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THE CAUSES OF FOOD WASTE: A CASE STUDY IN A LOCAL RESTAURANT

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ABSTRACT

THE CAUSES OF FOOD WASTE: A CASE STUDY IN A LOCAL
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This study investigated plate waste in a traditional home restaurant in Menemen, Izmir, Turkey to determine its impact on economic, environmental, and social sustainability, suggest ways to minimize plate waste, and raise the awareness of customers and employees. Semi-structured interviews were used to evaluate the awareness of customers and employees and to propose sustainable solutions for plate waste in the restaurant. The data were analyzed using qualitative analysis software (MAXQDA®). The findings showed that plate waste is high due to the lack of measures and knowledge about reusing plate waste. Most employees and customers showed low awareness about the issue. This study is original in terms of theoretically and empirically investigating plate waste in a mass consumption area, which is one of the main causes of food waste, and simultaneously evaluating the economic, social, and environmental impacts of plate waste.

Keywords: Food Waste, Plate Waste, Sustainable Food Supply Chain, Restaurants, Semi-Structured Interview, Planned Behavior Theory

ÖZ

YEMEK İSRAFININ NEDENLERİ: YEREL BİR RESTORANDA BİR
VAKA ÇALIŞMASI

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Bu çalışma, tabak artıklarının ekonomik, çevresel ve sosyal sürdürülebilirlik üzerindeki etkisini belirlemek, tabak israfını en aza indirmenin yollarını önermek ve müşteriler ve çalışanların bilinç düzeyini arttırmak için Menemen, İzmir, Türkiye'deki geleneksel bir ev restoranında tabak israfını araştırmıştır. Müşterilerin ve çalışanların farkındalığını değerlendirmek ve restoranda tabak israfına yönelik sürdürülebilir çözümler önermek için yarı yapılandırılmış görüşmeler yapılmıştır. Veriler nitel analiz yazılımı (MAXQDA®) kullanılarak analiz edilmiştir. Bulgular tabak artıklarının yeniden kullanımı konusunda önlem ve bilgi eksikliğinden dolayı tabak artıklarının yüksek olduğunu göstermiştir. Çoğu çalışan ve müşteri konu hakkında düşük farkındalık göstermiştir. Bu çalışma, gıda israfının temel nedenlerinden biri olan tabak artıklarının bir kitlesel tüketim alanında teorik ve ampirik olarak araştırılması ve aynı zamanda tabak artıklarının ekonomik, sosyal ve çevresel etkilerinin değerlendirilmesi açısından özgündür.

Anahtar sözcükler: Gıda Atıkları, Tabak Atıkları, Sürdürülebilir Gıda Tedarik Zinciri, Restoranlar, Yarı Yapılandırılmış Görüşme, Planlanmış Davranış Teorisi

ACKNOWLEDGEMENTS

TEXT OF OATH

My Master's Thesis "FOOD WASTE MANAGEMENT: EXAMPLE FROM SERVICE INDUSTRY" states that the work was written by me without resorting to any help that would be contrary to scientific morals and traditions, and the works I use consist of those shown in the bibliography, referenced and used, and I confirm this with honor.

MUSTAFA TİBET EĞMEN

29.12.2021

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LIST OF SYMBOLS AND ABBREVIATIONS

CO2: Carbon dioxide

CSF: The Committee on World Food Security

CSS: Corporate sustainability standards

EU: European Union

FAO: The Food and Agriculture Organization of the United Nations

MAXQDA®: Semi-Structured Interview Method

NRDC: Natural Resources Defense Council

NSLP: National School Lunch Program

TPB: Planned Behavior Theory

TRA: Theory Of Reasoned Action

UN: United Nations

ETPB: Extended Theory of Planned Behavior

PBC: Perceived Behavioral Control

1.INTRODUCTION

1.1. Problem Definition

In a world where food waste is increasingly on the agenda, its economic, environmental, and social effects cannot be ignored (Vizzoto et al., 2021), particularly in developed countries, where it is more common. Roe et al. (2018) define food waste as food suitable for human consumption, discarded at product level or left to spoil. Plate wastage refers to edible food that is not consumed after a customer completes a meal (Visschers et al., 2020). About 80% of people leave uneaten food on their plates while consumers waste 35% of their food, whether at home or in restaurants, cafeterias, or hotels. While technological inadequacies and environmental factors in the supply chain usually cause food waste during production, plate waste is usually caused by the consumers' lack of awareness and dietary habits (Williams and Warton, 2011). Given individual and daily differences in appetite and energy needs, tastes and preferences, such behaviors contribute to plate wastage in any food service setting (Reger et al., 1996). Other causes of plate wastage include food quality, preferences, ready-to-eat food consumption, limited time for meals, menu selection, food type and food preparation methods (Baik and Lee, 2009).

Plate waste creates economic, environmental and social concerns for restaurant operators. Environmentally, it causes pollution of nature and loss of nutrients (FAO, 2013). It causes cost loss economically (Usón et al., 2013; Kotykova and Babich, 2019). Socially, it has important effects such as poverty (Kotykova & Babych, 2019). Unconsumed food may indicate that a restaurant's customers are dissatisfied with the meal, cost, or lack of value. Restaurants should consider the cost of unconsumed food when setting meal prices and include it in their costing models. Restaurants can also benefit from minimizing plate waste, protecting profit margins and providing value to customers.

Although the amount of plate waste is increasing in restaurants, both consumers and employees seem unaware of the impact of this. However, it reduces

economic, environmental, and social sustainability. Therefore, the purpose of this study is to evaluate restaurant plate waste and determine its economic, environmental and social impact, propose some solutions and raise awareness. The main contribution of this study is to evaluate plate waste in terms of economic, environmental and social three dimensions of sustainability through semi-structured interviews with restaurant employees and customers. Previous studies in the literature have either evaluated plate waste in relation to the environmental dimension (e.g., Vermote et al., 2018) or the social and environmental dimensions (e.g., Derqui et al., 2020). Ultimately, this study aims to raise the awareness of customers and restaurant employees in how to reduce plate waste and ensure sustainability in restaurants.

1.2. Objective of the Thesis and Research Questions

This study aims to reveal the causes of plate waste in restaurants from the perspectives of restaurant customers and employees, evaluate the economic, environmental, and social effects of plate waste, offer suggestions to reduce plate waste, and increase the awareness of customers and employees about waste management.

The study addresses the following four research questions:

What are the causes of plate waste in the restaurant?

What are the social, economic, and environmental effects of plate waste?

What are the suggestions to reduce plate waste to make the restuarant sustainable?

What should be done to raise the awareness of customers and employees about waste management?

1.3. Significance of the Study

According to various studies, plate waste in restaurants is increasing (Enström and Kanyama 2004, Eugenios, 2012, Wilkie et al. 2015, Betz et al., 2015, Chalak et al., 2016, Wu et al., 2019, Zhu et al., 2019, Visschers al.,2020, Serebrennikovet al., 2020, Boschini et al. 2020, Armstrong et al., 2021, Coşkun & Filimonau,2021, Garcıa-Herrero et al., 2021; Hu et al., 2021). However, to my knowledge, no studies have used semi-structured interviews to evaluate plate waste in restaurants in terms of the three dimensions of sustainability (environmental, economic, and social).

The study investigates the main cause of plate waste in restaurants theoretically and empirically in terms of sustainability, thereby contributing to the literature by addressing its social, economic, and environmental effects. The main aim of this study is to change consumer and employee awareness and offer sustainable solutions to reduce plate waste. To find answers to the research questions, a detailed literature review of food waste and plate waste was conducted. Then, semi-structured interview questions were prepared and used with restaurant customers and staff to identify the root causes, assess the environmental impacts, and make recommendations. The semi-structured interviews were conducted with 60 customers and 8 restaurant employees over two weeks to evaluate their awareness of food waste. The qualitative content analysis of the data is conducted using MAXQDA®. MAXQDA provides an efficient, innovative, and easy interface for researchers of all levels with tools to code, analyze, and visualize results, and successfully complete their projects (Kuckartz & Radiker, 2019). The present study contributes to the literature by raising invididual awareness among customers and employees and offering suggestions for reducing plate waste. This provides academics, restaurant owners, and the food industry generally with guidance for future research and food management practices.

2.THEORETICAL BACKGROUND

2.1. Sustainable Food Supply Chain

A sustainable food value chain is one that has a positive impact on environmental, economic, and social sustainability, and the natural environment at all stages (FAO, 2018). It is based on the principle of generating profits throughout the chain while providing broad-based social benefits for society without permanently depleting natural resources by producing specific agricultural raw materials and converting them into specific foodstuffs. Sales to end consumers and disposal of waste involve the coordinated value-added activities of all agricultural enterprises and companies at each production stage in sequence (Zailani et al., 2012).

A sustainable food value chain focuses on effective improvements that lower food prices and increase access to food, thus allowing households to buy more food. However, as household income increases, consumers tend to spend more on foods of higher value, such as foods with higher nutritional value, convenience, health benefits, or a better image, rather than increasing the amount of food they consume. This evolution of consumer demand is becoming a key driver for innovation and value creation at all levels of the food chain, leading to continuous improvement in the food supply and increased benefits for consumers (Nguyen, 2014).

Food waste increases distribution, production, and disposal costs by wasting water, energy, land, and other natural resources (Betz et al., 2015). It is important to understand when and why food is wasted to develop solutions to this problem (Devin & Richards, 2018). The problem is complex because of the significant number of interactions between food supply chain members, who include different parties across several sectors (Strotmann et al., 2017). Undoubtedly, however, every supply chain member contributes to food waste.

A sustainable enterprise operates more efficiently and improves the business's competitive position in a market. This can enhance their reputation and attract investment (Buzby and Hyman, 2012). Sustainability is not simply a business strategy option, but rather a system in which companies thrive within the limited resources available to society and future generations. Although sustainability has

been widely discussed as a general concept, there are not many examples describing sustainable restaurants and how they should be run (Gustavsson et al., 2011).

The use of renewable resource systems or environmental investment functions should be avoided for environmental sustainability. In this process, it should also include the protection of biodiversity and other ecosystem functions that are not classified as economic resources (Alexander et al., 2017).

A socially sustainable system should ensure adequate provision of social services, including equal distribution, health and education, gender equality, political responsibility and participation (Brown et al., 2000). Social sustainability is defined as a society's assimilation of inputs locally or nationally, and its ability to maintain its characteristics in the short or long term without showing social incompatibility (Betz et al.,2015).

Because no resource is unlimited, it is necessary to find the best means of distribution to increase the quality of life of the society, respond to human needs, reduce poverty, and eliminate inequality. Depletion of resources is an important issue for economic sustainability. Therefore, sustainability has always been central to the renewable natural resources economy. Sustainbility requires reintroducing wastes into the economy and reducing food costs (Devin and Richards, 2018).

Marenzana and Arnett (2013) explores the problems, challenges, and solutions associated with the food supply chain. In particular, she addresses the environmental impact of the food supply chain under three main categories: production, consumption, and socio-economic challenges. Many researchers have considered how to monitor and make the food supply chain more transparent (Wognum et al., 2011). According to Hamprecht et al. (2005), little is known about how companies can efficiently control their existing supply chains in terms of their economic, social, and environmental performance while Wognum et al. (2011) argue that transparency in food supply chains is important to regain and maintain consumer trust because they want to be informed.

Their study also evaluated the current state of information systems to support sustainability in food supply chains. Finally, various researchers have explored how to ensure a sustainable supply chain (Fabbrizzi et al., 2014).

Although the restaurant industry does not cause as much pollution as other major polluting industries, its size and rapid growth necessitates environmentally sustainable action. No matter how small restaurants are, they significantly affect the environment in which they operate and all their stakeholders. Restaurants are large consumers of water, energy, supplies, and food products, and generate waste during their daily operations (Parfitt et al., 2010). Restaurants create employment directly or indirectly and contribute directly to public health by performing one of the most basic services, namely meeting people's nutritional needs. The legal framework for environmental and societal concerns is often redefined in line with the overall goal of stricter emissions and pollution controls. Thus, businesses need to remain one step ahead of the legislation instead of having difficulties in implementing new regulations. However, this requires restaurants to first become aware about sustainable waste management (Steen et al., 2018).

Accordingly, this study analyzes plate waste in mass consumption places, i.e., restaurants, and suggests sustainable solutions to reduce plate waste by focusing on consumer awareness.

2.2. Theory of Planned Behaviour

The theory of planned behavior (TPB) links people's beliefs to behavior. Yousafzai et al. (2010) argue that an individual's behavioral intentions are shaped by a combination of their attitudes and perceived behavioral control. According to TPB, behavioral intention is the proximal determinant of human social behavior. The theory was first elaborated by Ajzen (1991) to improve the predictive power of the earlier theory of reasoned action (TRA). Ajzen incorporated perceived behavioral control to explore the relationships between beliefs, attitudes, behavioral intentions, and behaviors in various human domains.

According to TPB, an individual's positive or negative evaluation of performing a particular behavior is affected by two factors. TPB assumes that the proximal cause of the behavior is the individual's intention to do or not to do that behavior. This in turn depends on the individual's perception of social pressure to do or not to do this behavior (Tonglet et al., 2004). TPB has been applied to explain

various behaviors (Fishbein and Ajzen 2010), such as the behavior of customers regarding food waste.

Mahmoudkhani et al. (2016) applied TPB to explain the behaviors that cause food waste in Switzerland. They concluded that behavioral control of consumers' perceptions of waste should be to reduce food waste in homes.

Several TPB studies have investigated situational factors. Coşkun and Özbük (2020) reported that price awareness and food flavor directly impact food waste behavior and food waste reduction plans. Lorenz et al. (2017) found that portion size is one situational factor that affecting perceived behavioral control and food waste behavior.

According to Chen and Tung, (2014), used TPB neutralization techniques to understand why restaurant visitors leave food uneaten. They investigated several variables, including purchasing eco-friendly products, encouraging customers to buy products, choosing a restaurant, and dining at an eco-friendly restaurant.

Filimonau et al. (2020) used TPB to explain how consumers blame restaurateurs for leftovers. For example, if portions are considered too large, they may ask the restaurant to reduce their size. Alternatively, they can request a take-out box for leftovers.

Several studies have investigated the role of perceived behavioral control. Steova and Alriksson (2017) used case studies to show that individuals do not generate waste if they have experience, knowledge, and satisfactory recycling conditions. Perceived behavioral control indicated that people with little knowledge about recycling were less likely to intend to recycle. In addition, responsible behavior had a strong effect on recycling intention was strong whereas perceived behavior control was not so important.

2.3. Application of Theory of Planned Behaviour to Understand Plate Waste in Restaurants

Consumer behavior includes eating out in various ways, whether in restaurants, fast food restaurants, or traditional street food sellers (Nişancı et al.,

2018). Customers can decide when and where to eat by planning in advance, or they can go out without planning. Eating out is more economical, convenient, and timesaving than preparing meals at home. It can also be preferred for social reasons, such as cultural interaction, being with family and friends, status, and prestige (Arnon et al., 2008). Research into food wastage has used TPB to understand household food waste behavior. However, few studies have investigated consumer food waste behavior in the food industry (Lorenz et al., 2017).

Filimonau et al. (2020) applied TPB to conclude that consumers blame restaurant operators for leftovers. As an october suggestion, a package can be made to take home leftovers (Sebbane et al., 2017). Most recently, the decision to take leftovers home rests solely with restaurant guests, although they usually do not request them when eating out (Talwar et al., 2021).

Mallinson et al. (2016) used TPB to investigate whether the taste of food affects food wastage behavior. Pellegrini et al. (2019) determined that price is an important factor in consumers' food preferences. Similarly, Asioli et al. (2017) found that price-conscious consumers prefer low-cost food products and generate less food waste. Furthermore, they act in a planned and systematic way to reduce food waste (Aktas et al., 2018). In contrast, consumers who are not price conscious in luxury restaurants who do not care about bills tend to over-order, thereby generating more food waste.

In summary, more systematic studies of food wastage are needed, including the psychological factors influencing plate waste reduction behavior (Reynolds et al., 2019). Plate waste generation behaviors can also be using TPB (Lorenz et al., 2017) by focusing on plate waste reduction behavior and possible explanatory factors. These; intention, attitudes, personal norms, perceived behavioral control (PBC), and beliefs. Additionally, providing information about waste food can increase consumers' awareness and knowledge about plate waste. Other interventions include making structural changes to food service, such as smaller portions (Reynolds et al., 2019).

In investigating the links between variables in different assessments, Kim et al. (2013) explored a theoretical framework for emotion based on TPB to explain consumer behavior and its utility. This study also examined the predictive power of

TPB on consumer intentions to choose eco-friendly restaurants while reinforcing TPB with the hoped-for regret structure. They found that decision-making models like TPB should include expected emotion. The findings provide further insights into the consumer decision-making processes required to develop green marketing strategies in restaurants.

Yay and Caliskan (2016) used TPB to identify the factors affecting the intention to eat in an environmentally friendly hotel restaurant. They found that gender affected customers' attitudes and intentions towards dining at a green hotel restaurant while marital status affected subjective norms. Education level also affected customers' attitudes whereas age and income had no effects in the model. Similarly, PBC was not affected by any of the demographic variables. The most significant influence on intention to eat in an eco-friendly hotel restaurant was attitude whereas the weakest influence was PBC.

Tommasetti et al., (2018) used TPB to show that consumers' behavioral attitude intentions, subjective norms, perceived behavioral control, perceived utility, and curiosity affected their decision to choose sustainable restaurants. However, while their survey sample was large, they concluded that more research was needed to fully explain why people choose particular kinds of restaurants.

Although the restaurant industry uses significant amounts of resources, very little research has addressed sustainability issues from a restaurant management perspective. Flanagan and Priyadarshini (2021) used TPB to identify what motivates casual restaurant managers to adopt and practice sustainable practices. They also examined managers' behavior when faced with environmental pressures.

Karakaş (2019) identified the factors affecting consumers' food waste behavior in the central district of Çorum in Turkey. The consumers demonstrated positive outcome awareness, intentions, and norms, but were ambivalent in the planning and purchasing stages. The findings also showed that intention and result awareness directly affect wasteful behaviors while planning and norms have indirect effects. Considering that intention is the most effective factor in purchasing behavior, activities that create awareness of the results of wastage for society should be emphasized.

To sum up, it is vital to investigate both theoretically and empirically the main causes of food waste, including plate waste in restaurants, from the perspective of sustainability. While some studies have discussed plate waste in the food industry, to the best of my knowledge, no studies have investigated the topic in terms of the three dimensions of sustainability (economic, environmental, and social) from the perspective of both customers and employees. Therefore, TPB is used in this study to understand the behavior of customers and employees concerning plate waste in one specific restaurant. The aim is to identify the reasons for creating waste and the factors affecting this process, and then to develop solutions to reduce plate waste.

3. FOOD INDUSTRY AND PLATE WASTE

3.1. Food Waste

A third of global food production is wasted each year at different stages of the food supply chain. 24-30% of this occurs during production, 20% during post-harvest processes and 30-35% during consumption (Vilarno et al., 2017). Food waste causes environmental, economic and social damages (Mourad, 2016). Environmentally, food waste contributes to atmospheric pollution, environmental pollution (FAO, 2013). Economically, food waste causes income and economic losses (Ferreira et al., 2013; Kotykova and Babych, 2019). Socially, food waste has important effects such as increased hunger and poverty (Kotykova and Babych, 2019).

Because of its economic, environmental, and social impacts, food waste has become an issue of interest to both researchers and society. Therefore, it is essential to evaluate the food supply chain (Jager et al., 2017). However, supply chain researchers disagree about how to define food waste and loss (Otles et al., 2015). According to Girotto et al. (2015), food waste consists of spoiled, lost, stale, or uneaten food on the plates while Stancu et al. (2016) define it as edible food that cannot be consumed or discarded, which is intentionally abandoned, for example, after eating in a restaurant. Food waste occurs because people decide not to eat something due to their preferences, deterioration caused by problems in the supply chain, or discarding expired products (Schanes et al., 2018).

Halloran et al. (2014), for example, shows that losses in postharvest stages are much higher in developing countries and higher for perishable foods in both industrialized and developing economies. Food losses in middle- and high-income countries are largely related to the lack of coordination between different intermediaries in the earlier stages of the supply chain. Therefore, the most important cause of food waste in developed countries is consumer consumption behavior (Parfitt et al., 2010). Food wastage at the consumption stage is closely associated with cultural and social factors, and consumer behavior and habits (Halloran et al., 2014). Significant factors include excessive purchases, expiration dates, and careless consumer attitudes. Despite better transportation, storage and processing facilities in developed countries,

food waste has been significantly increased due to low-efficiency farming practices, poor consumption habits and mass marketing (Finn, 2013). A large amount of waste results from consumers do not use what they bought or exceeding expiry dates as well as quality, aesthetic, or appearance standards (Parfitt et al., 2010).

Thus, most important factor in food waste in rich countries is consumer behavior (Gustavson et al., 2011). In high-income countries, consumers waste food due to poor planning, buying and cooking too much, and throwing away edible food because they cannot eat it immediately (Silvennoinen et al., 2014). Parfitt et al. (2010) claim that developed countries can reduce food waste significantly, particularly by changing raising consumers' awareness of the problem, thereby changing their behaviors.

The literature on food waste has so far focused on determining how much food is lost along the supply chain (Cicatiello et al., 2016). In their efforts to reduce world hunger, all countries should pay attention to the problems caused by food losses. Food waste affects food security, food quality, economic development, and the environment for people struggling with hunger (Liu et al., 2016). The causes of food waste vary worldwide, depending on a particular country or local situation (Gustavsson et al., 2011).

One of the issues to be investigated to prevent food waste is identifying the cause, where in the food supply chain losses are concentrated, and why. After that, we need to determine how to respond to reduce it. While food waste occurs differently at each stage, certain kinds of food waste are more common. After identifying the level of food loss and comparing the waste generation in different regions, a critical strategy should be developed and measures taken to reduce food loss and waste, where waste is more (Gruber et al., 2016).

Food waste can be a valuable resource when recycled appropriately according to sustainable criteria. Many environmental problems occur because waste cannot be recycled correctly. Yet, the environmental impact of agriculture can be decreased by reducing the total amount of water, land, and other resources needed by reducing food waste in all parts of the food system (Reynolds et al., 2019).

Various countries and organizations are trying to establish food waste management systems, identify problems, and find solutions. The Food and

Agriculture Organization of the United Nations (FAO) definition of waste sees food wastage or reduced quality throughout the food supply chain as the cause of food loss or waste. Despite several studies on food waste in Europe, there are still uncertainties in the assessment of food waste generation along the supply chain. The available data are almost incomparable, which makes it quite difficult to estimate the extent of food wastage and vital stages. One reason is the estimation of quantities. Although random waste analysis is mostly done at a national level, the findings are cited in research at the regional level. Other countries' lifestyles, incomes, and waste patterns are estimated based on their population size (Bräutigam et al., 2014).

Table 1 summarizes food waste studies considered in the literature review.

Table 1. Literature Review of Food Waste Studies

Authors	Method	Focus	Research Area
Goonan et al. (2013)	Observations and interviews	Providing a basis for further research on sustainable behavior for practices to reduce food waste in hospitals	Hospital
Ofei et al. (2014)	Interview and observation	Creating an application to reduce food waste and provide suggestions on how to reduce waste in a pilot hospital	Hospital
Charlebois et al. (2015)	Observation and interview	Identifying key determinants of domestic food waste at food service outlets	Hotel
Ferreira et al. (2015)	Observation	Analyzing the dishes served but not eaten in an acute care hospital	Hospital

		in Portugal and focuses on possible waste reduction measures	
Strotmann et al. (2017)	Literature review	Reducing food waste in a hospital and hospital cafeteria by enabling employees to take precautions against waste generation and applying a participatory approach integrated into the implementation process	Hospital
Morone et al. (2018)	Questionnaire	Funding networking activities to increase knowledge transfer and joint research between academia and industry on the evaluation of food waste and the creation of a social network on sustainable food waste with universities, large and small companies, and public institutions	Restaurant
Abdelaal et al. (2019)	Qualitative analyzes and interview	Analyzing food waste produced at various food outlets of a university campus in Qatar	University
Filimonau et al. (2019)	Observation and interview	Exploring prerequisites of consumer participation in reducing restaurant	Restaurant

		food waste	
Ozcicek and Var (2019)	Case study, observation	Investigating the amount of food waste in university cafeterias used by administrative and academic staff, and students to reduce food waste	University
Wu et al. (2019)	Observation, survey method, regression analysis	Measuring plate waste of university students in Beijing	University
Dolnicar et al. (2020)	Game-based intervention and quasi-experiment	Demonstrating the importance of changing tourist behavior and reducing tourists' waste food generation	Hotel
Okumus (2020)	Semi structured interview	Focusing on 32 hotel employees and managers in Florida	Hotel

Goonan et al. (2013) investigated plate waste and the impact of food waste on patient nutrition outcomes in hospitals. They did not focus on waste generation in the kitchen management of the hospital food system. Using a new approach to understand the causes of hospital food waste before consumption, they offered recommendations on minimizing food service. Their methods included document analysis, observations, individual interviews with kitchen staff, and focus groups with managers. They found that most food waste results from overproduction while the attitudes and habits of the food service workers are also important. The findings provide a basis for further research on sustainable behavior and systemic practices within the foodservice sector.

Ofei et al. (2014) used interviews and observations to investigate food service processes at lunch and dinner for 10 days during the week. All food discarded as waste after each service was weighed and recorded. Findings included portion size choices, menu information, monitoring of food waste, and use of unserved food. These findings suggest important information for reducing waste.

Finally, Charlebois et al. (2015) studied a well-known restaurant chain in Canada to show that waste generation in restaurants is the main determinant of domestic food waste. They aimed to provide a clearer understanding of menu design and technical analysis needs in the hospitality industry to provide catering services, develop culinary practices, reduce costs, and offer inedible waste generation recommendations.

In their case study, Ferreira et al. (2015) observed plate waste in a hospital for approximately eight weeks. They found differences in food waste, with some patients producing more than others. On average, each patient throws away 953 g of food each day or 35% of the food served. While food waste is inevitable, these results provide a basis for formulating future strategies to combat food waste, highlighting the potential financial and environmental savings for Portuguese hospitals.

Strotmann et al. (2017) measured food production and waste to reduce food waste in a hospital and hospital cafeteria. The results showed that portions should be reduced to minimize excessive food production and waste in the hospital. Establishing an effective communication structure to involve all actors in the food supply chain can also help reduce food waste.

Morone et al. (2018) showed that composting of restaurant food waste machine reduces fossil fuel greenhouse gas emissions compared to typical landfill disposal methods. The main environmental impacts were compost production and electricity use. Other catering establishments could benefit from this system and should be encouraged to adopt it.

Abdelaal et al. (2019) investigated food waste management in educational institutions. Their study had four stages: scanning, sampling, measuring, and synthesis. The results show that most waste is avoidable while the main cause is overproduction rather than consumer waste. They concluded that the main food

provider of meals for the university cafeteria lacks appropriate tools to measure food waste.

The literature review considered 14 articles about food waste. The analyzes show that restaurant employees can follow pro-environmental policies by creating information policies to increase consumer awareness. Filimonau et al. (2019) examined the behavior of Polish consumers regarding restaurant food waste and obtained data on how to raise their awareness. The study showed how Polish consumers can be guided to help restaurateurs reduce food waste more effectively.

Özçiçek and Var (2019) reported very low sensitivity to food waste among three groups of students. The students were not interested in bulletins, advertisements, or visual tools. Thus, food waste reduction strategies need to be diversified for all three groups.

Wu et al. (2019) evaluated the environmental impact of university plate waste in terms of nitrogen, phosphorus, carbon and ecological footprint. The results showed that plate waste was positively related to social class and financial status, with boys wasting less food than girls. Students who are aware of the quality and quantity problems of the food in the university restaurant pay attention to some factors when ordering food.

Dolnicar et al. (2020) investigated tourist behavior in hotel restaurants to change the behavior of tourists. Their findings formed a theory that argued that environmentally responsible behavior is important.

Okumus (2020) has brought a different perspective to the literature on food waste by customers and employees in hotel restaurants. This study determined that food waste occurs during both preparation and consumption. Food waste can be reduced by training employees, using appropriate equipment, better menu planning practices, accurate forecasting of customer demand, and efficient storage practices.

3.2. Plate Waste

Plate wastage was generally defined as the amount of the edible portion of the food served or the amount of food waste represented by the leftovers (Williams and Walton, 2011). According to Buzby and Guthrie (2002), plate waste is a common cause of food loss at the consumer and during food service. Given individual and daily differences in customers' tastes and preferences, plate waste is likely in any food service setting. The primary source of food waste in catering services and similar institutions is unconsumed leftovers. There are many reasons why consumers leave food on the plate. For example, up to 59% of customers say they did not eat everything because portion sizes are too large (Vizzoto et al., 2021).

Approximately 23% of plate residues are side dishes that consumers are not aware of when ordering. Additionally, reducing portion sizes is an effective measure to reduce plate waste (Elimelech et al., 2015). For example, Freedman and Brochado (2010) found that reducing the serving size of french fries by 50% resulted in a 31% reduction in plate waste per consumer. Vermote et al. (2018) showed that a 20.9% reduction in the portion of french fries resulted in a 9.1% reduction in overall purchase and a 66.4% reduction in plate waste. Kallbekken and Sælen (2013) observed that simple measures in hotel restaurants, such as reducing plate size and informing guests that multiple helpings are allowed, reduced food wastage by 20%.

As this literature review shows, most studies have been conducted in institutions like hospitals and schools whereas the number of studies of tourism enterprises like restaurants, cafes, and hotels is quite limited (Kuo and Shih, 2016).

According to Pirani and Arafat (2014), food waste, which constitutes approximately 40% of hotel waste and 60% of restaurant waste, is the cause of accommodation waste. Food waste occurs in all service processes such as delivery, storage, preparation, cooking, service and customer consumption.

More than 30% of all food waste in restaurants comes from dinner plates (Gordon Food Service 2021). While food waste can occur at any stage of preparation and cooking, most waste occurs during consumption. Therefore, the best way to determine if serving sizes are appropriately is to do a plate waste study to see if there is any food left on the plate after the meal has been served. Plate waste studies are a

quick way to efficiently and effectively measure waste generation. These studies are very important because large amounts of food are wasted, which causes huge financial losses and means residents cannot meet their nutritional needs (Massow and McAdams, 2015).

Plate waste food can solve specific problems. For example, it can be evaluated in waste recycling centers. Studies show that 8.4 million people in the UK and 40 million people in the United States struggle to eat enough. Therefore, there is a serious responsibility to stop or reduce this unnecessary waste, particularly through storage and recycling centers (Yüksel and Önal, 2021).

The first step in the food waste reduction system is to prevent food waste at source. If this cannot be avoided, the amount of waste generated can be reduced, or wasted food that is still suitable for human consumption can be delivered to people in need. The food should be easily accessible, the wastes can be delivered to animals in need, while the last option is energy recovery or composting from plate waste. Waste food that cannot be used should be incinerated or stored safely. That is, plate waste is classified as edible or inedible. Edible food waste can be separated, such as kitchen waste and plate waste in food and beverage businesses. Inedible food waste includes items that humans cannot consume, such as bone, eggshell, or coffee grounds (Şahin and Bekar, 2018).

A major disposal problem is caused by food that is not prepared and consumed by customers. Discarding this plate waste causes methane gas emissions. However, by recycling of this waste, it is possible to produce energy. Another problem caused by plate waste is the economic losses for restaurant operators. In restaurants, unconsumed food is seen as a sign of dissatisfaction. Therefore, restaurants should first change the meal contents. The first step is to change the menus. While pricing menu items, the cost of unconsumed foods should be considered through a costing model. Under pressure from rising labor and input costs, business owners are benefitting from minimizing waste, which protects their profit margins and serves customers better (Cohen et al., 2013). Although waste cannot always be avoided, a high level indicates ineffective controls and an disorganized supply system (Buzby and Guthrie, 2002).

Dolnicar (2020) researched people's awareness around the world regarding plate waste. The global plate waste problem appears to be a lack of awareness. Despite the growing interest of international environmental organizations in waste prevention, surprisingly little effort has been made to reduce plate waste. Currently, there are few scientifically proven measures to help prevent plate waste in restaurants, and evaluation and awareness remains low.

Table 2. Literature Review of Plate Waste Studies

Authors	Method	Focus	Research Area
Williams and Walton (2011)	Observation and weighing	Providing suggestions for minimizing plate waste in hospitals	Hospitals
Adams et al. (2015)	Observation and interview	Comparing plate formation in two schools	Schools
Massow and McAdams (2015)	Observation and interview	Investigating plate waste volume and important sources in a restaurant	Restaurants
Liu et al. (2016)	Physical weighing, questionnaire	Trying to reduce plate waste by identifying patterns and causes of plate waste in lunch programs at a school in Beijing	School
Cohen et al. (2017)	Interview	Reducing children's plate waste by changing eating habits	Restaurant
Eriksson et al. (2017)	Interview	Reducing plate waste in a university	University

Wang et al. (2017)	Weighing	The scales and patterns of consumer plate waste in developing countries have not yet been fully elucidated, necessitating a global effort to reduce plate waste.	Restaurant
Boschin et al (2018)	Literature review	Reducing food waste in a school using novel methods	School

Williams and Walton (2011) provided recommendations to reduce food waste in hospitals, particularly from plate food waste. They found that 30% of food waste in hospitals is plate wastage, which is higher than other food service sectors. These high levels result from the clinical conditions of the patients, food and menu problems, and service problems. To minimize wastage, they suggested food supplements, mass meal delivery systems, nutritional aid, and portion reductions. These ideas were presented to the hospital management for implementation.

The main goal of school lunch menus is to increase children's fresh fruit and vegetable consumption. Thus, a priority for school cafeterias is to prevent children from wasting such food. Adams et al. (2015) examined the food system to compare waste when school students self-serve, consume, and waste on plates with different salad bar layouts. Using multivariate regression, they investigated the effects of salad bar placement, gender, class, ethnicity, socioeconomic status, day of the week, and homeschooling. The results showed that very few students used salad bars that were placed outside the lunch line whereas significantly more salad was bought, consumed, or wasted whe salad bars were on the lunch line. They concludede thatschools should inform students about waste management.

According to Massow and Mcadams (2015), food waste is a major concern for restaurants and their customers. They introduced a new approach after determining how much individual menu content contributes to waste. Using extensive observations, they showed that their approach was effective and practical. They

found that portion size and menu content are important factors contributing to plate wastage in certain situations.

Liu et al. (2016) investigated the negative impacts of plate waste on resource use and environment in schools, and how this harms students' health, physical maturation, and academic success. Most of the studies on school plate waste have been researched in developed countries, so further research should be accelerated in developing countries. Their study investigated the standards and causes of plate wastage in school lunch programs in China, using physical weighing, questionnaires, and semi-structured interviewing. They found that school students in 2014 wasted 130 g per person, accounting for 21% of food served. Their pilot provides an initial understanding of plate waste that ignores school lunch programs in China, provides a reasonable basis for further analysis in this area, and will help inform policy-making malnutrition and education programs.

Cohen et al. (2017), there is little research on assessing the consumption of meals ordered by children, and it has been found that children regularly consume food from quick service restaurants. Therefore, they assessed the feasibility of collecting plate waste and examined whether dishes ordered as an october purpose set healthier standards for children's menu items and their consumption from children's menus. They found an association between calorie information and plate waste.

Eriksson et al. (2017), food waste is an important problem that needs to be reduced in order to make the food supply chain sustainable. For three months they researched Sweden's public catering sector, which provides many meals through municipal organizations including schools, kindergartens and aged care homes. Kitchen staff used kitchen scales to measure waste and the mass of food served, dividing it into plate waste and other food waste. They found 75 g of food waste per serving or 23% of the food mass served. They identified different causes of food waste in the kitchen, which require different methods to reduce.

Wang et al. (2017) considered the harmful sources, and environmental and socioeconomic effects of consumer food waste., given that the dimensions and patterns of consumer food waste are not yet fully understood, especially in developing countries. They used direct weighing to assessfood waste levels in 195

restaurants in four case cities in China in 2015. They experimentally identified scales and patterns of restaurant food waste in Chinese cities, which helps to set targeted and national food waste reduction targets.

Boschin et al. (2018) established a methodology for measuring food waste in school canteens to provide large-scale, time-saving, reliable, and comparable data. First, they weighed plate waste and unserved food using an electronic scale. The data were collected across schools and analyzed for comparison. They determined that the data accuracy of the weighing method does not take more time or cost more.

3.3. Plate Waste in Food Industry

The food service industry includes businesses and institutions responsible for catering, including restaurants, catering, cafeterias, and the hospitality industry (Coşkun and Filimonau, 2021). Restaurants, retailers, and foodservice businesses serve final customers. Therefore, they face similar demands for their product offerings, and consumers push businesses to overstock by demanding to get what they want when they want. Fluctuating demands lead to waste from excess storage (Jribi et al. 2020). For example, restaurants and catering businesses More than 80% of its waste accumulates as garbage while 12.7 million tons of food is incinerated as waste. Nearly half of this surplus is generated by full-service restaurants while about three-quarters comes from plate waste or customers who do not finish their food (Aktaş et al., 2018).

Foodservice is a challenging industry due to the variety of models. Restaurants, cafeterias, kiosks, hotels, and other establishments all serve customers similarly or uniquely. However, reducing food waste activities, educating consumers about waste management, and changing the environment in which they consume food offers an excellent opportunity to reduce food waste (Stefan et al., 2013).

According to Kallbekken and Sælen (2013), while catering operations do not directly affect consumers' preferences, they can reduce the amount of plate waste from service. They consider the concept of choice, which focuses on the influence people have on their decision making within a restaurant. Regarding university restaurants, all-you-can-eat restaurants are particularly wasteful due to inaccurate

demand planning while restaurant policies require that unused food items cannot be re-offered or thrown away (Derqui et al., 2016).

According to Lam (2010), kitchen waste is affected by influences such as staff training and quality of materials. Reducing plate size focuses on interfering with the food waste process and can reduce waste generation. In restaurants, consumer plate waste is caused by loss of appetite, over-service, disappointment in food taste, and lack of preferred food options. Stancu et al. (2016) conducted a field experiment on the effect of plate size on food waste. They found that a 3 cm reduction in plate diameter reduced plate waste by 22% without affecting customer satisfaction. Thiagarajah and Getty (2013) found that reducing the number of trays from a university cafeteria reduces the amount of food waste.

Papargyropoulou et al. (2019), 20% of all wasted food in the world USA comes from wasted plates in foodservice settings. In restaurants, colleges, hotels, workplace cafeterias, and other foodservice settings, so much food is served to customers that they leave it on their plates. While many catering providers have made significant investments in measuring and managing food waste in their kitchens, plate waste receives much less attention. It is difficult for those in the food industry and customers are not told about the food they leave behind.

The Natural Resources Defense Council (NRDC) and Bon Appetit Management Company (Martins et al., 2020) researched plate waste in food service to encourage cleaner plates. Edible food wasted per customer in university restaurants was more than double that per customer in industry accounts. Edible food wastage per customer in inexpensive cafes is about 40 % higher than in retail accounts, where guests pay for their chosen food. Edible waste per customer at lunch and dinner is more than double the amount at breakfast. Effective methods to reduce waste incluide offering tasting spoons and training food service personnel to give appropriate portions. However, using smaller plates and not taking trays do not reduce customer waste, contrary to previous findings. Edible waste per customer was three times higher in some locations than others, demonstrating that organizational culture, consumer education, and other factors can also play an important role. The researchers hope that this issue will be recognized more clearly and encourage more focused analyses of the drivers of and solutions to plate wastage.

3.4. Plate Waste in Restaurants

Food waste has become an economic and environmental problem. Food is wasted at every stage of the food supply chain. In developed countries, consumers are responsible for food waste in the supply chain process from production to consumption. Consumers in Europe and the United States throw away more than a third of their total food production. In the FAO study, the level of food waste is the same with developed and developing countries, but differences in the occurrence of this waste were observed (FAO, 2013). More than 40% of food losses in developing countries occur post-harvest and during the supply chain (Gustavsson et al., 2011).

In the last decade, the increase in out-of-home consumption and the improvement of people's purchasing power have also increased the number of restaurants. In this way, as human consumption increases, waste production also increases in direct proportion. Compared to other provinces, Istanbul accounts for 41 percent of total out-of-home consumption in Turkey. 7 million people eat out every day in Istanbul, and diners spend most of their time in restaurants and fast food places. This ranking is followed by hotels, cafes, entertainment venues, patisseries and catering establishments (Pirani and Arafat, 2014).

Silvennoinen et al. (2015) determined that the main reason for food waste in restaurants is not during the preparation of the food, but rather due to the customers eating. There is also an increasing demand for food served outside the home around the world. With customers making more money and having too many food choices, consumers are buying too much food and wasting edibles. Another problem is the behavior of irresponsible consumers at the beginning of the most important factors of food waste in restaurants.

In general, consumers say that wasting food is part of the consumption system. Producers encourage consumers to buy by making discounts, which affects consumers' purchasing decisions and leads to food waste. Many campaigns have been launched in restaurants to reduce plate waste. For example, in 2014 the European Union proposed the Year for the Elimination of Food Waste. Italy has proposed the Milan Protocol to reduce global food waste. The United Nations has

announced its latest Sustainable Development Goal to reduce global food waste (Grandhi et al. 2016).

In studies aimed at preventing plate waste, changes in the design and size of the boxes have led to changes in the food waste behavior of consumers (Börühan and Özbiltekin-Pala,2021), and restaurants reduced food waste by giving shopping bags to customers (Sirieix et al. 2017). According to Mirosa et al. (2016) conducted a survey with consumers about tray waste and their behavior in a university restaurant.

When consumers are adequately informed about the adverse effects of food waste while eating, they generate less food waste. However, if they are informed that the food waste they produce will be recycled they also create more waste (Kantor ve diğerleri, 1997).

The results of food waste research that raise awareness of food waste among consumers around the world should be explored. In addition, it should be investigated whether social media advertisements can help reduce this waste generation. Rather than raising user awareness, they reflected how customer response campaigns throughout the food supply can be wasted and the importance of raising awareness for the future (Marlette et al., 2005). Consumers today tend to expect freshness and perfection in supermarkets. Changing these perceptions and habits is crucial in preventing food waste. Cultural differences in different parts of the same country greatly affect food waste due to different lifestyles of consumers. (Aschemann-Witzel et al., 2015).

In restaurants, it is very important to ensure the continuity of sustainability (Godfray et al., 2010). The problem of plate waste in restaurants has become a particular concern for sustainability as the food service industry's environmental sustainability is a problem. Giving importance to the evaluation of wastes with a sustainable waste management system is an important issue in reducing both the damage of wastes to the environment and the costs to businesses. The literature has explored whether restaurants in a region can move forward in line with logical and beneficial objectives for an environmental organization and integrated plans for waste management. If managers and employees have the necessary waste management awareness in order to minimize food waste in restaurants, reduce the

costs of restaurants, reduce the environmental impact of food waste and contribute to sustainability. Understanding of food production and consumption. Positive effects are observed (Inglezakis and Moustakas, 2015).

Kuo and Shih (2016) used informational methods to examine the problem of food waste in school cafeterias by gender. Even if trainings to reduce food waste are successful in a short time, can affect consumer behavior in the long run (Sirieix et al., 2017).

As a result, food waste is a heavy operational burden for restaurants. To maintain persistence and stability, restaurants need to expand their sustainability by investing more in society and the environment. Otherwise, balancing the budget to increase sustainability and solve economic, social and environmental issues is crucial to reducing food waste (Giorgi 2013).

4. METHODOLOGY

4.1. Case Study: Restaurant

The research was carried out in a restaurant in the Menemen district of Izmir. The restaurant's capacity is 60 customers and it has eight restaurant employees. The restaurant opened in 2014 and has operated for seven years. The restaurant is a small restaurant so I reached out to the whole population as the number of people coming in a day is small. The restaurant was selected for several reasons. First, it has survived for nearly a decade. Second, it is located in the center of the district. Third, initial observation indicated that it has some problems about how to reduce plate waste. Thus, this restaurant was a suitable case to investigate plate waste, identify its causes, and find solutions.

The study used semi-structured interviews, although this is a qualitative method of data collection. The interviews were used to evaluate the awareness of restaurant users about plate waste and to find sustainable solutions to reduce it. The interview questions were prepared from the related literature. Five academicians checked the questions to ensure their clarity comprehensibility. The interviews were conducted with both customers and the restaurant's employees from October 22 to November 5, 2021 between 10:30 and 14:30.

The interview was audio recorded by permission and interview responses were then transcribed as MS Word files. MAXQDA® was used for qualitative content analysis, whereby all the data were categorized and coded. Observations, interviews, and document analysis are considered effective data collection techniques for qualitative research (Creswell, 2013).

MAXQDA is one of the most effective analysis programs used for qualitative technique. The program is used for all types of qualitative research, including basic theory, literature review, exploratory sunday research, qualitative text analysis and mixed method approaches. It enables the development and testing of theories through the systematic evaluation and interpretation of qualitative data (Creswell, J. W and Creswell, J. D., 2017). Content analysis is used to identify data and reveal hidden patterns in it. This in turn allows meaningful output by coding the data in the

research documents within the framework of specific themes (Yıldırım & Şimşek, 2016).

For the present study, categories were within the program, together with the answers of the restaurant employees and customers. These categories were then defined by coding. A systematic structure has been developed by including important answers in the codes.

After all the data were coded, they were collected under one category, with 222 codings for employees and 1,835 codings for customers. The process was repeatedly validated many times to ensure reliability of the coding.

Tables 6 and 8 show the categories, codes, and subcodes for the analysis of the employee and customer data, respectively. Figures 1 and 2 show the visual maps of the respective completed categories and codes. The thicker arrows indicate more frequent codes.

4.2. Semi-Structured Interview Method

In qualitative research, semi-structured interviews are usually preferred because they provide descriptive information about a particular topic, while eliminating the limitations of writing and filling out questionnaires by providing standardization. Semi-structured interviews enable successful mutual communication between interviewers and participants while allowing the interviewer to improvise questions according to the participant's answers (Galletta 2012).

Semi-structured interviews use questions prepared beforehand in a planned manner. The interviewer conducts the interview along different subheadings depending on the interview situation and the specific answers given. At the same time, semi-structured interviews ensure a particular level of standardization (Schmidt, 2004).

For this study, semi-structured interviews were chosen as an information diversification tool for two main reasons. First, they are well suited for exploring warnings about complex and sometimes sensitive issues. Second, more data can be accessed through the unstructured questions that follow a participants' initial

answers. The contextual effects that are evident in the participant's narratives but are not always so well explained can also be explored (Galletta, 2013).

The interview question design process began by examining the purpose of the study to determine whether the research questions could be addressed by this method. Once this was confirmed, prior knowledge was used to formulate the pre-interview tip. The literature review was essential for developing prior knowledge (Kallio et al., 2016).

Tables 5 and 6 show the studies referred to in designing the semi-structured interview questions for customers and restaurant employees, respectively.

Table 3: Sources of Semi-Structured Interview Questions for Employees

AUTHORS	QUESTIONS
	GENERAL QUESTIONS
La Barbera et al. (2016)	1) Does your restaurant generate food waste? If yes, what do you think are the reasons?
Goh and Jie (2019)	2) Do you evaluate leftovers on the plate? If yes, how do you evaluate them? If not, what are your reasons?
La Barbera et al. (2016)	3) What types of food do your customers leave on their plates most frequently? (e.g., main course, rice, side dishes like pasta, sweet, fruit, salad, bread)
Liao et al. (2018)	4) Do you measure the leftovers in your restaurant? If yes, which methods do you use? If no, why not?
Goh and Jie (2019)	5) Where does food waste occur most frequently according to your observations? (e.g., kitchen, storage area)
Lorenz et al. (2017)	6) Do you think the leftovers left in this restaurant are a problem for your restaurant? If yes, why?
Wang et al. (2017)	7) Do you leave food on your plate at home? If yes, why?

	ECONOMIC IMPACT
Dolnicar et al. (2020)	8) How would you evaluate the economic impact of leftover food in this restaurant? (e.g., tax relief to restaurants that recycle waste food)
Dolnicar et al. (2020)	9) What are the effects of food waste generated in your restaurant on costs? (What should be done to reduce these effects?)
	SOCIAL IMPACT
Zhao et al. (2019)	10) How would you evaluate the social impact of leftover food in this restaurant?
Zhao et al. (2019)	11) Would a social campaign to prevent food waste in this restaurant have an impact? (e.g., end-of-the-month rewards for customers who don't leave any food on their plates)
	ENVIRONMENTAL IMPACT
Williams & Walton (2011)	12) What do you think is the the environmental impact of food waste in this restaurant?
	SUGGESTIONS
Alcorn et al. (2020)	13) How could this restaurant reduce food waste? (e.g., packing leftover food, reducing portions, changing cooking methods, working with recycling companies)
Alcorn et al. (2020)	14) How do you prevent or reduce food waste in this restaurant yourself?
	SUGGESTIONS FOR REDUCING FOOD WASTE
Dou et al. (2021)	15) What do you think should be done about storing or recycling leftover food? (What are the operational processes and your preferred methods?)
Pancino et al. (2021)	16) Do you take any precautions on the kitchen side to prevent food waste in this restaurant? If yes, what kind of precautions do you take? (e.g., storing food in appropriate conditions, not ordering more food than for daily or weekly needs)
Pancino et al. (2021)	17) Have you received any training on evaluating waste food in your restaurant? If yes, what kind of training have you received?

Table 4: Sources of semi-structured interview questions for Customers

AUTHORS	QUESTIONS
	GENERAL QUESTIONS
Coşkun & Özbük (2020)	1)Does the food served in the restaurant meet your expectations? If no, why not?
Neubig et al. (2020)	2) What do you think are the causes of food waste in this restaurant? (e.g., food left on the plate, waste from faulty service, waste in the kitchen, wrong demand forecast)
Lorenz et al. (2017)	3) What types of food (e.g., main course, side dish (rice, pasta), fruit, sweet, etc.) do you usually leave on your plate?
Neubig et al. (2020)	4) Do you think that leftover food on your plate is a problem for this restaurant? If yes, why?
Bhatti et al. (2019)	5) Do you leave food on your plate at home? If yes, why?
Lorenz et al. (2017)	6) Which age groups do you think leave more food on their plates in this restaurant? Why?
	FOOD WASTE REASONS
Pellegrini et al. (2019)	7) Why do you leave food on your plate? (e.g. food you didn't like, overlarge portion, insufficiently hungry, allergies, insensitive about hygiene, food waste)
	SUGGESTIONS FOR REDUCING FOOD WASTE
Ghanem (2020)	8) How do you think this restaurant can reduce the amount of leftover food?
McAdams et al. (2019)	9) How important do you think it is to include food waste into the economy? (1: extremely unimporant, …. 5: extremely important)
Kim & Morawski (2012)	10) As a customer of this restaurant, what do you do to incorporate leftover food into the economy? (e.g., donating to stray animals, taking unfinished food home)
Kim & Morawski (2012)	11) What should the owner (operator) of this restaurant do to prevent food waste? (e.g., predict customer demand correctly, manage food orders accurately, store food at appropriate temperatures, buy better ingredients)

McAdams et al. (2019)	12) What should the owner (operator) of this restaurant do to incorporate food waste into the economy? (e.g., contracting with other businesses that make animal feed, fertilizer, etc., distributing leftover meals to those in need, donations)
	ENVIRONMENTAL IMPACT
Visschers et al. (2020)	13) What do you think is the environmental impact of food waste in this restaurant?
	ECONOMIC IMPACT
Katare et al. (2019)	14) What do you think is the impact of leftover food in this restaurant on the economy?
	SOCIAL IMPACT
Marlette et al. (2005)	15) What do you think is the social impact of leftover food in this restaurant?
	COVID 19 EFFECT
Burlea-Schiopoiu et al. (2021)	16) How do you think the Covid 19 pandemic has affected food waste in this restaurant? Has it increased or reduced it? Why?
Burlea-Schiopoiu et al. (2021)	17) Do you think the Covid 19 pandemic affects food waste management in this restaurant? (e.g., recycling costs)
	CHALLENGES IN REDUCING FOOD WASTE
Yon et al. (2012)	18) What do you think are the difficulties in reducing leftovers in this restaurant?
Yon et al. (2012)	19) What can you do to prevent leftovers in this restaurant? What do you do to prevent food leftovers yourself?

For employees, there were 17 open-ended questions under six main headings: general questions, economic impact, social impact, environmental impact, suggestions, and suggestions for reducing food waste. For the restaurant customers, there were 19 open-ended questions for customers under eight main headings: general questions, food waste reasons, suggestions for reducing food waste and implications, environmental impact, economic impact, social impact, covid 19 pandemic effect, and challenges in reducing food waste.

The general questions addressed waste evaluation, what kind of food is wasted, whether food waste is measured, frequency of eating, level of satisfaction with the food, and problems with food on the plate. Other questions identified the reasons for the extent of plate waste, which age groups create leftovers, why people leave food on their plates, and what can be done to stop it. Questions about the challenges of reducing plate waste identified the factors that hinder reducing food waste in the restaurant. Recommendations for plate waste analyzed what individuals or organizations can do to reduce food waste in the restaurant. Other questions addressed the possible effects of the current covid-19 pandemic on food waste. Finally, questions related to sustainability analyzed the economic, environmental, and social impacts of the restaurant's food waste.

5. FINDINGS

The interview findings are discussed below in seven sections corresponding to the seven headings. The following items were coded specifically as important topics: causes of plate waste, types of food left on the plate, areas where plate waste occurs, plate waste measurement, awareness of reusing plate waste, the impact of plate waste on sustainability, and recommendations for reducing plate waste.

5.1. Semi Structured Interview Findings for Employees

Semi-structured interviews were first conducted with eight restaurant employees, and the readability and comprehensibility of the questionnaire items were revised in line with their suggestions. As seen in Table 5 below, the employees' gender, age, income, marital status, education, and job were also identified.

Table 5: Employees' Demographic Characteristics

Characteristic	Number (N)	Percentage (%)
Gender		
Female	3	37
Male	5	63
Total	8	100
Age (years)		
18-25	3	38
26-35	1	16
36-45	2	30

46-55	1	16
Total	8	100
Marital status		
Married	5	63
Single	3	37
Total	8	100
Education level		
High school	7	88
University	1	12
Total	8	100
Years working in the restaurant		
0-2 years	3	37.5
3-5 years	1	12.5
6-8 years	4	50
Total	8	100

For example, as shown in Table 3, employees were more likely to be male, young, and married. In addition, the degree of high school graduates from employees is very high, and half of the employees have worked at the restaurant for between six and eight years.

5.1.1. Causes of Plate Waste

According to Buzby and Guthrie (2002), plate waste is caused both by restaurant customers and inexperienced employees. In traditional home restaurants, it is critical to ensure the quality of food to prevent plate waste. Most of the restaurant employees attributed plate waste to the customers' lack of awareness and cooking more than demanded. Customers also order more food than they need, so they do not eat it all. One participants mentioned some other reasons:

Our business owner and employers do not have enough experience. Also, we do not work with any recycling company. (restaurant employee, 40, male)

5.1.2. Types of Food Left on The Plate

According to the employees, salad and bread were left the most, although observation indiciated customers mainly waste the main dish itself. The type of foods that were least wasted were sweets, fruit, and side dishes. As two employees reported,

Customers leave many types of food, such as fruit, salad, and bread. (restaurant employee , 38, female)

Customers leave many types of food, such as fruit, main course, and side dishes (restaurant worker, 25, male)

5.1.3. Areas Where Plate Waste Occurs

Waste was most frequently generated after the meals had been served to the customers. The main reasons were that customers order too much or do not like the food they ordered. However, observation also indicated that plate waste is generated while serving and in the kitchen. In contrast, less waste is generated in storage areas.

Waste is generated during serving, sometimes during storage (restaurant employee, 23, male)

Waste is generated while serving customers (restaurant employee, 33, male)

5.1.4. Plate Waste Measurement

The interview responses indicated that both restaurant employees and the owner of the restaurant are aware about the amount of plate waste. However, they do not measure plate waste and lack training and knowledge about this. Some participants agreed that training could help them reduce or prevent plate waste. Williams and Walton (2011) demonstrated the benefits of their plate waste measuring method. Each waste food categorized to determine which had types generated more waste and reduce plate waste by reducing waste generation for these foods. The most comprehensive measure of plate waste is the percentage of energy content (calories) of total food ordered but not consumed. The interviewees' comments on this topic included the following:

No, we do not consider [plate waste]. Inedible food is thrown away. We have no knowledge and take no action on this matter. (restaurant employee, 25, male)

No. We take no precautions on this subject, but we want to work for the future. (restaurant employee, 45, female)

5.1.5. Awareness of Utilizing Plate Waste

Lack of awareness about food waste is a major reason for slow progress in reducing food waste (Pinto et al., 2018). Derqui et al. (2016), not creating food waste depends on the behavior of individuals. The reason they waste food and leftovers depends on the actions of individuals interacting with each other. Therefore, identifying the causes of plate waste will help to significantly reduce current food waste in restaurants.

Most of the restaurant employees in the present study lack the knowledge or training to reduce food waste, so inedible food goes to waste. The interviews clearly show the employees' lack of awaraness about plate waste. All participants accepted the existence of plate waste and stated that they had no idea how to reuse it: Yes, inedible

food waste piles up but we do not know exactly how to recycle them. (restaurant employee, 25, male)

I do not think there is any big problem. We throw away the accumulated waste. (restaurant employee, 33, male)

Figure 1. The visual map of categories and codes for employees
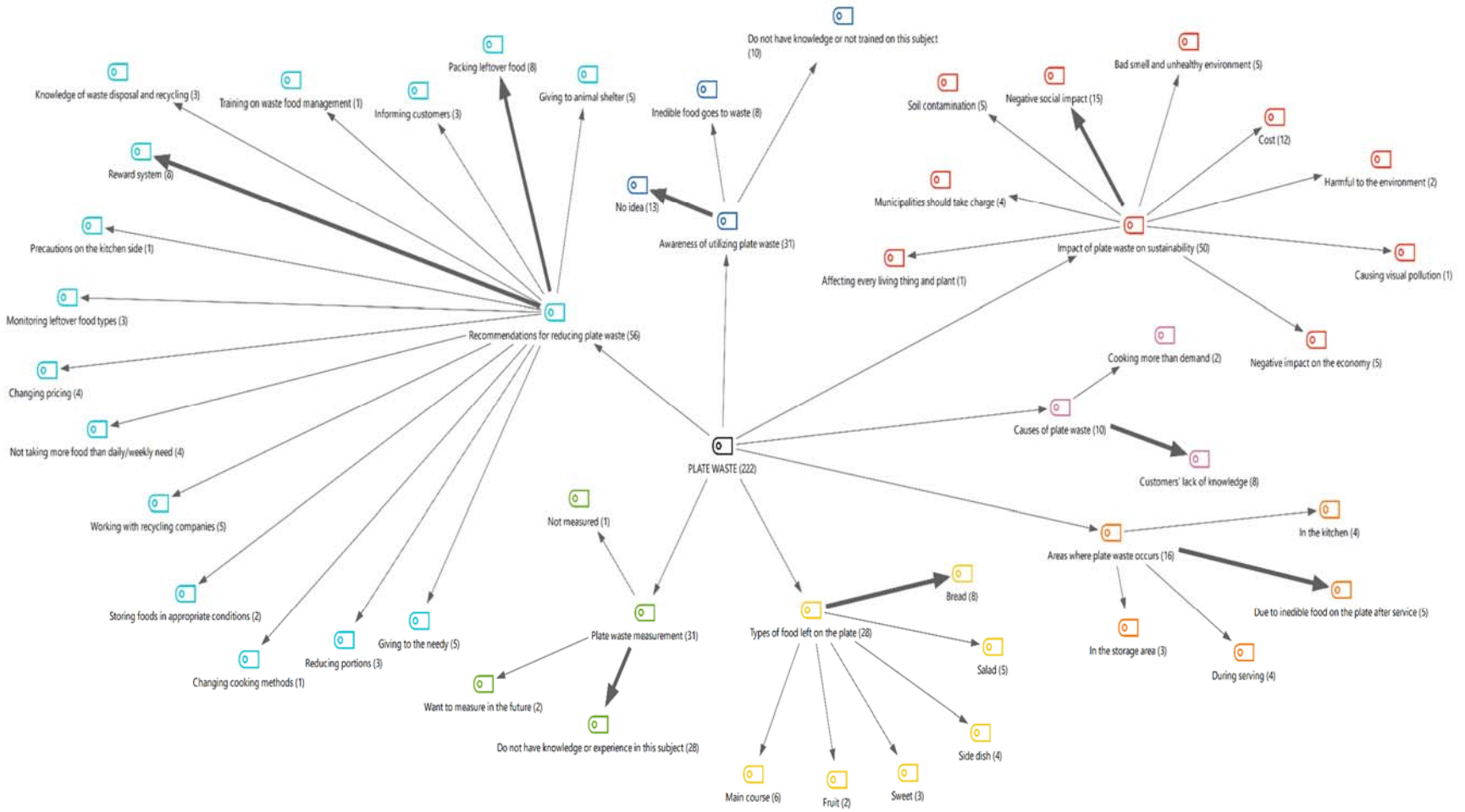
Table 6. Categories, codes, for employees

Categories	Codes
Causes of plate waste	Customers' lack of knowledge Cooking more than demand
Types of food left on the plate	
	Main course Side dish Sweet Fruit Salad Bread
Areas where plate waste occurs	
	During serving In the kitchen In the storage area Due to inedible food on the plate after service
Plate waste measurement	
	Not measured Do not have knowledge or experience in this subject Want to measure in the future

Awareness of utilizing plate waste	
	Do not have knowledge or not trained on this subject
	No idea
	Inedible food goes to waste
Impact of plate waste on sustainability	
	Cost
	Negative impact on the economy
	Harmful to the environment
	Bad smell and unhealthy environment
	Causing visual pollution
	Soil contamination
	Affecting every living thing and plant
	Negative social impact
	Municipalities should take charge
Recommendations for reducing plate waste	
	Giving to animal shelter
	Giving to the needy
	Packing leftover food
	Reducing portions
	Changing pricing
	Changing cooking methods
	Monitoring leftover food types
	Working with recycling companies
	Knowledge of waste disposal and recycling
	Precautions on the kitchen side

	Storing foods in appropriate conditions
	Not taking more food than daily/weekly need
	Training on waste food management
	Informing customers
	Reward system

5.1.6. The Impact of Plate Waste on Sustainability

The semi-structured interviews revealed a high level of plate wastage in the restaurant. Many organizations in developed countries have recently begun to focus on the environmental, economic and social impact of food waste on their sustainability (Thiagarajah et al., 2015). However, the main problem of this restaurant is that plate waste is increasing but the employees do not evaluate it in terms of sustainability.

The participants in the present study agreed that plate waste causes environmental, economic, and social problems. More specifically, they said that the economic cost will fall on the restaurant while unused products will charm the country's economy. However, some stated that they were not aware of this issue:

I do not think it has much effect on an economy. (restaurant employee, 25, male)

While the participants did not have enough information about environmental effects, they offered some ideas, such as that food waste harms the environment, animals, and plants, causes bad smells, and pollutes the soil.

I believe it creates a bad smell and an unhealthy environment. On the other hand, I don't think the effects of waste are much. (restaurant employee, 38, male)

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Finally, the participants were not sufficiently aware of social impacts. Although they said they do not waste food at home, they pay no attention to this issue in the restaurant.

I do not leave plate waste at home (restaurant employee, 45, male)

As we are unaware of its social impact, I think this type of waste generation will continue. (restaurant employee, 23, male)

The participants suggested that municipalities should collect and evaluate waste food by organizing various awareness-raising campaigns to encourage customers and restaurants.

I think that the reflection on the costs is low, we should determine the causes of the effects and create a solution. (restaurant employee, 47, male)

5.1.7. Recommendations for Reducing Plate Waste

The participants suggested that plate waste should be given to animal shelters and people in need. In principle, they believe that plate waste can be reduced by reducing portion sizes. They also suggested that each dish be priced individually rather than on a fixed menu. Most recently, the restaurant staff can now pack food for those who want to take it home. Other suggestions included changing cooking methods, reducing food portions, monitoring which foods are left by customers, and reducing food purchasing. They also suggested working with a recycling company to create a waste disposal and recycling system. Other suggestions included kitchen side precautions, storage of food in suitable conditions daily/weekly, not buying more food than needed, waste food management training, informing customers, and organizing a reward system. Participants also mentioned the challenges that could hinder implementation of these recommendations. They stated that food waste could not be reduced because of not implementing these recommendations. Example answers are given below:

Remaining food can be packaged and distributed to animals and dormitories or it can be used for recycling. (restaurant employee, 40, male)

Customers can reduce waste generation with this reward system. (restaurant employee, 33, male)

Packages can be distributed to those in need and portions can be reduced. (restaurant employee, 47, male)

An effective way should be followed by working with companies that can reuse inedible food and the remainder is served. (restaurant employee, 22, male)

5.2. Semi Structured Interview Findings for Customers

The interview findings for customers are discussed below in the following nine sections corresponding to the nine dimensions.

Interviews were conducted with 60 consumers who visited the restaurant. The readability and clarity of the questions were revised in line with the respondents' suggestions. Data was also collected on their gender, age, income, marital status, education, and occupation to determine the times that different customers preferred to visit.

Table 7: Demographic Characteristics of the Customers

Characteristic	Number of people (N)	Percentage (%)
Gender		
Female	24	40
Male	36	60
Total	60	100
Age (years)		
18-25	5	8

26-35	29	48
36-45	16	27
46-55	9	15
56 and above	1	2
Total	60	100
Marital status		
Married	37	62
Single	23	38
Total	60	100
Education level		
High school	10	16
Undergraduate	49	82
Postgraduate	1	2
Total	60	100
Restaurant preference year		
0-2 years	48	80
3-5 years	11	18
6-8 years	1	2
Total	60	100
Job		
Worker	56	93
Retired	1	2

Student	3	5
Total	60	100

For example, as shown in Table 7, customers were more likely to be male, 26-35 years old, married and have a university degree. In addition, the number of undergraduates are very high, and the period of restaurant selection of customers are from one to two years. Finally, the majority of respondents have jobs.

The findings for the interviews with the restuarant's customers are discussed below in the following nine sections corresponding to the nine dimensions in the questionnaire.

5.2.1. Satisfaction

Meeting the needs of consumers for food sustainability poses a great challenge (Fox et al., 2019). Therefore, it is very important that restaurants take precautions to prevent plate waste. Most of the participants stated that they were satisfied with the food.

Yes, satisfying (25, male, lawyer, single)

For those participants who were dissatisfied, one said that he left food on his plate because of its taste while another mentioned lack of variety. In fact, the most frequent source of dissatisfaction was variety problems. Taste of the food and coldness also caused dissatisfaction.

No, the reason is that there is not enough variety of food and the taste of the food is not good, (26, female, architect, single)

5.2.2. Causes of Plate Waste

The main reasons why the participants left food was not being hungry enough. However, they also claimed that the restaurant's employees also caused plate waste because of their insensitivity to the sources of food waste. For example, participants left dishes they did not like on their plates, including because of wrong demand estimates and defective service.

I think food waste caused by incorrect demand forecasting. (55, head teacher, male, married)

I think food waste caused by incorrect service. (35, architect, male, married)

Incorrect service and food left on the plate, I think kitchen waste is a problem. (35, lawyer, male, married)

I think there was incorrect service and food left on the plate. (31, caretaker, male, married)

Finally, the restaurant should pay attention to hygiene conditions. In addition, participants may october be able to eat certain foods in the restaurant if they have food allergies. The restaurant should pay attention to these problems or it will cause food waste. That is, restaurant customers who have hygiene problems while eating or are allergic to food do not want to eat.

I sometimes leave food on the plate when I am not hungry enough, and when there is a problem with hygiene (28, head teacher, male, married)

I usually leave food on my plate when I'm not hungry enough or ıf I have a food allergyI'm alle (35, barber, male, single)

5.2.3. Types of Food Left on the Plate

The most frequently left food types were side dish and sweet. However, observation inidicated that customers waste more of the main dish. The least wasted food types were salad, fruit, and bread.

Sometimes I do not eat sweet or fruit. (42, nurse, female, married)

Sometimes I do not eat side meal or a main meal. (53, teacher, female, single)

5.2.4. Age Groups That Cause Most of the Leftovers in The Restaurant

Most participants said that those who leave food on their plates lack awareness about waste management. Participants also suggested that younger customers are more likely to waste food because they are unaware about this issue.

I know that young people are not conscious enough about this issue. (28, head teacher, male, single)

Those who are not conscious about waste left on their plates. (55, head teacher, male, single)

However, they also claimed that older, middle-aged, and small businessmen would be unaware about plate waste.

5.2.5. Challenges for Reducing Plate Waste

According to the restaurant's customers, one of the greatest challenges to reducing plate waste is the lack of awareness of the owner and employees. Therefore, they cannot find solutions to reduce it.

In my opinion, the owner and employees cannot find a solution to reduce the amount of waste. (33, small businessman, male, married)

However, another reason is that unaware customers do not do anything about the issue. Other waste reduction challenges that participants mentioned included producing more than demand, lack of supervision by municipalities, not cooperating with institutions on waste management, and people taking more food than they need (greedy people).

No matter how much warning is given to insensitive customers, the desired effect cannot be achieved. (45, head teacher, female, married)

5.2.6. Customers᾽ Awareness about Reusing Plate Waste

Raising awareness can also help reduce food waste (Mirosa et al., 2016) since the consumer's behavior is greatly influenced by their level of education and knowledge (Zeineddine et al., 2016). Consumer awareness describes the extent to which customers are aware of their purchasing decisions or responsibilities.

In the present study, most participants claimed that they do not leave food on their plates, especially at home.

I do not leave food on plates. (43, grocer owner, male, married)

However, a few either had no opinion, did nothing, or had no knowledge or training.

I don't do anything. (22, teacher, male, single)

Although the responses clearly show that awareness levels are low, some participants agreed that food was being wasted and offered suggestions about how to reuse it. Instead of leaving food on the plate, customers can take it home or give it to street animals. One well-aware customer suggested using the waste as fertilizer.

I give leftovers to street animals. (65, retired, male, married)

Figure 2. The visual map of categories and codes for customers

Table 8. Categories, Codes, for Customers

Categories	Codes
Satisfaction	
	Satisfied
	Unsatisfied
	Taste of food
	Variety problems
	Cold food
Causes of plate waste	Faulty service
	Kitchen wastage
	Incorrect demand forecast
	Disliked food
	Portion size
	Not being hungry enough
	Allergy problems
	Hygiene problems
	Insensitivity to food waste
	Inexperience of the owner and employees
	Not working with recycling companies
Types of food left on the plate	
	Main course
	Side dish
	Sweet
	Fruit
	Salad
	Bread

Age groups that leave the most food	
	Young
	Old
	Middle-aged
	Those who are unaware about waste management
	Small businessmen
Challenges to reducing plate waste	
	Inability to find a solution to reduce the amount of waste
	Producing more than demand
	Unaware customers
	Lack of supervision by municipalities
	Unawareness of the owner and employees
	Not cooperating with institutions on waste management
	People getting more food than they need (greedy people)
Customers' awareness about reusing plate waste	
	No knowledge or training on this subject
	No idea
	Not doing anything about it
	Giving plate waste to animals
	Not leaving plate waste
	Packing leftover food and taking it home
	Making fertilizer from plate waste

Impact of plate waste on sustainability	
	Negative impact on the economy
	Negative impact on the environment
	Unpleasant smell and unhealtyv environment
	Causing visual pollution
	Soil contamination
	Affecting all living things and plants
	Negative social impact
	Negative cost impact
	Cost for the restaurant
	Greenhouse effect
	Negative impact on underground water resources
	Poverty
	No economic effect
Effect of Covid-19 on plate waste and waste management	
	Increased recycling costs
	Reduction of plate waste due to decreased restaurant demand
	Reduction of waste because restaurants are closed
	No effect
	Negative impact on waste collection
	Negative impact on the environment

Customer suggestions for reducing plate waste	
	Forecasting customer demand accurately
	Better order management
	Better planning for needs
	Storing foods at appropriate temperatures
	Better food item purchasing
	Higher employee awareness
	Greater variety of foods
	Working with the municipality and recycling companies
	Working with animal feed companies
	Creating community awareness
	Preparing a special menu
	Reducing portion sizes
	Packing leftover food
	Giving leftover food to the needy
	Giving leftover food to animal shelters
	Encouraging customers not to leave plate waste
	Social media campaigns

5.2.7. The Impact of Plate Waste on Sustainability

Many organizations in developed countries have established different methods to assess the economic, social, and environmental impacts of the food system (Heller & Keoleian, 2003). The participants in the present study agreed that food waste harms the environment. They mentioned various problems, such as "unpleasant smell and unhealty environment", "visual pollution", "soil contamination that affects every living thing and plant", "greenhouse gas effect", and "negative impact on underground water resources".

It affects the environment negatively, and methane gas is formed, polluting the atmosphere and causing soil contamination. (27, insurer, female, single)

In contrast, there was no clear consensus regarding the economic effects. While a majority of customers believed that plate waste has economic effects, increases restaurant costs, and has a negative impact on food purchased, others said that there is no economic impact.

I do not think it has an economic impact. (35, barber, male, single)

There was a lack of awareness about the negative social effects of plate waste, although participants suggested raising people's awareness. Some participants stated that not being able to reuse or recycle waste food causes poverty.

I think we can have an impact on this issue by making everyone aware of each other. (31, caretaker, male, married)

5.2.8. The Effect of Covid-19 on Plate Waste and Waste Management

Food acquisition patterns have fundamentally changed during the Covid-19 pandemic (Moorthy et al., 2020). For example, time spent in restaurants and hotels decreased by over 60% (Chetty et al. 2020) while demand for food and beverages was almost eliminated. The lack of restaurant customers caused financial losses (Nazneen et al., 2020), creating an extremely deep crisis is extremely deep. This has wider effects in Turkey as restaurant businesses provide significant employment while also being very risky (Balcı and Çetin, 2020). Filimonau (2021) found that the pandemic reduced restaurant customers' intentions to purchase, recommend, or pay more.

It has reduced waste generation because people do not want to go to the restaurant because they are afraid of the virus. (47, teacher, female, married)

Some participants suggested that plate wastage was lower during the Covid-19 pandemic because daily restaurant demand had fallen, although some believed there was no effect on plate waste.

The participants believed that recycling companies would not collect waste food from restaurants during the pandemic, which would have environmental effects and increase the restaurant's costs.

I think there will be problems in collecting waste. (48, architect, male, married)

5.2.9. Suggestion of Customers to the Restaurant Owners for Reducıng Plate Waste

The majority of participants suggested giving leftover food to animal shelters. Other ways to reduce plate waste included "getting better food items", "storing foods at appropriate temperatures", "increasing the variety of foods". In addition, "making better planning for needs", "working with the municipality and recycling companies", "forecasting customer demand accurately and better order management", "working with animal feed companies", "preparing a special menu", and "portion size reduction".

I get my left over food food packed and take it home (37, lawyer, female, married)

Participants recommended packaging leftover food and giving it to those in need. This could be turned into a social campaign to create community awareness and set an example for other restaurants. Costumers suggested encouraging them not to give up.

It can be used as animal feed, or restaurants can work with companies that distribute food to those in need, or the restaurant owner can work with a recycling company. (29, teacher, female, single)

6.CONCLUSION

6.1. Theoretical Contribution

This study aimed to identify the reasons for plate waste in a restaurant and analyze the behavioral intentions of customers and restaurant employees to find sustainable solutions to plate waste based on the framework of the theory of planned behavior. Specifically, this theory helps in understanding the development of behavior, and the behavioral intentions of the restaurant's customers and employees regarding food waste management.

Consistent with previous research (e.g., Raab et al., 2018), the findings in this study draw on the theory of planned behavior to determine participants' awareness of food waste and their suggestions to reduce it. In addition, emphasizing the importance of sustainability, the participants also suggested solutions to the environmental, social, and economic problems of waste generation. Various studies of plate waste and food waste management in restaurants have used the theory of planned behavior (e.g., Coşkun and Filimonau, 2021). The present study contributed to the literature by focusing on the role of both customers and restaurant employees in generating plate waste, and by suggesting solutions to reduce this problem.

More specifically, the literature on plate waste usually focuses on either customers or food waste measurement (Coskun and Filimonau, 2020). The findings in the present study indicated that neither customers nor employees are sufficiently aware about food waste. This is consistent with the work of Yu et al. (2021), who analyzed the behavior of restaurant employees and customers and identified their recommendations. These included working with a recycling company, giving food to animals and those in need, and changing the demand system. These suggestions show that it is not difficult to reduce food waste.

Drawing on the theory of planned behavior, the semi-structured interviews showed that both customers and restaurant employees play a role in generating plate waste, so they should work together to achieve sustainability. However, the main responsibility lies with the employees. They can solve the problem of waste generation in the restaurant through various practices, such as changing food storage,

measuring food, and working with the municipality. One of the most important factors in reducing plate waste is that restaurant employees should receive training on waste management.

While the issue of providing sustainable food in restaurants has already been examined by many researchers (Dolnicar et al., 2017), the present study makes an original contribution by identifying the causes of plate waste in restaurants and considering the roles of both employees and customers in relation to the theory of planned behavior. The study is also unique in examining the effects of plate waste in terms of social, economic, and environmental sustainability. Finally, this study also investigated the effect of the Covid-19 pandemic on restaurant food wastage by observing how the behavior of customers and employees changed.

6.2. Managerial Contribution

The MAXQDA analysis showed that some customers were dissatisfied with the food in the restaurant. However, plate wastage also occurs when even satisfied customers lack awareness about plate waste. Thus, restaurant owners and employees should take various steps regarding the effects of plate waste on sustainability. These include preparing menus that meet customer needs more accurately by estimating demand and implementing better ordering methods. Regarding dissatisfied customers, the restaurant should increase the variety and quality of the food it offers. Finally, reducing plate sizes can decrease the amount of waste generated.

The restaurant owner should create a waste management system to reduce plate waste in the restaurant. First, plate waste should be classified as bread, salad, fruit, main dishes, etc. to identify which types of food are most often wasted. Second, plate waste can be segregated and then sent to people in need or animal farms through recycling companies and municipalities. Third, greater effort is needed to raise awareness through brochures, campaigns, etc. Fourth, the restaurant's employees should receive training on waste management to ensure effective planning for the collection of food waste in the restaurant. Finally, the restaurant's employees need to be aware how the Covid-19 pandemic has affected waste management. The

restaurant owner should plan to ensure that food waste is disposed of appropriately given the new conditions.

Based on the MAXQDA analysis, Figure 3 presents a proposed flow system to reduce food wastage in the restaurant and enable better planning for the restaurant's needs. Social awareness to reduce plate waste in the restaurant can be raised through posters, brochures, and announcements. Training on sorting systems can be organized to make both employees and customers more knowledgeable about food waste. One advantage of such training is that it can offer incentives to customers to avoid plate waste. Finally, separated waste food, such as bread, salad, fruit, and main courses, can be packaged for customers to take home or sent to animal farms, etc.

Figure 3. Social, environmental, and economic benefits of proposed flow system
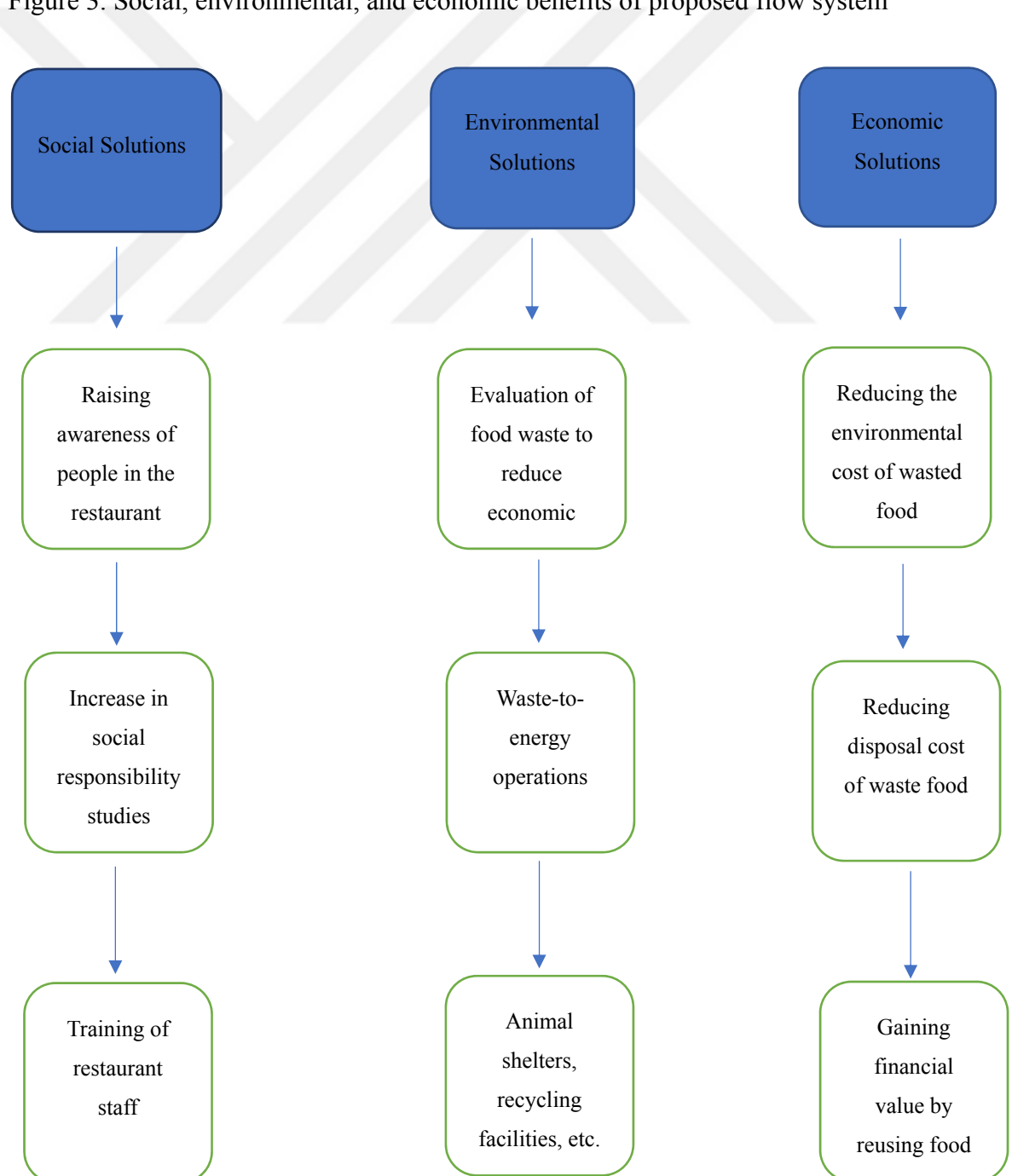
This proposal will enable the restaurant to develop its social responsibility as an exemplary role model. If the restaurant does not reuse or recycle its food waste, then it causes soil pollution, harms animals and plants, and results in greenhouse gas formation. The proposed system allows the restaurant to help the economy by separating and reusing plate waste. Finally, while residual food is an economical cost for the restaurant, the proposed system reduces costs by effectively managing food waste. Thus, if the restaurant works with a recycling company, it will benefit.

6.3. Limitation and Further Research

The first limitation of this study is that it is difficult to generalize the results since the analysis only covered a single restaurant. Second, because the study analyzed a traditional home-cooked restaurant rather than a large restaurant, the number of interview participants was limited. Third, the interviews could not last too long because of the restaurant's short opening hours. The fourth limitation is that the interview participants had insufficient knowledge about waste management. Lastly, even if the restaurant accepts the proposed solutions, it still requires economic incentives for them to be feasible.

Further research can be conducted in other types of restaurants rather than a single traditional restaurant. Future research can also focus on the kitchen side to develop better capacity planning and demand planning during meal preparation. Research can be conducted with both restaurants and recycling companies. In addition, future studies can investigate the effects of the Covid-19 pandemic on reducing and recycling of food waste, and the behavior of employees and customers regarding food waste management. Finally, a social campaign and study can be developed for both customers and employees to address the need to measure restaurants' perceptions of food waste management and sustainability.

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ATTACHMENTS

APPENDIX 1: SEMI STRUCTURED INTERVIEW FORM

Academic Research: Food Waste Management: Example From Servıce Industry

Dear Participants,

I am a master's thesis student at Yaşar University, Department of International Logistics Management. The subject of my thesis is "food waste management: example from servıce ındustry". This study aimed to identify the reasons of plate waste in a restaurant and analyze the behavioral intentions of customers and restaurant employees to find sustainable solutions to plate waste based on the framework of the theory of planned behavior. We declare that the answers given to the interview questions will remain completely confidential and will be used for scientific purposes.

Thank you in advance for your contribution to this scientific study.

MUSTAFA TİBET EĞMEN, Yasar University

QUESTIONS TO EMPLOYEES

Age:

Gender:

Occupation:

Education:

How long have you been working at this restaurant?

GENERAL QUESTIONS

1) Does your restaurant generate food waste? If yes, what do you think are the reasons?

2) Do you evaluate leftovers on the plate? If yes, how do you evaluate them? If not, what are your reasons?

3) What types of food do your customers leave on their plates most frequently? (e.g., main course, rice, side dishes like pasta, sweet, fruit, salad, bread)

4) Do you measure the leftovers in your restaurant? If yes, which methods do you use? If no, why not?

5) Where does food waste occur most frequently according to your observations? (e.g., kitchen, storage area)

6) Do you think the leftovers left in this restaurant are a problem for your restaurant? If yes, why?

7) Do you leave food on your plate at home? If yes, why?

ECONOMIC IMPACT

8) How would you evaluate the economic impact of leftover food in this restaurant? (e.g., tax relief to restaurants that recycle waste food)

9) What are the effects of food waste generated in your restaurant on costs? (What should be done to reduce these effects?)

SOCIAL IMPACT

10) How would you evaluate the social impact of leftover food in this restaurant?

11) Would a social campaign to prevent food waste in this restaurant have an impact? (e.g., end-of-the-month rewards for customers who don't leave any food on their plates)

ENVIRONMENTAL IMPACT

12) What do you think is the the environmental impact of food waste in this restaurant?

SUGGESTIONS

13) How could this restaurant reduce food waste? (e.g., packing leftover food, reducing portions, changing cooking methods, working with recycling companies)

14) How do you prevent or reduce food waste in this restaurant yourself?

SUGGESTIONS FOR REDUCING FOOD WASTE

15) What do you think should be done about storing or recycling leftover food? (What are the operational processes and your preferred methods?)

16) Do you take any precautions on the kitchen side to prevent food waste in this restaurant? If yes, what kind of precautions do you take? (e.g., storing food in appropriate conditions, not ordering more food than for daily or weekly needs)

17) Have you received any training on evaluating waste food in your restaurant? If yes, what kind of training have you received?

QUESTIONS TO CUSTOMERS

Age:

Gender:

Occupation:

Education:

How long have you been choosing this restaurant?

GENERAL QUESTIONS

1)Does the food served in the restaurant meet your expectations? If no, why not?

2) What do you think are the causes of food waste in this restaurant? (e.g., food left on the plate, waste from faulty service, waste in the kitchen, wrong demand forecast)

3) What types of food (e.g., main course, side dish (rice, pasta), fruit, sweet, etc.) do you usually leave on your plate?

4) Do you think that leftover food on your plate is a problem for this restaurant? If yes, why?

5) Do you leave food on your plate at home? If yes, why?

6) Which age groups do you think leave more food on their plates in this restaurant? Why?

FOOD WASTE REASONS

7) Why do you leave food on your plate? (e.g. food you didn't like, overlarge portion, insufficiently hungry, allergies, insensitive about hygiene, food waste)

SUGGESTIONS FOR REDUCING FOOD WASTE

8) How do you think this restaurant can reduce the amount of leftover food?

9) How important do you think it is to include food waste into the economy? (1: extremely unimporant, …. 5: extremely important)

10) As a customer of this restaurant, what do you do to incorporate leftover food into the economy? (e.g., donating to stray animals, taking unfinished food home)

11) What should the owner (operator) of this restaurant do to prevent food waste? (e.g., predict customer demand correctly, manage food orders accurately, store food at appropriate temperatures, buy better ingredients)

12) What should the owner (operator) of this restaurant do to incorporate food waste into the economy? (e.g., contracting with other businesses that make animal feed, fertilizer, etc., distributing leftover meals to those in need, donations)

ENVIRONMENTAL IMPACT

13) What do you think is the environmental impact of food waste in this restaurant?

ECONOMIC IMPACT

14) What do you think is the impact of leftover food in this restaurant on the economy?

SOCIAL IMPACT

15) What do you think is the social impact of leftover food in this restaurant?

COVID 19 EFFECT

16) How do you think the Covid 19 pandemic has affected food waste in this restaurant? Has it increased or reduced it? Why?

17) Do you think the Covid 19 pandemic affects food waste management in this restaurant? (e.g., recycling costs)

CHALLENGES IN REDUCING FOOD WASTE

18) What do you think are the difficulties in reducing leftovers in this restaurant?

19) What can you do to prevent leftovers in this restaurant? What do you do to prevent food leftovers yourself?

EK 1: YARI YAPILANDIRILMIŞ GÖRÜŞME FORMU

Akademik Araştırma: Gıda Atık Yönetimi: Hizmet Sektöründen Örnek

Sayın Katılımcılar,

Yaşar Üniversitesi Uluslararası Lojistik Yönetimi Bölümü'nde yüksek lisans tez öğrencisiyim. Tezimin konusu "Gıda Atıkları Yönetimi: Hizmet Sektöründen Bir Örnek". Bu çalışma, bir restoranda tabak israfının nedenlerini belirlemeyi ve planlı davranış teorisi çerçevesinde müşterilerin ve restoran çalışanlarının tabak israfına sürdürülebilir çözümler bulmaya yönelik davranışsal niyetlerini analiz etmeyi amaçlamıştır. Anket sorularına verilecek cevapların tamamen gizli kalacağını ve bilimsel amaçlarla kullanılacağını beyan ederiz.

Bu bilimsel çalışmaya yapacağınız katkılardan dolayı şimdiden teşekkür ederiz.

MUSTAFA TİBET EĞMEN, Yaşar Üniversitesi

Yaş:

Cinsiyet:

Medeni durum:

Eğitim:

Ne kadar süredir bu restoranda çalışıyorsunuz?

GENEL SORULAR

1)	Restoranınızda gıda atığı oluşuyor mu? Evet ise nedenleri sizce nelerdir?

2)	Tabakta kalan yemek artıklarını değerlendiriyor musunuz? Evetse nasıl değerlendiriyorsunuz? Hayırsa değerlendirmeme neden/nedenleriniz nedir?

3)	Müşterileriniz en çok hangi tür yiyecekleri tabaklarında bırakıyorlar? (Örneğin; ana yemek, pilav, makarna gibi yan yemek, tatlı, meyve, salata, ekmek vb.)

4)	Restoranınızda kalan yemek artıklarını ölçümlüyor musunuz?) Evetse hangi yöntemleri kullanarak ölçümlüyorsunuz? Hayırsa neden?

5)	Gözlemleriniz sırasında gıda atığı en çok hangi tarafta oluşuyor? (Örnek Servis, mutfak, depolama alanında vb.)

6)	Bu restoranda bırakılan yemek artıklarının restoranınız için bir problem teşkil ettiğini düşünüyor musunuz? Evetse, sizce neden?

7)	Siz kendi evinizde tabağınızda yemek artığı bırakıyor musunuz? Evetse, nedenleri nedir?

EKONOMİK ETKİLER

8)	Bu restorandaki gıda artığının ekonomiye olan etkisini nasıl değerlendirirsiniz? (Örnek vergi indirimi atık gıdalarını geri dönüştüren restoranlara)

9)	Restoranınız da oluşan gıda atıklarının maliyetlere yansımasının etkileri nelerdir? (bu etkilerin azaltılması için neler yapılmalıdır?)

SOSYAL ETKİ

10) Bu restorandaki yemek artığının sosyal etkisini nasıl değerlendirirsiniz?

11) Bu restorandaki yemek artığını önlemek için sosyal bir kampanya düzenlemenin etkisini nasıl değerlendirirsiniz? Örnek tabaklarında artık bırakmayanlara ödüller ay sonu)

ÇEVRESEL ETKİ

12) Bu restorandaki yemek atığının çevreye olan etkisini nasıl değerlendiriniz?

ÖNERİLER

13) Bu restoranda oluşan gıda atıklarının değerlendirilmesi için önerileriniz nelerdir? (Arta kalan yiyecekleri paketleme, porsiyon küçültme, pişirme yönteminin değiştirilmesi, geri dönüşüm şirketleri ile çalışmak vb.)

14) Bu restoranda siz kendi adınıza gıda atığını önlemek veya azaltmak için nelere dikkat ediyorsunuz?

GIDA ATIKLARININ AZALTILMASI İÇİN ÖNERİLER

15) Arta kalan yiyecekleri saklama veya geri dönüştürme hakkında sizce neler yapılmalıdır? (operasyonel süreçler ve tercih ettiğiniz yöntemler nelerdir?)

16) Bu restoranda gıda atıklarının oluşmaması için mutfak tarafında herhangi bir önlem alıyor musunuz? Evetse, ne tür önlem/önlemler alıyorsunuz? (Örneğin; gıdaların uygun koşullarda saklanması, günlük/haftalık ihtiyaçtan fazla gıda alınmaması, ….

17) Restoranınızdaki oluşan atık gıdaların değerlendirilmesi konusunda herhangi bir eğitim alıyor musunuz? Evetse, ne tür eğitimler alıyorsunuz?

MÜŞTERİLERE SORULAN SORULAR

Yaş:

Cinsiyet:

Medeni durum:

Eğitim:

Meslek:

Ne kadar süredir bu restoranı tercih ediyorsunuz?

GENEL SORULAR

1) Restoranda servis edilen yemekler beklentinizi karşılıyor mu? Hayırsa neden?

2) Bu restoranda gıda atığına yol açan nedenler sizce nelerdir? (Tabakta bırakılan yemekler, hatalı servisten ileri gelen atıklar, mutfaktaki atıklar, yanlış talep tahmini vb.)

3) Genellikle hangi tür yiyeceği (ana yemek, yardımcı yemek (pilav, makarna), meyve, tatlı vb.) tabağınızda bırakırsınız?

4)Tabağınızda bıraktığınız yemek artığının bu restoran için bir problem teşkil ettiğini düşünüyor musunuz? Evetse neden?

5) Siz kendi evinizde tabağınızda yemek artığı bırakıyor musunuz? Evetse, nedenleri nedir?

6) Sizce bu restoranda hangi yaş grupları tabaklarında daha çok yemek artığı bırakıyor? Neden?

GIDA İSRAFI NEDENLERİ

7) Tabağınızda yemek artığı oluşturma sebep/sebepleriniz nedir? (Sevmediğiniz yemek, porsiyon büyüklüğü, yeterince aç olmamak, alerjiniz varsa, hijyen, gıda atığı konusunda duyarsız olmanız vb.)

GIDA İSRAFINI AZALTMA ÖNERİLERİ ve ETKİLERİ DÖNGÜSEL EKONOMİ

8) Bu restoranda yemek artığını azaltma konusunda öneri/önerileriniz nelerdir?

9) Gıda atıklarının tekrar ekonomiye kazandırılmasının etkisini (1: kesinlikle önemli değildir, …. 5: kesinlikle önemlidir) olmak üzere nasıl değerlendirirsiniz?

10) Bu restoranın bir müşterisi olarak oluşan yemek artıklarını tekrar ekonomiye kazandırma konusunda siz neler yapıyorsunuz? (örn: sokak hayvanlarına verme, kalanı paket yaptırıp eve götürme vb.)

11) Bu restoranın sahibi (işletmeci) gıda atığını önlemek için neler yapmalıdır? Önerileriniz nelerdir? (Müşteri talebini doğru tahmin etmeli, sipariş yönetimini doğru yapmalı, uygun sıcaklıklarda gıdaları depolamalı, daha iyi malzeme almak vb.)

12) Bu restoranın sahibi (işletmeci) oluşan gıda atığını tekrar ekonomiye kazandırmak için neler yapmalıdır? (Hayvan yemi, gübre vb. yapan diğer işletmelerle anlaşmak, kalan yemekleri ihtiyacı olanlara dağıtmak, bağış, vb.)

ÇEVRESEL ETKİLER

13) Bu restorandaki yemek atığının çevreye olan etkisi hakkındaki görüşleriniz nelerdir?

EKONOMİK ETKİLER

14) Bu restorandaki yemek artığının ekonomiye olan etkisini nasıl değerlendirirsiniz?

SOSYAL ETKİLER

15) Bu restorandaki yemek artığının sosyal etkisini nasıl değerlendirirsiniz?

COVID 19 ETKİSİ

16) Bu restoranda Covid 19 süreci sizce gıda atığını nasıl etkilemiştir? Arttırmış mıdır? Ya da azaltmış mıdır? Neden?

17) Bu restoranda Covid 19 sürecinin gıda atık yönetimini etkileyebileceğini düşünüyor musunuz? (Örnek geri dönüşüm maliyetleri)

GIDA FAZLASININ AZALTILMASINDAKİ ZORLUKLAR

18) Bu restoranda yemek artığını düşürmedeki zorluk/zorluklar sizce nelerdir?

19) Bu restoranda yemek artığını önlemedeki rolünüz nedir? Siz kendi adınıza yemek artığını önlemek için nelere dikkat ediyorsunuz?