Gastroia: Journal of Gastronomy and Travel Research, Vol. 8, Issue 1, 2024, 32-48
Can Plate Waste be an Indicator of Customer Attitude and Behavior in Restaurants?

Sinecan ŞİMŞEK, Vedat YİĞİTOĞLU

CAN PLATE WASTE BE AN INDICATOR OF CUSTOMER ATTITUDE AND BEHAVIOUR IN RESTAURANTS?

[i] Sinecan ŞİMŞEK

[ii] Vedat YİĞİTOĞLU

Journal of Gastronomy and Travel Research

GASTROIA

ABSTRACT

This research aims to reveal the amount of plate waste in restaurants and determine the relationship between plate waste and perception of food quality, restaurant satisfaction, and customers' behavioral intentions. Research data was collected through an online questionnaire in April 2020 in Turkey. At the end of the research, It was determined that customers left more plate waste in pastry products than meat and vegetable. In addition, it was revealed that customers' perception of food quality and restaurant satisfaction affect the level of plate waste. The findings also showed that plate waste has a lower effect on the customers' behavioral intentions. The findings of this study indicated that plate waste is an important variable that can be used to understand and evaluate customer behavior in restaurant businesses.

Keywords: Fusion kitchen, culinary culture, eat

Received 15.06.2023
Accepted 31.12.2023

[i] sinecancerrah@beykent.edu.tr
[ii] vedatyigitoglu@akdeniz.edu.tr

10.32958/gastoria.1315044

INTRODUCTION

Food service businesses are one of the most important sources of food waste. The findings of Kranert et al. (2012) conducted in Germany showed that the foodservice industry is the second-largest producer of food waste after households with 17% (Betz et al. 2015). Similar results are obtained in tourism. The studies indicated that hotels, restaurants, and other food and beverage businesses handle a significant 14% of the food waste generated throughout the European Union (BIO Intelligence Service 2010).

Food waste can occur in different stages, such as purchasing, receiving, storage, preparation, production, and consumption. In this context, research, especially in developed countries, shows that most of the waste in restaurant establishments is composed of consumption or plate waste. Indeed, Silvennoinen et al. (2015) showed that 50% of the food waste in restaurant establishments comprises plate or consumption waste while 30% is originated from kitchen scraps and the remaining 20% is service waste. In another study conducted within the hospitality and food service, it was determined that 21% of the food waste occurred in the spoilage, 45% in the preparation, and the remaining 34% in the consumption phase (WRAP, 2013).

Food waste on the plate left by customers represents some clues about customers' dining experiences and business operations. For instance, food waste during the consumption phase can result from incorrect planning, changing consumer preferences, inappropriate materials or menus, and inadequate personnel performance (Ferreira et al. 2013). The research conducted by Yiğitoğlu (2020) in a luxury restaurant business indicated that the amount of plate waste could be included in the menu analysis process as a variable that reflects the customer's opinion. Customers dissatisfied with their dining experience are expected to be more likely to leave waste on their plates. In this context, Massow and Mcadams (2015) argue that food not consumed by restaurant customers can indicate dissatisfaction. Above all, the reduction of plate waste also contributes to operating profitability. Recycling or disposal of the resulting waste also has a considerable cost, exceeding 3% of the total restaurant cost (WRAP, 2013).

Plate waste has the highest potential for reducing food waste at the general and business level. According to some studies, most plate waste make up avoidable waste (Kummu et al. 2012; Betz et al. 2015). However, the literature reflects that most of the studies focus on corporate foodservice establishments in hospitals and schools (Williams and Walton 2011; Ferreira et al. 2013; Liz Martins et al. 2014) as well as food and beverage businesses in the tourism sector, especially restaurant businesses, are limited (WRAP, 2013; Massow and Mcadams 2015; Silvennoinen et al. 2015). Furthermore, the studies conducted in tourism focus on determining the waste level and the sources of the plate waste. In contrast, the customers' behaviours regarding food waste remain in the background (Stancu et al. 2016). Possible relationships between plate waste and customer attitudes and behaviours may cause businesses to pay more attention to this issue. Thus, it would reduce the negative effects of plate waste and thus food waste. In this context, it is considered that there is still a gap in practical studies on the relationship between plate waste and customer behaviours.

CONCEPTUAL FRAMEWORK

Plate waste

Food waste can occur in different stages such as storing, preparation, cooking, service, and consumption in businesses. On the other hand, plate waste includes food served in food and beverage establishments but not consumed for some reason (Kuo and Shih 2016). However, in the tourism literature, it is described differently depending on the type of business and service. For example, Silvennoinen et al. (2015) determined it as the leftovers from the food served with à la carte service in restaurants.

It is possible to mention two perspectives on the conceptualization of plate waste in food businesses. First, when evaluated in terms of social responsibility, it is a subject that should be prevented first-hand since it includes the evaluation of unavoidable waste. When evaluated from the business perspective, the waste reflects the customers' perceptions towards the business itself. In this context, it is possible to evaluate it as one of the essential indicators of the activities, especially in the foodservice businesses.

Excessive plate waste reflects operational deficiencies, such as undesirable quality food, wrong portion sizes, or menu inefficiency (Ferreira et al. 2013). Connors and Rozell (2004) consider it one factor to determine how much food on the menu is preferred. Indeed, such a case is tough to predict or control since it includes consumers' preferences and their relationships with food. For this reason, preventing waste in a business refers to increasing profitability by reducing raw material and workforce losses. At the same time, the sustainability of quality in the business needs to understand why the customers do not consume some food to determine the source of the problem.

The relationship between plate waste and the perception of food quality

Food quality is the most critical component of a dining experience since food is at the centre of the services offered by restaurant businesses (Ryu and Han 2010). Despite that, a consensus has not been reached yet on the qualities that make up the food quality. On the other hand, six basic dimensions come to the fore in food quality perception; presentation, taste, freshness, temperature, healthy options on the menu, and the diversity of the menu (Kivela et. al. 1999; Namkung and Jang 2007). Businesses also value food quality to meet the expectations and customers' requests. According to studies conducted in the literature, the consumption rate is considered an essential factor reflecting food performance or quality perception (Ferreira et al. 2013; Massow and Mcadams 2015). Therefore, the amount of waste left on the plate is expected to be less since food with a taste, texture, pleasant smell and appearance, and affordable prices are consumed more. In this context, the following hypotheses have been developed.

H1: Customers' perception of the food quality affects the amount of waste on the plate.
H1a: Customers' perception of the food quality affects the amount of meat waste on the plate.
H1b: Customers' perception of the food quality affects the amount of pastry waste on the plate.
H1c: Customers' perception of the food quality affects the amount of vegetable waste on the plate.

The relationship between plate waste and restaurant satisfaction

Satisfaction of customers with a restaurant is indicated as a holistic comparison of tangible and intangible components by customers with subjective evaluations (Sulek and Hensley 2004). It is a general evaluation by customers after purchasing a product or service (Anderson et al. 1994). Even the customer is satisfied with the food, and they may not be satisfied with the price, the speed of service, or the atmosphere of the business. However, the customer can state that they are satisfied while evaluating the restaurant. It is a fact that satisfied customers are the basis for making profits, standing out in a competitive environment, and creating value for businesses in the service sector (Kivela et al. 1999). For restaurants, satisfaction is important for determining their performance and evaluating service quality (Gupta et al, 2007).

Plate waste can also be considered a sign of customer behaviour in this context. Indeed, Ferreira et al. (2013) state that low plate waste levels could be associated with high customer satisfaction. Furthermore, Yiğitoğlu (2020) also associated plate waste with customer satisfaction in the expectation-disconfirmation theory. Based on this information, there was a significant relationship between plate waste and customer satisfaction. Considering these issues, the following hypotheses were formed.

H2: Customer satisfaction affects the amount of plate waste.
H2a: Customer satisfaction affects the amount of meat waste on the plate.
H2b: Customer satisfaction affects the amount of pastry waste on the plate.
H2c: Customer satisfaction affects the amount of vegetable waste on the plate.

The relationship between plate waste and behavioural intention

Research on customer satisfaction reveals a positive and significant relationship between satisfaction and behavioural intentions. Satisfied customers exhibit positive attitudes and behaviours, while unsatisfied ones represent the opposite: adverse reactions (Kivela et al. 1999; Ryu and Han 2010). Furthermore, customers exhibit different behaviours (return, recommendation, loyalty, pay more, complaint). The revisit intention and advice are at the forefront.

Food, the basic product for restaurant businesses, also significantly affects behavioural intentions, such as satisfaction (Kim et al. 2013). For this reason, there might be a significant relationship between food consumption or waste and the customers' behavioural intentions. For this reason, the following hypotheses were established regarding this issue.

H3: Plate waste affects customers' behavioural intentions.
H3a: The amount of meat waste on the plate affects customers' behavioural intentions.
H3b: The amount of pastry waste on the plate affects customers' behavioural intentions.
H3c: The amount of vegetable waste on the plate affects customers' behavioural intentions.

Considering the dining experience in a restaurant business, the significant component that affects customer satisfaction compared to service and atmosphere elements is the quality of the food (Prayag et al. 2015) since the behavioural intention is accepted as an indicator of customer satisfaction (Ryu and Han 2010). Therefore, if the customer is satisfied, they are more likely to return to the restaurant,

make positive statements, and recommend it. In this context, the following hypotheses are established.

H4: Perception of the food quality affects customer satisfaction.
H5: Perception of food quality affects behavioural intentions.
H6: Customer satisfaction affects behavioural intentions.

The research model provided in Figure 1 is formed considering the determined hypotheses. According to this model, the plate waste of customers differs according to their demographic characteristics and dining experiences. In addition, perception of the food quality and customer satisfaction is associated with plate waste, which affects the customers' behavioural intentions. In addition, perception of the food quality penetrates customer satisfaction while it triggers behavioural purposes.

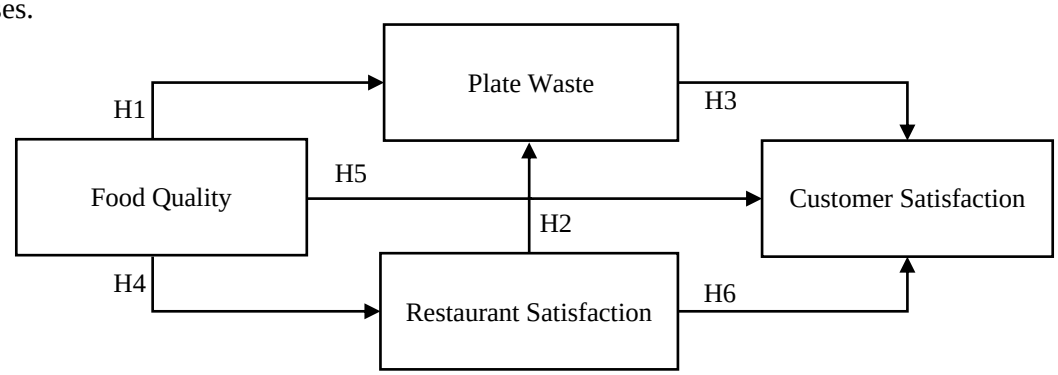

Figure 1. The Research Framework

Methodology

The research population comprises adults who have experienced food service in a restaurant in Turkey. Considering the limited time and limitations experienced because of COVID-19, convenience and snowball sampling methods were used together in this study.

After examining the studies on plate waste, three different methods, physical measurement by weighing, a subjective measure, and observation with a questionnaire or visual measurement using a camera, are considered in the waste determination process (Connors and Rozell 2004; Williams and Walton 2011). The survey method comes to the fore in studies conducted with a larger sample in less time. The questionnaire form was used due to both the large sample size and the suspension of the activities of all food and beverage businesses across the country due to COVID-19. Similarly, in a study conducted by Hamerman and Martins (2018) in the USA, plate waste was revealed by a questionnaire. The participants are assumed to have difficulty remembering their last meal experience because the data collection process started a few days after restaurant businesses shut down. So, food options were limited in the questionnaire, while three basic food types were considered to facilitate recall. The first option was meat products, including meat, chicken, fish, and kebab. The second was pastry products covering many foods such as pita, pizza, and lahmacun, while the third was vegetable products. In another study in Sweden by Engström and Carlsson-Kanyama (2004), foods were similarly evaluated in three categories of meat-fish, vegetables, and starchy products (such as pasta, potatoes, and rice).

In the literature, some scales have different intervals developed for measuring the amount of plate waste by visual methods. Among these, the most used one is 6 points scale (all left, one bite taken, 3/4 left, 1/2 left, 1/4 left, and none left) developed by Comstock et al. (1981) (Williams and Walton 2011). In addition, the Comstock measurement scale has been used in various forms and percentage

statements in different studies. For example, in the study performed in a restaurant, the average amount of plate waste was determined to be between 4-8% (Papargyropoulou et al. 2016). Besides, in another study conducted by Massow and Mcadams (2015) in a university student restaurant using the weighing method, the average plate waste was determined as 11%. For this reason, it is more appropriate to prefer the scales with the most distinctive features in the studies performed in the restaurant. As provided in Table 1, the expressions of the scale points are presented with percentages and a simple pie chart to make it easier to understand.

Three different scales, as a perception of the food quality, restaurant satisfaction, and customers' behavioural intentions, were used in the study. The perception of the food quality scale was adapted from the study by Jang and Namkung (2009), considering the four-item scale. In addition, the three-item scale was used mentioned by Namkung and Jang (2007) to determine restaurant satisfaction. Finally, Zeithaml et al. (1996) obtained the behavioural intention scale with three items. The statements in all three scales were presented as a 5-point Likert scale (1: Totally disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Totally agree).

Table 1. The Plate Waste Determination Scale

	1	**2**	**3**	**4**	**5**	**6**	**7**
Expressions	Never left	One bite left	Very few left	Few left	Half left	Most left	All left
Percentage of Waste	0%	5%	10%	25%	50%	75%	100%
Visual Expression							

The survey application was carried out online because of the COVID-19 pandemic period. For this reason, the questionnaire, which was first formed in the Google Forms environment, was submitted for evaluation by 3 academicians and 2 practitioners who are experts in food services. The questionnaire form, which was revised according to the evaluations, was then sent to 50 participants online and subjected to a pilot test. Afterwards, the final survey application was carried out in April 2020. Participants of the research were reached by using convenience and snowball sampling methods. At the end of the application, 573 questionnaires were collected. The forms of the participants under the age of 18 were eliminated so that a total of 565 valid questionnaires were gathered for the study.

To determine the analysis techniques, the normal distribution of the scale data was examined as the first step. Then, the skewness and kurtosis values were checked for the normality tests. At the end of the analysis performed for three food groups (meat, pastry, and vegetables) and three scales, the skewness values are obtained to vary between -1.010 and +1.988, while the kurtosis value values ranged from -.183 to 3.975. These results indicate that the research data follows a normal distribution (Kline, 2011). For this reason, parametric test techniques and the test of the hypotheses were used in data analysis. Next, the obtained data were analyzed using descriptive statistics, difference tests, and correlation analysis. In this context, frequencies, percentages, means, and standard deviations related to the demographic characteristics and experiences of the participants were revealed. Then, the reliability and validity tests of the scales were performed. Finally, correlation and regression analysis were also used to test the research hypotheses.

FINDINGS

The demographic characteristics of the participants are provided in Table 2, where 565 adult participants were included in the analysis. The gender distribution of the participants shows that the number of men and women were close to each other. On the other hand, most participants are married (about 60%) and aged between 36-55 (55%). Besides, the educational status of the participants shows that most of them have a university degree (approximately 74%) and have a monthly income of 5,000 TL or less (53%).

Before testing the research hypotheses, reliability and validity tests of the scales were conducted. The reliability coefficient of the food quality scale was determined as α=0.798, while the restaurant satisfaction scale was α=914, and it was α=0.947 for the behavioural intention scale. The obtained values showed that the scales are highly reliable (Hair et al., 2010). In addition, explanatory factor analysis (EFA) was performed separately for the construct validity of each scale used in the study. According to the EFA results, each of the three rankings is collected in a one-factor dimension. The item loads of the expressions measuring the food quality dimension were between 0.740 and 0.845, while it was between 0.897 and 0.943 for the restaurant satisfaction dimension and between 0.944 and 0.958 for the items measuring the behavioural intention dimension.

Table 2. The Demographic Characteristics of the Participants

		f	**%**
Gender (n=560)	Female	273	48.75
	Male	287	51.25
Marital status (n=560)	Single	222	39.64
	Married	338	60.36
Age (n= 557)	18-25	104	18.67
	26-35	114	20.47
	36-45	169	30.34
	46-55	137	24.60
	56+	33	5.92
Education (n=563)	Elementary	23	4.09
	High school	122	21.67
	Associate degree	57	10.12
	Undergraduate	290	51.51
	Postgraduate	71	12.61
Income (n=550)	2500 ₺ and less	118	21.45
	2501-5000 ₺	173	31.45
	5001-7500 ₺	152	27.64
	7501-10000 ₺	69	12.55

	10001 ₺ and more	38	6.91

* The Currency is the Turkish Lira. 1 TL is approximately $0,15 during the data collection process.

In the study, primary meal plate waste was determined based on food groups. As mentioned before, only the primary three food groups were considered for participants to remember them easily. The participants were asked about the food waste in groups they left on the main course plate. The mean of the plate waste amount in the main dish is listed in Table 3. The results show that each group has a different frequency while the frequency totals are higher than the number of questionnaires. This is because a consumer's main course plate is included in one or more food groups. For example, if the customer's main meal is Dürüm, they may have left food for the meat and the pastry group. On the other hand, if it was a hamburger, the vegetable along with meat and pastry might be left on the plate.

The minimum and maximum values of the relevant plate waste are also examined where the minimum value (1) refers to that no plate waste was left on the plate. In contrast, the maximum value (7) indicates that the entire plate waste was gone. As provided in Table 3, the lowest amount of plate waste was in products such as meat, chicken, and fish ($\bar{x}$=1.68). On the other hand, it was determined that the plate waste amount in pastry products was at the highest level ($\bar{x}$=2.13). Similarly, Silvennoinen et al. (2015) considered 51 different food business samples in Finland and determined that pastry foods' leftovers were more than the plate waste of meat products. In another study by Connors and Rozell (2004), five different food groups were evaluated in a hospital except for meat products. This study determined that pastry products waste (such as bread) and vegetable waste were close to each other without meat products. The findings of this study are in parallel with the results obtained from these studies.

Table 3. Customers' Plate Waste by Food Type

	f	**Minimum**	**Maximum**	**Mean**	**S. D.**
Meat waste	503	1.00	7.00	1.68	1.21
Pastry waste	407	1.00	7.00	2.13	1.55
Vegetable waste	481	1.00	7.00	2.07	1.46

Pearson Correlation Analysis was applied to examine the relationship between the variables in the research model (Table 4). The analysis was carried out for three food types meat, pastry, and vegetable products. The results show that there is a significant negative relationship between meat waste and food quality, customer satisfaction and behavioural intentions. As in meat products, there is a low-level negative significant relationship between plate waste of vegetable products and food quality, customer satisfaction, and behavioural intentions. In terms of pastry food, there is no statistically significant relationship between the plate waste and the food quality, restaurant satisfaction, and behavioural intention ($p>.05$). Such a lower relationship can be explained by the close service standards offered in restaurants. Most of the businesses that have pastries on the main course, such as pita, lahmacun, pizza and hamburger, operate as chain and fast-food restaurants. For this reason, the services reflected by the customers in the relevant businesses may represent similar characteristics compared to other businesses. On the other hand, the effect of pastry on customers' perception of food quality and satisfaction level may vary depending on whether the pastry is the

major product or a by-product. So, other types of food can be effective in the relevant evaluations. Accordingly, there is a positive and significant relationship between food quality perception, satisfaction, and behavioural intention in all three food types.

Table 4. The Results of the Correlation Analysis of the Variables

	Food Type	**Food quality**	**Satisfaction**	**Behavioural Intention**
	Meat			
Meat waste	1			
Food quality	-.251**	1		
Restaurant Satisfaction	-.212**	.759**	1	
Behavioural intention	-.226**	.722**	.890**	1
	Pastry			
Pastry waste	1			
Food quality	-.016	1		
Restaurant Satisfaction	-.064	.770**	1	
Behavioural intention	-.036	.733**	.898**	1
	Vegetable			
Vegetable waste	1			
Food quality	-.162**	1		
Restaurant Satisfaction	-.165**	.767**	1	
Behavioural intention	-.158**	.732**	.891**	1

** Correlation is significant at the 0.05 level (two-tailed)

According to the results of the correlation analysis, no significant relationship was determined between pastry waste and other variables. For this reason, regression analysis was performed only for meat and vegetable waste. The results show that the regression models determining the effect of food quality perception on plate waste are significant for both meat and vegetable waste. The findings indicate that the food quality perception of restaurant customers significantly affects the meat and vegetable waste on the plate (Table 5). Considering the R^2 values, 6.3% of the variation in plate waste of meat products is explained by the perception of food quality. In vegetable waste, the same parameter is decreased to 2.6%. The findings indicate that perception of food quality is more effective on meat waste than on vegetable waste. ***Therefore, such a result supports the H1a and H1c hypotheses.***

Table 5. The Effect of Food Quality Perception and Restaurant Satisfaction on Plate Waste

	Non-standardized Coefficients		**Standardized Coefficients**	t	p
	β	Standard Deviation	β		
(Constant)	3.286	.281		11.688	.000

Food quality perception	-.401	.069	-.251	-5.800	.000
Dependent variable: Meat waste R: 0.251; R²: 0.063; Adjusted R²: 0.061; D-W: 1.943; F-statistic: 33.641; p<.001					
(Constant)	3.357	.363		9.258	.000
Food quality perception	-.317	.088	-.162	-3.602	.000
Dependent variable: Vegetable waste R: 0.162; R²: 0.026; Adjusted R²: 0.024; D-W: 1.936; F-statistic: 12.972; p<.001					
(Constant)	2.945	.265		11.098	.000
Restaurant satisfaction	-.309	.064	-.212	-4.850	.000
Dependent variable: Meat waste R: 0.212; R²: 0.045; Adjusted R²: 0.043; D-W: 1.956; F-statistic: 23.518; p<.001					
(Constant)	3.284	.336		9.759	.000
Restaurant satisfaction	-.294	.080	-.165	-3.670	.000
Dependent variable: Vegetable waste R: 0.165; R²: 0.027; Adjusted R²: 0.025; D-W: 1.924; F-statistic: 13.472; p<.001					

According to the regression analysis findings performed to determine the effect of satisfaction on plate waste, the model is significant for meat and vegetable waste. Satisfaction has a negative and significant impact on plate waste. The level of this effect considering the results 4.5% for meat waste and 2.7% for vegetable waste. In other words, the decrease in restaurant satisfaction significantly increases the plate waste of meat and vegetable, even just a tad. According to these results, as in the perception of food quality, restaurant satisfaction affects more meat waste in plates than vegetables. ***In this context, the results confirmed H2a and H2c hypotheses.***

The results show that the regression model is significant for meat and vegetable waste (Table 6). Besides, they negatively affect the behavioural intentions of customers. According to the results, 5.2% of the variation in behavioural intentions of customers is explained by the amount of meat waste, while it is 2.5% for vegetable waste. Therefore, the amount of plate waste is a significant indicator of customers' behavioural intentions. ***So, the results support the H3a and H3c hypotheses.***

Table 6. The Effect of Plate Waste on Behavioural Intention

	Non-standardized Coefficients		**Standardized Coefficients**	t	p
	β	Standard Deviation	β		
(Constant)	4.400	.068		65.150	.000
Meat waste	-.169	.033	-.226	-5.195	.000
Dependent variable: Behavioural Intention R: 0.226; R²: 0.051; Adjusted R²: 0.049; D-W: 2.035; F-statistic: 26.992; p<.001					
(Constant)	4.355	.070		62.499	.000
Vegetable waste	-.096	.027	-.158	-3.492	.001
Dependent variable: Behavioural Intention R: 0.168; R²: 0.025; Adjusted R²: 0.023; D-W: 1.913; F-statistic: 12.192; p<.005					

The results obtained in the correlation and regression analysis revealed that meat waste in the plate is a factor that can reflect customer perceptions and behaviours. However, it is crucial to state that a more robust relationship can be reached by considering a sample of certain menu items in the business. Meat products are one of the most important types of food, not only for the types of restaurants that serve meat, fish, chicken, or kebab but also for other restaurants. In a study by Birdir and Kale (2014), 92 restaurant businesses were asked about the kind of food they serve. The results showed that approximately 95% offer meat products. For this reason, from the customers' point of view, meats are one of the most preferred food types in a restaurant business as they reflect the product/value perception most. For this reason, the effect of meat products offered in businesses on business performance may be more pronounced.

In vegetable waste, the relationship between customer perceptions and behavioural intentions is relatively lower than meat. From this point of view, vegetable waste is determined to be a minor determinant in reflecting customer perceptions and behavioural preferences than meat waste. On the other hand, vegetables are the main product for vegetarians. Therefore, businesses can also include vegetable products in their menus to meet the demands of vegetarians for various reasons like health and environmental concerns. However, vegetables can be served directly as the main course but are often used as a side dish or side product alongside other types of food. Therefore, the plate waste generated in vegetable products should be evaluated separately as the main course and side dish.

The regression analysis results performed to test the effect of food quality perception on customer satisfaction are provided in Table 7. The analysis results showed that the model is significant (F: 750.979; p<.001). Furthermore, the model reveals that 57.2% of the variation in customer satisfaction, the dependent variable, is explained by the perception of food quality. ***For this reason, the results confirm hypothesis H4.***

The results in the same Table also indicate that the regression analysis regarding the effect of food quality perception on behavioural intention represents a significant model (F: 614,742; p<.001) while the food quality perception can predict 52% of the variation in the behavioural intention of the customers. According to the analysis results, the perception of food quality has a positive and robust effect on behavioural intention. In other words, customers' perception of food quality positively affects their behavioural intention. ***Therefore, the research model results support the H5 hypothesis.***

Customers' behavioural preferences were considered the dependent variable to analyze the relationship between customer satisfaction and behavioural intentions, while customer satisfaction was used as the independent variable. The results indicated that the model is significant (F: 2197.791; p<.001) while customer satisfaction variation can be explained by approximately 80% of the variation in customers' behavioural intentions. Customer satisfaction is determined to be a strong predictor of behavioural purposes. ***For this reason, the findings support hypothesis H6.***

Table 7. Results of the Regression Analysis

	Non-standardized Coefficients		Standardized Coefficients	t	p
	β	Standard Deviation	β		
(Constant)	.809	.122		6.616	.000
Food quality perception	.824	.030	.756	27.404	.000
Dependent variable: Satisfaction R: 0.756; R^2: 0.572; Adjusted R^2: 0.571; D-W: 1.920; F-statistic: 750.979; p<.001					
(Constant)	.712	.140		5.067	.000
Food quality perception	.856	.035	.722	24.794	.000
Dependent variable: Behavioural Intention R: 0.722; R^2: 0.522; Adjusted R^2: 0.521; D-W: 2.040; F-statistic: 614.742; p<.001					
(Constant)	.154	.087		1.776	.076
Satisfaction	.970	.021	.892	46.881	.000
Dependent variable: Behavioural Intention R: 0.892; R^2: 0.796; Adjusted R^2: 0.796; D-W: 2.028; F-statistic: 2197.791; p<.000					

According to the analyses performed concerning the last three hypotheses of the research, the restaurant satisfaction and behavioural intentions of the customers also increase as the perception of food quality increases. There are many studies in the literature supporting similar results. For example, in the study by Ha and Jang (2010), a positive 69% relationship was determined between customer satisfaction and behavioural intentions. Ryu and Han (2010) looked at the effect of three independent variables (perception of food, service, and atmosphere quality) on satisfaction as the dependent variable. Of these three independent variables, it was determined that the perception of food quality had the highest effect on satisfaction. Within the same study, satisfaction on behavioural intention was also examined, where a 65.9% relationship was obtained. Finally, in another study by Namkung and Jang (2007), it was revealed that the perception of food quality is one of the most important variables affecting customer satisfaction.

CONCLUSION

Conclusion

The aim of the research is to explore reveal the amount of plate waste in restaurants and determine the relationship between plate waste and perception of the food quality, restaurant satisfaction, and behavioural intentions of the customers. So, the researchers determined the number of plate waste of customers who had a dining experience in a restaurant business. Then, the plate waste relation to customer perceptions and behaviours are examined. The mean plate waste was determined to be the lowest in meat products ($\bar{x}$=1.68) and vegetable products ($\bar{x}$=2.07), while it was the highest in pastry products ($\bar{x}$=2.13). Considering the percentage equivalents of these averages in the scale, it was obtained that plate residues in restaurant businesses are generally close to 5%. Vaz (2006) argued that up to 3% of plate waste was acceptable in restaurants. He also suggested that special attention be paid to waste exceeding these levels. However, the amount of plate waste may vary from enterprise to enterprise.

For this reason, the amount of waste considered normal in one business can be a sign of severe problems for the other. For example, in a luxury restaurant, the amount of plate waste at 1% may be considered high. At the same time, it may be regarded as a standard or even desired amount in a

casual restaurant. It is more accurate for each business to determine an acceptable amount of plate waste taking its purposes and goals into account.

The findings reveal that the perception of food quality and customer satisfaction affects the amount of plate waste. At the same time, plate waste reflects the customers' behavioural intentions. Accordingly, customers who find the quality of the food higher and have a higher level of satisfaction tend to leave less plate waste in the relevant businesses. This result indicates that restaurant managers who want to improve customer attitude and behaviour can consider food waste a vital variable. The study also revealed that perception of food quality is an important variable that can refer to customer satisfaction and behavioural intention. According to these results, every activity to improve food quality in restaurant businesses would improve customer satisfaction and behavioural purposes and increase restaurant profitability by reducing food waste level's scope of the win-win principle.

On the other hand, the significant relationship between plate waste and restaurant satisfaction shows that customer satisfaction can be monitored indirectly. A similar case applies to the customers' behavioural intentions as well. The low level of plate waste of customers, who perceive the food as good quality and are satisfied with the restaurant, has a significant effect on the positive behavioural intentions of customers, such as repeating and recommending.

Theoretical and practical implications

Plate waste has been subjectively evaluated or ignored in previous studies. This paper revealed that plate waste could be used as an essential performance indicator in the success of food service businesses. Also, the study is one of the limited studies that reveal the relationship between the plate waste of the guests and their attitudes and behaviours. Foodservice businesses can find the opportunity to improve their menu items by observing the plate waste. So, the production of undesirable foods could be avoided by adjusting the menu. In this context, considering plate waste as a performance indicator have multi-faceted contributions for businesses.

With this study, the importance of establishing a recording, control and observing system for plate waste has emerged. First, considering the production processes, it is necessary to act in a planned manner at the purchasing stage to prevent waste and make continuous storage controls to prevent waste during the purchasing phase. This way may allow the foods that are not consumed but have in the production and service processes to be identified.

Some aspects of food quality (such as temperature) that cause plate waste are related to the serving process. The kitchen and service personnel have a significant share in ensuring the food quality, so they need to cooperate. Therefore, it is essential to train the employees and use various rewarding and performance evaluation systems in the enterprises.

Environmental factors are influential in food waste. In this perspective, anti-waste or environmentalist posters and information materials could be considered essential for customers to be sensitive to waste. In cases where food waste cannot be avoided, the evaluation of waste comes to the fore. Therefore, the customers could use incentive approaches such as packaging and providing gift certificates to attract them to revisit the restaurants. In addition, the waste can be donated to the companies and organizations that collect the food waste. Finally, practitioners can make plans for managing food waste by using technology and scientific studies. The prevention, control, and evaluation of food waste are among the primary responsibilities of local and central governments. The relevant administrations should support commercial enterprises providing food services to prevent food waste in this context. At this point, legal regulations could be adapted for the plate or portion size.

Limitations and future research

One of the limitations is the data collection style, an online survey but not a face-to-face interview. It was emerged as a necessity due to the COVID-19. Plate waste information was handled based on three major food groups to eliminate the adverse effects. So, it is also essential to collect plate waste data by weighing or visual recording methods and obtain customer attitudes and behaviours through face-to-face surveys to get more reliable results in a future study. Another limitation is the evaluation of leftovers based on limited food groups, not specific menu items. Studies to be carried out in a single business sample and within the scope of certain menu items can provide more meaningful results as a case study. The factors causing plate waste were ignored in this study. Studies performed in this regard would significantly contribute to preventing and reducing plate waste.

It is impossible to completely prevent food waste in food services since plate waste can occur in various conditions and stages, even if precautions are taken. Along these lines, studies can be performed to examine how food or plate waste would be evaluated. In addition, in future studies, restaurant satisfaction can be handled more comprehensively in three dimensions as food, service and atmosphere satisfaction. Lastly, some studies can be conducted to determine the opinions of the parties receiving and providing services about food waste in different types of businesses such as school, hospital, hotel, and restaurant.

REFERENCES

Almohaimmeed, B. M. A. (2017). Restaurant quality and customer satisfaction, *International Review of Management and Marketing, 7*(3), 42–49.

Anderson, E. W., Fornell, C. and Lehmann, D. R. (1994). Customer satisfaction, market share and profitability: Findings from Sweden, *Journal of Marketing, 58*(3), 53–66. https://doi.org/10.1177/002224299405800304

Betz, A., Buchli, J., Göbel, C. and Müller, C. (2015). Food waste in the Swiss food service industry - magnitude and potential for reduction, *Waste Management, 35*, 218–226. https://doi.org/10.1016/j.wasman.2014.09.015

BIO Intelligence Service (2010). Preparatory study on food waste across eu 27. Paris, France. Retrieved from https://ec.europa.eu/environment/eussd/pdf/bio_foodwaste_report.pdf (accessed 15 February 2020).

Birdir, S. S. and Kale, E. Y. (2014). Restoran işletmelerinde yenilik uygulamaları: Mersin ve Adana örneği, *Seyahat ve Otel İşletmeciliği Dergisi*, *11*(3), 57–72.

Comstock, E. M., St Pierre, R. and Mackiernan, Y. D. (1981). Measuring individual plate waste in school lunches. Visual estimation and children's ratings vs actual weighing of plate waste, *Journal of the American Dietetic Association*, *79*(3,) 290–296.

Connors, P. L. and Rozell, S. B. (2004). Using a visual plate waste study to monitor menu performance, *Journal of the American Dietetic Association*, *104*(1), 94–96. https://doi.org/10.1016/j.jada.2003.10.01294

Engström, R. and Carlsson-Kanyama, A. (2004). Food losses in food service institutions examples from Sweden, *Food Policy*, *29*(3), 203–213. https://doi.org/10.1016/j.foodpol.2004.03.004

Ferreira, M., Liz Martins, M. and Rocha, A. (2013). Food waste as an index of foodservice quality, *British Food Journal, 115*, (11), 1628–1637. https://doi.org/10.1108/BFJ-03-2012-0051

Gupta, S., McLaughlin, E. and Gomez, M. (2007). Guest satisfaction and restaurant performance, *Cornell Hotel and Restaurant Administration Quarterly*, *48*(3), 284–298. https://doi.org/10.1177/0010880407301735

Ha, J. and Jang, S. C. (2010) Perceived values, satisfaction, and behavioural intentions: The role of familiarity in Korean restaurants, *International Journal of Hospitality Management, 29*(1), 2–13. https://doi.org/10.1016/j.ijhm.2009.03.009

Hair, J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2010). *Multivariate data analysis: A Global Perspective.* Upper Saddle River: Pearson.

Hamerman, E. J. and Martins, C. M. (2018). Factors that predict taking restaurant leftovers: Strategies for reducing food waste, *Journal of Consumer Behavior*, *17*(94), 94–104. https://doi.org/10.1002/cb.1700

Jang, S. C. and Namkung, Y. (2009). Perceived quality, emotions, and behavioural intentions: Application of an extended Mehrabian-Russell model to restaurants, *Journal of Business Research, 62*(4), 451–460. https://doi.org/10.1016/j.jbusres.2008.01.038

Kim, H., Park, J. Kim, M. and Ryu, K. (2013). Does perceive restaurant food healthiness matter? Its influence on value, satisfaction and revisit intentions in restaurant operations in South Korea, *International Journal of Hospitality Management*, *33*(1), 397–405. https://doi.org/10.1016/j.ijhm.2012.10.010

Kivela, J., Inbakaran, R. and Reece, J. (1999). Consumer research in the restaurant environment, Part 1 : A conceptual model of dining satisfaction and return patronage, *International Journal of Contemporary Hospitality Management, 11*(5), 205–222. https://doi.org/10.1108/09596119910272739

Kline, R. B. (2011). *Principles and practice of structural equation modeling.* The Guilford Press.

Kranert, M., Hafner, G., Barabosz, J., Schneider, F., Lebersorger, S., Scherhaufer S., Schuller, H. and Leverenz, D. (2012). *Ermittlung der weggeworfenen lebensmittelmengen und vorschläge zur verminderung der wegwerfrate bei lebensmitteln in Deutschland*. Studie der Universität Stuttgart, Germany.

Kummu, M., Moel, H., Porkka, M., Siebert, S. Varis, O. and Ward, P.J. (2012). Lost food, wasted resources: Global food supply chain losses and their impacts on freshwater, cropland, and fertilizer use, *Science of the Total Environment*, *438*, 477–489. https://doi.org/10.1016/j.scitotenv.2012.08.092

Kuo, C. F. and Shih, Y. (2016). Gender differences in the effects of education and coercion on reducing buffet plate waste, *Journal of Foodservice Business Research*, *19* (3), 223–235. https://doi.org/10.1080/15378020.2016.1175896

Liz Martins, M., Cunha, L., Rodrigues, S. and Rocha, A. (2014). Determination of plate waste in primary school lunches by weighing and visual estimation methods: A validation study, *Waste Management*, *34*(8), 1362–1368. https://doi.org/10.1016/j.wasman.2014.03.020

Massow, M. Von and Mcadams, B. (2015). Table scraps: an evaluation of plate waste in restaurants, *Journal of Foodservice Business Research*, *18*(5), 437–453. https://doi.org/10.1080/15378020.2015.1093451

Namkung, Y. and Jang, S. C. (2007). Does food quality really matter in restaurants? Its impact on customer satisfaction and behavioral intentions, *Journal of Hospitality and Tourism Research*, *31*(3), 387–409. https://doi.org/10.1177/1096348007299924

Papargyropoulou, E., Wright, N., Lozano, R., Steinberger, J., Padfield, R. and Ujang, Z. (2016). Conceptual framework for the study of food waste generation and prevention in the hospitality sector, *Waste Management*, *49*(1), 326–336. https://doi.org/10.1016/j.wasman.2016.01.017

Prayag, G., Khoo-Lattimore, C. and Sitruk, J. (2015). Casual dining on the French Riviera: examining the relationship between visitors' perceived quality, positive emotions, and behavioral intentions, *Journal of Hospitality Marketing and Management*, *24*(1), 24–46. https://doi.org/10.1080/19368623.2014.859114

Ryu, K. and Han, H. (2010). Influence of the quality of food, service, and physical environment on customer satisfaction and behavioral intention in quick-casual restaurants: the moderating role of perceived price, *Journal of Hospitality and Tourism Research*, *34*(3), 310–329. https://doi.org/10.1177/1096348009350624

Silvennoinen, K., Heikkilä, L., Katajajuuri, J. M., & Reinikainen, A. (2015). Food waste volume and origin: Case studies in the Finnish food service sector, *Waste Management*, *46*, 140–145. https://doi.org/10. 1016/j.wasman.2015.09.010

Stancu, V., Haugaard, P. and Lähteenmäki, L. (2016). Determinants of consumer food waste behaviour: Two routes to food waste, *Appetite*, *96*, 7–17. https://doi.org/10.1016/j.appet.2015.08.025

Sulek, J. M. and Hensley, R. L. (2004). The relative importance of food, atmosphere, and fairness of wait: The case of a full-service restaurant, *Cornell Hotel and Restaurant Administration Quarterly*, *45*(3), 235–247.https://doi.org/10.1177/002224299405800304

Vaz, C. S. (2006). *Restaurantes: controlando custos e aumentando lucros.* Metha.

Williams, P. and Walton, K. (2011). Plate waste in hospitals and strategies for change, *e-SPEN, the European e-Journal of Clinical Nutrition and Metabolism*, *6*(6), e235–e241. https://doi.org/10.1016/j.eclnm.2011.09.006

WRAP (2013). Overview of waste in the uk hospitality and food service sector. Retrieved from https://www.wrap.org.uk/sites/files/wrap/Overview%20of%20Waste%20in%20the%20UK%20Hospitality%20and%20Food%20Service%20Sector%20FINAL.pdf (Accessed 11 October 2019)

Yiğitoğlu, V. (2020). The application of the plate waste on menu analysis, *Journal of Tourism and Gastronomy Studies*, *8*(1), 191–210. https://doi.org/10.21325/jotags.2020.543

Zeithaml, V. A., Berry, L. L. and Parasuraman, A. (1996). The behavioral consequences of service quality, *Journal of Marketing*, *60*(1), 31–46. https://doi.org/10.1177/002224299606000203