statistically significant ($p < 0.05$). Accordingly, the normality condition was ensured. Based on the results of the KMO and Bartlett's test, it was concluded that the data were suitable for factor analysis.

TABLE I. ROTATED COMPONENT MATRIX AND RELIABILITY SCORES FOR FOOD WASTE AWARENESS.

Items for food waste awareness	Factor loading	Percentage of total variance explained	Cronbach's Alpha
31. I want to prevent food waste.	0.976		
30. I believe that food shortage may be prevented.	0.975		
25. Prevention of food waste may enable the access of everyone in the world to the water as much as they need.	0.974		
28. I'm thinking of hungry people when food is wasted.	0.974		
29. I think food waste is very widespread.	0.974		
27. I'm caring for the prevention of food waste.	0.974		
16. I think we may contribute the prevention of food shortage by preventing food waste.	0.974		
24. Prevention of food waste may enable the access of everyone in the world to the food as much as they need.	0.974		
23. I think the food prices are increasing due to food waste.	0.974		
26. There is nothing I can do for the prevention of food waste.	0.973		
21. I believe we may contribute to the budget of the individual and household by abstaining from food waste.	0.973		
22. I believe we may contribute to the reduction of operating costs by abstaining from food waste.	0.973		
18. Governmental institutions should make sufficient effort in order to prevent food waste.	0.972		
12. I think we may protect the water resources by preventing food waste.	0.971		
19. The relevant institutions should make sufficient effort in order to prevent food waste.	0.971	92.494	0.997
13. I believe the governments should make an effort in order to find a way out for food shortage.	0.970		
17. I believe we may protect the water resources by preventing food waste.	0.970		
14. I believe we have to make effort in order to prevent food waste.	0.970		
11. I think we may protect the natural resources in the world by preventing food waste.	0.969		
20. I believe we may contribute to the national economy by preventing food waste.	0.969		
15. I think we may contribute to the environmental protection by preventing food waste.	0.968		
10. I believe there is a relationship between food waste and environmental pollution.	0.965		
9. It is not possible to prevent food waste.	0.965		
3. Food waste should be prevented for the people who cannot find sufficient food to have access to food.	0.962		
4. I think more people will be affected by food shortage in the near future due to food waste.	0.960		
7. Global warming is a significant problem in terms of food shortage.	0.955		
6. I believe global warming will slow down if food waste is prevented.	0.954		
8. It is not possible to prevent food shortage.	0.952		
5. Food waste has no relevance to global warming.	0.947		
1. I believe world hunger may be resolved if food waste is prevented.	0.945		
2. I don't think there is a relationship between food waste and food shortage.	0.935		
32. I can't think that preventing food waste will have an economic effect.	0.800		

An exploratory factor analysis was performed to determine the construct validity of the scale of caring for the faults and omissions causing food waste

As observed in **table II**, the factor loadings for the scale on caring for faults and omissions causing food waste consisted of 16 expressions varying between 0.814 and 0.973. The factor's rate of explaining the total variance was calculated to be 88.471%. Moreover, as the Cronbach's Alpha coefficient was 0.991, it was concluded that the scale was highly reliable.

Participants

The questionnaire was administered to 979 chefs, 565 men (57.7%) and 414 women (42.3%), aged 25-40, working in hotel kitchens in Turkey. In terms of their positions in the kitchen, 28.2% of the participants were executive chefs, 46.0% were sous chefs, and 25.8% were chef de parties. The structured questionnaire was administered to chefs who agreed to participate in the study through a face-to-face interview in Turkish. The 1200 questionnaire forms applied in total were reduced to 979, and the remaining 1200 were excluded from the assessment.

TABLE II. ROTATED COMPONENT MATRIX AND RELIABILITY SCORES FOR CARING FOR THE FAULTS AND OMISSIONS CAUSING FOOD WASTE.

Items for caring for the faults and omissions causing food waste	Factor loading	Percentage of total variance explained	Cronbach's Alpha
2. Purchased food being of good quality	0.973		
11. Performance of faults during cooking in the kitchen	0.972		
7. Performance of faults during preparation in the kitchen	0.971		
12. Having high amount of products prepared for daily service	0.971		
13. Having high variety of products prepared for daily service	0.971		
10. Omissions of the kitchen staff	0.971		
8. Losses arising during sorting in the kitchen	0.967		
9. Losses arising during chopping in the kitchen	0.963		
6. Performance of faults during storage	0.962	88.471	0.991
4. Caring for the rotation in the storeroom	0.960		
3. Sufficiency of receipt checks	0.960		
5. Sufficiency of storeroom's physical conditions	0.958		
1. Performance of purchase planning	0.958		
16. Guests' receipt of high amount of products during self-service at open buffet	0.829		
15. Excessive order of the guests	0.822		
14. Large portion sizes	0.814		

Statistical analysis

The data analysis was performed with SPSS 26.0. In the study, scores on the food waste awareness scale and the scale of caring for the faults and omissions causing food waste were calculated, and the coefficients of kurtosis and skewness were examined to determine the compliance of the scores with a normal distribution (**Table III**).

When the values are examined, it is observed that the coefficients of kurtosis and skewness for each score, calculated for the food waste awareness scale and the scale of caring for the faults and omissions causing food waste, ranged from -3 to +3. Accordingly, it was concluded that the scores were showing normal distribution (Groeneveld and Meeden 1984, Moors 1986, Hopkins and Weeks 1990, De Carlo 1997). As the scores showed normal distribution, parametric test techniques were used in the study. Structural equation model was used to examine the direction and severity of the relationship between food waste awareness and caring for the faults and omissions causing food waste; t test was used to

analyze the difference of food waste awareness and caring for the faults and omissions causing food waste in terms of taking measures for the reduction of food waste; and analysis of variance (ANOVA) was used to analyze the difference of food waste awareness and caring for the faults and omissions causing food waste in terms of measures taken for the prevention of food waste.

RESULTS

Results of the descriptive analysis for the food waste awareness scale and the scale of caring for the faults and omissions causing food waste are shown in **table III**.

According to the analysis, the average food waste awareness score was 124.82 ± 35.91 . The minimum score that can be obtained is 32, and the maximum score is 160. Accordingly, it can be said that the chefs' awareness of food waste was high. The average score of caring for the faults and omissions causing food

TABLE III. DESCRIPTIVE STATISTICS (n = 979).

Scales	Minimum	Maximum	\bar{x} *	SD*	Skewness	Kurtosis
Food waste awareness	32.00	160.00	124.82	35.91	-1.056	0.015
Caring for the faults and omissions causing food waste	16.00	80.00	50.22	21.90	0.433	-1.652

* \bar{x} : Arithmetic mean, SD: Standard deviation.

TABLE V. RESULTS OF EFFECT REGARDING THE MODEL.

	Variables	Estimate	S.E.*	C.R.*	p
Food waste awareness	< --- Caring for the faults and omissions causing food waste	0.230	0.041	7.334	***

*S.E.: Standard error, **C.R.: Critical ratio.

***p < 0.001

the chefs' food waste awareness ensures their higher caring for the faults and omissions causing food waste ($p < 0.001$; **Fig. 1, Table V**).

Results of analysis regarding the difference of food waste awareness and caring for the faults and omissions causing food waste in terms of taking measures for the reduction of food waste at the restaurants are given in **table VI** and **table VII**.

It was determined that food waste awareness of the chefs who work at restaurants where measures were taken for the reduction of food waste was higher, compared to the ones who work at restaurants where measures were not taken for the same (132.32 ± 36.94 , 117.55 ± 33.94 , respectively), and that the difference was statistically significant ($p < 0.001$; **Table VI**).

In addition, there is a statistically significant relationship between the chefs' caring for faults and omissions that cause food waste and their taking measures to reduce food waste ($p < 0.001$).

Results of ANOVA performed for the analysis of the difference of food waste awareness and caring for the faults and omissions causing food waste in terms of measures taken for the prevention of food waste are given in **table VII**.

No statistically significant difference was found in food waste awareness or in measures taken to

prevent food waste ($p > 0.05$). While the ones specifying that all measures were taken at the restaurant for the prevention of food waste in terms of caring for the faults and omissions causing food waste had the highest average score (66.82 ± 19.28), effective planning of portion sizes and effective planning of production amounts and types had the lowest average score (55.09 ± 22.37 and 58.11 ± 22.77 , respectively). The difference was statistically significant ($p < 0.01$).

DISCUSSION

Waste, which is a significant sustainability problem considering the effect caused on operating income, public health, and the environment (Thyberg and Tonjes 2016, Wang et al. 2017), has critical importance for the hospitality sector, whose operations are disproportionately large and generate more waste as it grows (Ball and Taleb 2011, Massow and McAdams 2015). One type of waste in the hospitality sector is food waste (WRAP 2013), as tourists want to have a meal and like to experience a variety of foods. For that reason, the environmental damage of food supply cannot be easily reduced (Juvan et al. 2021). In this research, it was found that increased

TABLE VI. THE RELATIONSHIP BETWEEN FOOD WASTE AWARENESS AND CARING FOR THE FAULTS AND OMISSIONS CAUSING FOOD WASTE AND TAKING MEASURES FOR THE REDUCTION OF FOOD WASTE AT THE RESTAURANT.

Variables	Are there measures and practices in place to reduce food waste at the restaurant where you work?	n*	\bar{x} *	SD*	t*	p*
Food waste awareness	Yes	482	132.32	36.94	6.573	0.000***
	No	497	117.55	33.34		
Caring for the faults and omissions causing food waste	Yes	482	64.90	20.13	27.301	0.000***
	No	497	35.97	11.84		

*n: Frequency, \bar{x} : Arithmetic mean, SD: Standard deviation, t: Independent samples t tests, p: Significance.

***p < 0.001

TABLE VII. THE RELATIONSHIP BETWEEN FOOD WASTE AWARENESS AND CARING FOR THE FAULTS AND OMISSIONS CAUSING FOOD WASTE AND TAKING MEASURES FOR THE PREVENTION OF FOOD WASTE (n: 482).

Variables	If there are measures and operations for the reduction of food waste at the enterprise where you work, what are they?	n*	\bar{x} *	SD*	F*	p*
Food waste awareness	Effective purchase planning	26	130.58	36.42	0.500	0.736
	Effective storage planning	27	124.00	42.02		
	Effective planning of production, amount, and types	19	130.00	37.02		
	Effective planning of portion sizes	46	136.02	33.35		
	All	364	132.72	37.11		
Caring for the faults and omissions causing food waste	Effective purchase planning	26	60.38	21.14	4.556	0.001**
	Effective storage planning	27	64.96	19.39		
	Effective planning of production, amount, and types	19	58.11	22.77		
	Effective planning of portion sizes	46	55.09	22.37		
	All	364	66.82	19.28		

*n: Frequency, \bar{x} : Arithmetic mean, SD: Standard deviation, F: One - Way ANOVA, p: Significance.

**p < 0.01.

food waste awareness among kitchen chefs working in hotels is associated with greater care for faults and omissions that cause food waste (**Fig. 1, Table V**). Thus, kitchen staff's awareness of food waste affects the reduction of food waste caused by faults and omissions in restaurants. The study performed by Bhatti et al. (2023) also supports this finding. Training chefs and all individuals in society on the social, environmental, and financial effects of food waste will contribute to reducing food waste (Dolnicar and Juvan 2019). However, having the relationship at a very weak level may also be interpreted as indicating that they do not sufficiently care about reducing faults and omissions to prevent waste, even if they are aware of food waste (**Fig. 1, Table V**). Training chefs on both increasing food waste awareness and actions to prevent food waste may contribute more to reducing food waste. In fact, Dolnicar and Juvan (2019) and Tomaszewska et al. (2021) stated that personnel must be trained in reducing practices that cause waste and in the correct processing of food. Evidence shows that food waste can be minimized in hotels by increasing personnel's food waste awareness through training and communication, as they become more inclined to share this information with guests (Bohdanowicz 2006, WRAP 2013).

Studies on the importance of various operational practices for minimizing food waste in hotels indicated that untrained personnel may be less willing to participate in these practices. For that reason, the hotel industry should adopt new techniques and strategies to reduce food waste and understand the importance of staff training (Sealey and Smith 2014). In the present research, it was concluded that food waste may be reduced by increasing kitchen chefs' food waste awareness.

Moreover, the inclusion of executives in practices regarding food waste, along with kitchen chefs, and the development of enterprise policies regarding this issue are required to solve the problem (Kilibarda et al. 2019, Okumus 2019). Leverenz et al. (2021) determined that food waste at enterprises can be reduced through a food waste monitoring system that facilitates personal reporting in hotel enterprises. In line with the findings of this study, a relationship was found between taking measures to prevent food waste at enterprises and a high level of food waste awareness (**Table VI**). Again, the chefs' care for the faults and omissions that cause food waste is related to taking measures to reduce food waste. Among the strategies developed by the executives for the reduction of food waste at hotel enterprises, the training of

the personnel regarding food waste (Tomaszewska et al. 2021), the requirement for the training of the personnel regarding the usage and preparation of food for the reduction of food waste (Mabaso and Hewson 2018, Gandhi et al. 2019, Luu 2020), and the requirement for the awareness and caring for of the personnel regarding portion sizes for the reduction of food waste were emphasized. Thus, all initiatives implemented as business policy to prevent food waste will contribute to increasing staff awareness and fostering positive behavioral changes. Ultimately, less food waste will be possible.

CONCLUSIONS

Problems such as global warming, population growth, and urbanization impede the ability of current agricultural inputs to meet people's nutritional requirements. Thus, reducing food waste should be considered a significant objective for efficiently using current resources.

The present study finds that increased food waste awareness among chefs leads to greater care for the faults and omissions that cause food waste. Increasing personnel's awareness of food waste may help reduce it.

The chefs' food waste awareness and their care for the faults and omissions that cause food waste are related to measures to reduce food waste in enterprises. Thus, enterprises' attempts to reduce food waste will increase as personnel's awareness and consciousness grow. Moreover, the executives' policies regarding food waste will help reduce waste by increasing personnel's awareness and sensitivity.

The significant issues that require improvement in terms of the measures taken for the prevention of food waste are practical planning of production amounts and types, and effective planning of portion sizes. The waste of product ready for service (waste not served and/or waste of guests' plates) also means losses in terms of workforce and energy resources, along with food waste. Moreover, this implies a greater loss in terms of the profitability of the enterprise and the effective use of the world's resources.

The results of the present study may form a foresight for individual consumers as well as food and beverage enterprises. Thus, it can be a landmark for studies on the prevention of food waste. Moreover, the findings will also be helpful to academics working on food waste by contributing to the literature.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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