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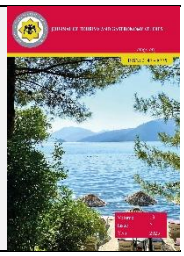

Sustainable Food Waste Management in Chain Restaurants: The Case of Istanbul**

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Abstract

The study investigates the origins, stages, and consequences of food waste within chain restaurant settings. It further seeks to address the central research question: What are the limitations, assessment methodologies, governance mechanisms, and operational procedures implemented to ensure effective and sustainable food waste management? In this respect, the research aims to develop a generic framework for sustainable food waste management in chain restaurants, identify the key variables influencing planning and implementation, and offer contributions to the existing body of literature capable of analyzing and explicating food waste management processes. In this direction the study holds significance in that it provides a comprehensive assessment of the current state of food waste management practices in chain restaurant operations. Also, the study has original value in that it provides valuable insights to practitioners by integrating empirical data with theoretical perspectives, providing evidence-based conclusions from participant interviews and academic literature. Employing a qualitative research design within a process management framework, the study reveals that food waste originates from a combination of cognitive, behavioral, and managerial shortcomings. Moreover, it highlights that strategies for the prevention and recycling of food waste are shaped by regulatory environments, financial capacity, infrastructural conditions, and technological resources. As such, the research underscores the urgent need to establish a systematic and sustainable model for food waste governance. In line with this, the study concludes by presenting a series of action recommendations for both scholars and restaurant managers.

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INTRODUCTION

Food waste is seen as a significant problem that raises concerns due to its detrimental impact on the environment, economy, and society (Oelofse & Suzanna, 2014; Wen et al., 2018; Ewaid et al., 2019; Nardella et al., 2022; Mir et al., 2024). Food waste offers numerous benefits, particularly in terms of its management. It involves planning, prevention, and assessment, which are actions carried out by public and private organizations and society (Fox & Fimech, 2013; Cabelloa et al., 2020; Ekren & Kumar, 2022; Lee vd., 2024). Communities such as the United Nations, the European Union, and the African Union are currently engaged in studies on food waste. The United Nations has officially reported that a staggering 2.1 billion tons of food waste is produced annually, resulting in a significant financial loss of 2.6 billion dollars to the world economy. The United Nation's statement on Sustainable Development Goals aims to reduce the amount of waste in the food supply chain by 50% by 2030, as indicated in publications by Food and Agriculture Organization of United Nations (2015, 2020), United States of America Department of Agriculture (2017), and United Nations (2017). Furthermore, the European Union has underscored the implementation of new policies by EU member states at regular intervals to attain these objectives (European Commission, 2017). Nonetheless, the African Union has expressed its intention to reduce post-harvest food loss by 50% by the year 2025, as outlined in the "Malabo Declaration" (De Pinto & Ulimwengu, 2017; Sarker et al., 2024).

Upon examining the research conducted by various institutions and organizations in Turkey, it becomes evident that there are significant shortcomings in the management of food waste. This issue is reflected in the quantity of food waste generated (Tatlidil et al., 2013; Atalaysun, 2016; Sahin & Bekar, 2018; Tekiner et al., 2021). According to a Turkish Waste Prevention Foundation survey, over 18 million tons of fruits and vegetables are wasted annually in Turkey. According to TISVA (2019), waste is responsible for causing almost 214 billion Turkish Liras worth of damage to the Turkish economy. The Turkish Soil Products Office (Bread Waste Research in Turkey) conducted a study that found that around 2.1 billion slices of bread are wasted annually (TMO, 2013). Based on extensive research and data, it is evident that food waste has significant negative impacts at both local and global levels. Therefore, effective management of food waste is crucial (FWRA, 2014).

This study examines the origins, stages, and outcomes of food waste within the context of chain restaurant operations. The study seeks to address the research question: What are the limitations, assessment methods, governance mechanisms, and operational procedures employed to ensure effective and sustainable food waste management? Accordingly, the research aims to develop a generic framework for sustainable food waste management in chain restaurants, identify the key variables that influence the planning and implementation processes, and contribute to the existing literature by providing a comprehensive analysis and explanation of food waste management practices. In this regard, the study is significant as it offers an extensive evaluation of the current state of food waste management practices within chain restaurant operations. Furthermore, it holds original value by integrating empirical data with theoretical insights, delivering evidence-based conclusions drawn from participant interviews and academic sources, thereby offering valuable guidance to practitioners.

Literature Review

Definition of Food Waste

The terms "food loss" and "food waste" are commonly used in the literature (Sakaguchi et al., 2018; Jang & Lee, 2022). The notions have been found to possess comparable meanings and are hence utilized interchangeably (Pearson et al., 2013; Schneider, 2020). Food loss, in this context, pertains to the losses that occur throughout the food supply chain due to administrative and health-related problems (Graham-Rowe et al., 2015; Riesenegger & Hübner, 2022). In this study conducted by Ceylan et al. (2017), the term "food loss" refers to the situation where non-consumable components of food, such as shells, stems, and seeds, are not utilized despite the presence of appropriate controls, processing techniques, and information during the food processing stage. Another notion discussed in the pertinent literature is the idea of food waste (Mekonnen & Fulton, 2018; Delgado & Torero, 2021; Batool et al., 2024). Yigitoglu & Cerrah (2021) describe food waste as uneaten or discarded parts of food due to sensory or physiological factors. According to FAO, food loss refers to the loss of food and beverage products caused by technological and systematic inadequacies. On the other hand, food waste is defined as the deterioration or expiration of food products due to mistakes and unconscious behaviors of producers and consumers (FAO, 2014). The term "food loss" refers to the loss of food items during production due to various factors. On the other hand, "food waste" refers to food products that are discarded as trash during both the production and consumption process (Adbelradi, 2018; Ferro et al., 2022; Dey et al., 2022). Consequently, the term "food waste" is used to refer to the wastage of food and beverages that occur primarily due to behavioral and managerial factors at various stages of the food supply chain, including agricultural production, transportation, storage, and distribution (Mutlu & Sandikci, 2019; Carvalho et al., 2025). Therefore, the study opted to utilize the concept of food waste.

Food Waste Generation, Classification and Management

Approximately 33% of food products are wasted in the food supply chain. Understanding the specific quantities and causes of waste at each level of the food supply chain is crucial for effective food waste management (Ju et al., 2017; Pelt et al., 2020; Read et al., 2020; Hossain et al., 2024). In this context, the following factors contributing to food waste generation in the food supply chain are provided.

- Insects, pests, medications, weather conditions, hazardous microbes, and diseases are potential challenges that can arise during agricultural production.
- Defective procedures conducted during the manufacturing stage of the food sector, inadequate infrastructure and technology,
- Mistakes that occur during the loading, shipping, and unloading processes in the transportation and distribution phase, disturbances in the cold chain, and either early or too late delivery.

Insufficient planning, staffing, and customer conduct, as well as defective production and service, are common issues in the food and beverage sector.

Food waste in households can be attributed to unregulated consumption, aesthetic preferences, insufficient storage conditions, and other unfavorable consumer behaviors (Graham-Rowe et al., 2014; Kurnaz & Ozdogan, 2018; Grainger et al., 2018; Soma et al., 2021; Lin and Guan, 2021; Montesdeoca-Calderón et al., 2024).

Upon reviewing the literature, it was observed that the waste generated in the food supply chain was categorized

based on specific criteria (Bellemare et al., 2017). The classifications comprise three distinct managerial strategies: (i) preventable, (ii) likely to be prevented, and (iii) unpreventable (Edjabou et al., 2016; Corrado et al., 2019; Coskun & Ozbuk, 2020; Yang et al., 2024). Avoidable food waste refers to the unnecessary disposal of food and beverages resulting from factors such as excessive purchasing, unregulated consumption, errors, and accidents (Griffin et al., 2009; Elimelech, 2018). Food waste is converting edible products into discarded garbage, primarily due to human activity. Preventable food waste arises from shortcomings in the production process of food or beverage goods (Tanic, 2014; Giordano et al., 2019; Fami et al., 2019). This circumstance is commonly linked to the policies and production techniques implemented by businesses during the many stages of agricultural production, storage, transportation, and distribution (Lebersorger & Schneider, 2014; Zamri et al., 2020). Unavoidable food wastes refer to portions of the produced items that are inedible for humans. Examples of inevitable food waste include bones, eggshells, nerve and fat components of beef products, remnants of fruits and vegetables, and nut shells (Ammann et al., 2021; Riesenegger & Hübner, 2022). The categorization of food waste into three types is based on subjective criteria. Nevertheless, the strategy in question remains one of the approved methods (Richter & Bokelmann, 2017).

Food waste management refers to the practice of efficiently utilizing food and beverage items across the entire process, from manufacturing to consumption, with the goal of minimizing waste (Ciccullo et al., 2021). The purposes of food waste management encompass tasks such as preventing the conversion of food products into waste, recycling inevitable food waste, or employing it in various domains. Several research studies have examined approaches for preventing and evaluating food waste (Thi et al., 2015; Van Dooren et al., 2019). The evaluation of these approaches is based on their levels of benefit, and the utilization of ways with high benefit levels is promoted (Adenso-Díaz & Mena, 2014; Osazee, 2019). Within this framework, techniques such as source reduction, redistribution to those in need, animal feed, industrial applications, composting or fertilization, and incineration are among the approaches for effectively utilizing food waste (Adhikari et al., 2009; De Laurentiis et al., 2020).

Sustainable Food Waste Management in Chain Restaurants

Chain restaurants fall under the classification of restaurants, which encompass firms that offer food and beverage services (Demirkol, 2004). Nevertheless, chain restaurants have distinctive characteristics in terms of production and management as compared to other restaurants (Cantele and Cassia, 2020). For instance, certain production activities within chain restaurants are conducted externally from the actual branches (Van Holsteijn and Kemna, 2018). Specifically, certain storage and initial preparation procedures occur within centralized storage and product processing zones. These locations serve as storage and processing facilities for substantial quantities of items. Controller software systems are employed to regulate the storage process and product processing stages. These systems enforce rigorous inspections inside the workflow process (Gössling et al., 2011; Blum, 2020; Nathalia et al., 2024). Furthermore, the industrial sectors employ advanced technical production equipment to facilitate mass production and minimize the rate of waste. Nevertheless, independent restaurant establishments are unlikely to possess a comprehensive and organized manufacturing framework as a result of their budgetary limitations (Gu, 2014; Pham et al., 2014).

Job descriptions at chain restaurant establishments exhibit more clarity compared to those in independent restaurants (Wu et al., 2021). The cause of this scenario is the presence of a systematic workforce management structure in chain restaurants that employ many staff. Due to this circumstance, implementing policies and choices

regarding food waste management will be facilitated. Furthermore, food waste management techniques will be subject to auditing throughout the workflow process, making it easier to identify any inadequacies. Therefore, a more accurate understanding of the factors and progression of food waste generation can be obtained (Leverenz et al., 2020; Renfors, 2024). Merely identifying the factors and phases of food waste is inadequate for effectively managing food waste. Furthermore, it is imperative to quantify the quantity of food waste. The centralized and standardized manufacturing structure of chain restaurant operations makes them a viable location for measuring food waste (Nguyen, 2018). By doing a situational analysis using these metrics, the necessary procedures and management activities can be determined to prevent and assess food waste. Chain restaurants enable consistent management practices throughout all production regions, including the central production center and branches (Elimelech et al., 2018). This administrative structure enables the utilization of a significant quantity of food waste to generate financial support for the business's food waste management. This management process entails investment expenses, time, and space requirements (Marthinsen et al., 2019; Kaman et al., 2024).

Chain restaurant operations possess certain benefits when it comes to applying preventive measures in sustainable food waste control. The following benefits are enumerated below.

- Precise prediction of demand (to prevent unnecessary food production),
- Implementation of quality assurance standards (to minimize food spoilage),
- Development of a well-planned menu (to avoid excessive food stockpiling),
- Control over portion sizes (to minimize leftovers on customers' plates),
- Effective communication strategies (to engage customers and employees in managing food waste) (Condrasky et al., 2007; McAdams et al., 2019; Filimonau et al., 2019; Dolnicar & Juvan, 2019; Lee et al., 2024).

Practitioners should prioritize the implementation of preventive steps to minimize food waste. Nevertheless, the specified preventive actions alone are inadequate. To ensure effectiveness, it is crucial to assess and control various factors, including (i) the fluctuation of customer demand throughout different seasons, (ii) the demand for high-quality food and large portions, and (iii) the competitive drive to excel in communication and portion sizes (Silvennoinen et al., 2015; Filimonau et al., 2022; Rakesh & Mahendran, 2024).

To ensure the sustainability and profitability of food waste management, it is essential to assess and implement all policies, practices, and considerations discussed in this study section across the entire production process. Various application models based on the production phase have been created in the literature to assess the process of managing food waste in chain restaurants from a comprehensive standpoint (Charlebois et al., 2015; Sakaguchi et al., 2018; Filimonau et al., 2020; De Morais Watanabe et al., 2021). Within this framework, the production processes pertaining to sustainable food waste management can be categorized as follows: Figure 1.1 was formulated using models that delineate the menu into distinct phases, including planning, purchasing, storage, preparation, serving, and consumption.

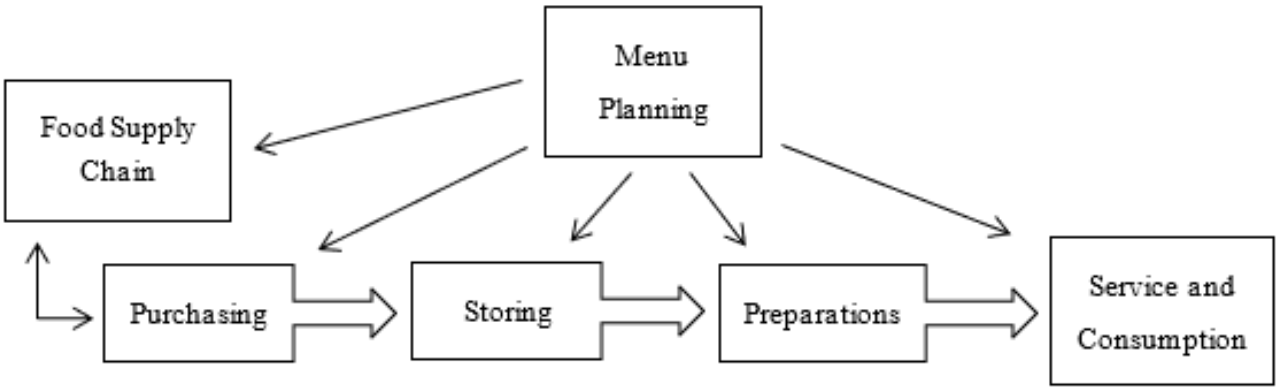

Figure 1. Sustainable Food Waste Management Application Model in Chain Restaurants

Source: It was created using the studies of Papargyropoulou et al. (2014), Pirani and Arafat (2014), Silvennoinen et al. (2015), Heikkilä et al. (2016), Principato et al. (2018), Okumus (2020), Cirisoglu and Akoglu (2021).

The food waste management model depicted in Figure 1.1 serves as the theoretical framework for elucidating food waste management in chain restaurants. The studies conducted using this approach focused on the management of food waste in businesses' production processes. Pirani and Arafat (2014) suggested that it would be beneficial to develop a framework for production processes to gain a comprehensive understanding of the food waste management process.

Method

Food waste management encompasses numerous sophisticated procedures. These processes are believed to encompass cognitive, behavioral, and managerial phenomena, which in turn impact food waste management (Banna et al., 2018; Irani et al., 2018; Attiq et al., 2021). Giordano et al. (2019) emphasized the significance of cognitive approaches and behavioral phenomena in food waste management, specifically about the formation of food waste. Furthermore, Aydin and Yildirim (2021) contend that food waste arises from cognitive factors, including moral views and buying behaviors, as well as physical factors like consumption space and design. Furthermore, the study indicated that individuals generate a reduced amount of food waste when they possess unfavorable sentiments towards wasteful conduct and recognize that this circumstance is incongruent with their self-perception. Assessing cognitive, behavioral, and managerial factors is necessary to prevent or evaluate food waste effectively. In addition, the process of managing food waste involves interconnected stages, including planning, management, execution, and inspection (Wang et al., 2017). While the listed processes are interconnected, it is beneficial to analyze each of them individually. Consulting the opinions of specialists responsible for planning, managing, implementing, and supervising the food waste management process is of utmost importance (Martin-Rois et al., 2018). To achieve a suitable conclusion for the study's objective, it is necessary to gather comprehensive data from industry professionals with relevant knowledge and expertise. The study favored using qualitative research methods due to these several justifications. The qualitative research method was utilized to obtain targeted data within the scope of the study. This method offers the advantage of closely examining people, behaviors, and events, as well as facilitating access to detailed information through interaction (Saldana, 2011; Gurbuz & Sahin, 2014; Berg & Lune, 2019; LaMarre & Chamberlain, 2022).

The research utilized a case study design to investigate the many processes and scenarios related to food waste control in chain restaurants, including policies, planning, implementation, and inspection. The pertinent pattern plays a comprehensive and regulatory role in investigating the reasons and management activities associated with the development of food waste (Turnuklu, 2000; Forrest-Lawrence, 2019). Employing the case study design makes it feasible to elucidate the food waste management process systematically.

The study's population comprises chain restaurant locations currently operational in Istanbul. Istanbul was chosen as the study's population due to its prominence in Turkey in terms of population, economy, and gastronomy. Chain restaurants are favored because they possess a managerial framework that enables efficient control over substantial quantities of food waste from a centralized location. The hierarchical organization of management in chain restaurants provides financial and systematic benefits in comparison to other types of restaurants when it comes to managing food waste (Li & Luo, 2018; Wang'anya, 2018; Cho et al., 2018). To strengthen the indicated financial and systemic benefits, we ensured the chain restaurant outlets we questioned possessed a top-tier tourism business certificate.

The purposive sampling method is extensively employed in qualitative research. Purposeful sampling is a method used to study circumstances and occurrences that provide detailed and comprehensive information (Basturk & Tastepe, 2013; Baskale, 2016; Hennink & Kaiser, 2021). The research utilizes the affine sampling approach, which is one of the deliberate sampling strategies. The study opted for the comparable sampling approach due to its ability to gather comprehensive information from groups that share common characteristics for a specific objective (Surmiak, 2018). By employing the comparable sampling method, it becomes feasible to concentrate on the topic under investigation, streamline the subject matter, and restrict the variability outside the scope of interest (Yagar & Dokme, 2018). Indeed, it is acknowledged that the respondents share a commonality as people employed in the restaurant sector who actively participate in the management of food waste. Managers who are policy and planning producers, as well as active practitioners with knowledge of food, beverages, and dishes, were questioned to gain a comprehensive understanding of the food waste management process.

The study utilized the interview method as the preferred data collection method. The interview method is characterized by the interaction between at least two individuals, facilitating the exchange of comprehensive information within the context of the subject matter (Tekin, 2006; Cokluk et al., 2011; Christensen et al., 2015; Thelwall & Nevill, 2021). The interview approach was chosen for the research due to its capacity to extensively and comprehensively investigate food waste management in chain restaurants. Data was collected for the study using a semi-structured questionnaire. Expert comments were sought during the development of semi-structured questions, and document evaluation was conducted. Subsequently, a pilot interview was carried out with one manager from a chain restaurant and three staff members, resulting in the formulation of potential interview questions. Afterward, semi-structured interview questionnaire and participant information form containing demographic and professional information were examined at the Akdeniz University Social and Human Sciences Scientific Research and Publication Ethics Board's meeting numbered 02 held on 02.02.2022 and approved with the decision numbered 46.

Requisite appointments and permits were acquired from the chain restaurants where interviews were conducted. In this regard, a meeting was held with nine chain restaurant establishments currently functioning in Istanbul. However, owing to the worldwide pandemic and the prevailing congestion, meetings were conducted exclusively with five distinct chain restaurants. Between February 15 and April 8, 2022, interviews were conducted with 15

participants who held various positions in the restaurant industry, including restaurant managers, cooks, waiters, bar managers, and dishwashers. The interviews lasted between 30 to 60 minutes. The interviews were concluded because of factors such as the duplication of data gathered during the interviews and the attainment of data saturation in both breadth and depth. The data collected during the interview process was captured using an audio recording device and subsequently analyzed and documented between February 15th and April 11th.

Data analysis in qualitative research is conducted using deductive and inductive methodologies. The study employs an inductive technique, which is a philosophical methodology that relies on concepts and relationships to elucidate the gathered data (Manafov and Oruk, 2020; Sertel and Gunbayı, 2021). Strauss and Corbin (1990) assert that concepts facilitate people in comprehending facts and situations and engaging in effective cognitive processing of these data. Furthermore, the study claims that when humans conceptualize a phenomenon or circumstance, they categorize and organize it into themes and categories within an intellectual framework. This allows for a more thorough and complete examination of the events and situations in question. Indeed, the data collected throughout the investigation were conceptualized. The topics were categorized and elucidated using categories and codes. In this context in the study, themes and concepts related to the data were identified through the open coding method. Using the axial coding method, the relationships between these themes were examined to construct a cumulative structure. Finally, through selective coding, categories were defined, and the resulting data sets were integrated. The thematic analysis method, which involves coding the data, generating themes and categories, organizing themes, categories, and codes, and defining and interpreting the findings, is considered advantageous for achieving the study's objectives. It enables chain restaurants to articulate the food waste management process in a comprehensive and structured manner.

To ensure the validity and reliability of the study, the data must be both traceable and reproducible while also remaining unchangeable (Haven & Van Grootel, 2019). Reproducibility refers to the capacity for other researchers in related fields to enhance a study by utilizing the same data-gathering and analysis methodologies (Akdemir & Kilic, 2021). Invariance refers to the consistency of research findings when the study is replicated (Belotto, 2018; İlgar & İlgar, 2014). The authors of the study conducted research processes, including data collection, analysis, and interpretation, within the specified dates. These processes were performed in accordance with the concepts of traceability, repeatability, and immutability. Furthermore, to enhance the dependability and authenticity of the research, the coding procedure was conducted by two distinct researchers. The coding findings generated by the two researchers were compared, revealing an approximate match of 87%.

Findings

The data in the findings section was obtained using the interview technique, one of the qualitative data collection methods. In this context, the study questions were asked by the participants regarding food waste management processes. The causes of food waste, its effects, prevention and evaluation methods, and the findings section were created by analyzing the data obtained.

Table 1. Demographic and Professional Information of Participants

CODE	Professional Description	Age	Gender	Education level	Vocational Education Level	Experience in the Industry	Experience in the Institution
K1	Restaurant Manager	29	Male	High School Graduate	Secondary education	More than 10 years	5-10 years
K2	Head Chef	35	Male	High School Graduate	Secondary Education	More than 10 years	More than 10 years
K3	Bar Manager	24	Male	Bachelor Graduate	High Education	5-10 years	2-5 years
K4	Dishwasher	48	Male	Primary School Graduate	Course	5-10 years	5-10 years
K5	Restaurant Manager	42	Male	High School Graduate	Secondary Education	More than 10 years	2-5 years
K6	Head Chef	33	Female	Bachelor Graduate	High Education	More than 10 years	5-10 years
K7	Bar Manager	29	Male	Bachelor Graduate	High Education	5-10 years	Less than 2 years
K8	Dishwasher	41	Female	Primary School Graduate	Course	2-5 years	2-5 years
K9	Restaurant Manager	44	Male	High School Graduate	Course	More than 10 years	2-5 years
K10	Head Chef	31	Male	High School Graduate	Course	More than 10 years	5-10 years
K11	Headwaiter	40	Female	High School Graduate	Secondary Education	More than 10 years	Less than 2 years
K12	Dishwasher	61	Male	Bachelor Graduate	Course	2-5 years	2-5 years
K13	Restaurant Manager	47	Male	High School Graduate	Secondary Education	More than 10 years	5-10 years
K14	Head Chef	38	Male	High School Graduate	Course	More than 10 years	5-10 years
K15	Headwaiter	44	Female	High School Graduate	Secondary Education	More than 10 years	5-10 years

Data regarding the individuals interviewed is included in Table 1. Participants were selected from the professional groups included in the study sample. The table includes participants with job descriptions such as restaurant manager, head chef, head waiter, bar manager and dishwasher. In this context, interviews were held with 15 participants who worked as managers or employees in 5 different chain restaurants. In addition to the demographic information of the participants, such as their age, gender, and education level, the table also provides professional information, such as the level of professional education, the duration of experience in the sector, and the duration of experience in the institution.

Findings on the Causes of Food Waste Generation in Chain Restaurants

First question in the interview form, participants were expected to express their observations regarding the causes of food waste generation in the chain restaurants where they worked. In this context, the data obtained from the participants were analyzed and Table 2 was created.

Table 2. Causes of Food Waste in Chain Restaurants

THEMES	CATEGORIES	EXPLANATION
Physical and Administrative Structure	Physical Structure of the Production Area	The areas where the restaurant business carries out production by processing products or providing services (kitchen, bar, lounge, etc.) must be suitable for the workflow.
	Incorrect Menu Planning	Incorrect evaluation of situations related to factors such as customers, staff and restaurants during the menu planning process.
	Quality Assessment Issues	Failure to utilize quality assessment practices at all stages of purchasing, storage, preparation, service and consumption, or failure to manage the process in question.
	Service Type Selection	Inability to choose the most suitable service method or method for the restaurant business, such as open buffet, card selection, banquet, take away, pick and take.
Employee	Guaranteed Supply	Supplying more products than the production amount due to certain uncertainties.
	Hygiene and Sanitation Problems	Personnel not paying attention to personal cleanliness, not complying with hygiene rules while working, and not hygienic or sanitizing the production area.
	Professional Education and Experience Level	The staff has an educational background that is incompatible with the restaurant business and is inexperienced in this field.
	Lack of Belonging and Motivation	The staff does not feel a sense of belonging to the restaurant business for some internal or external reasons and is not motivated about food waste management.
Customer	Customer Portfolio	The number of customers visiting the restaurant results in the generation of a large amount of food waste.
	Unconscious Attitude	Customers cause food waste due to some cognitive and behavioral deficiencies.
	High Expectation of Sensory Satisfaction	Restaurant customers like taste, smell, texture, appearance, etc. Not to consume or consume some of the products that do not show high sensory properties in terms of health.
	Status Display	Customers order large quantities of products to show status.

Reasons for food waste generation in chain restaurants; It is classified into three categories: physical and administrative structure, personnel, and customers. The first of these, the physical and systemic structure, is associated with situations such as production area design, faulty menu planning, quality evaluation problems, and service style in restaurants. In addition, factors, and situations such as guaranteed supply, hygiene and sanitation problems, professional training and experience level, lack of motivation and belonging are among the reasons for personnel-related food waste generation. Finally, food waste caused by customers is associated with factors such as customer portfolio, unconscious attitude, high sensory satisfaction expectation and status display.

Findings on the Effects of Food Waste in Chain Restaurants

The answers given by the participants to the second question in the interview form were examined. Table 3.3 was created accordingly. When the information obtained was evaluated, it was understood that food waste affected ecological, economic, and sociological contexts.

Table 3. Effects of Food Waste in Chain Restaurants

THEMES	CATEGORIES	EXPLANATION
Ecological	Air Pollution and Damage to the Atmosphere	Gases such as methane and carbon dioxide released from food waste increase air pollution and cause serious damage to the structure of the atmosphere.
	Global warming	Gases released from food waste create a greenhouse gas effect on the atmosphere, thereby increasing global warming.
	Water pollution	The release of food waste into consumable waters poses a biological risk and pollutes these waters.
	Agricultural and Forest Land Pollution	Biodegradable food waste is left on agricultural and forest lands, causing damage to these areas.
	Living Area Pollution	City, town etc. Food waste stored together with other wastes in areas may pose a biological risk or cause explosions.
	Decrease in Natural Resources	Waste of natural resources spent on the production of food products become waste.
Economic	Impoverishment	Waste or loss of financial resources due to food products becoming waste.
	Supply-Demand Imbalance	The decrease in the amount of food supplied due to food products becoming a waste and, as a result, increasing prices by not being able to meet the increasing demand.
	Commercial Threat	Increase in criminal activities such as food hoarding and piracy due to increased levels of food waste and food poverty.
	Waste of Labor and Time	Loss of labor and time used in stages such as production, transportation, processing and distribution of waste food products.
Sociological	Increasing Food Poverty	Communities and individuals experiencing food poverty cannot access food products whose supply level has decreased due to food waste.
	Difficult Access to Food	Due to the increase in food waste, purchasing power decreases and as a result, individuals in society have difficulty accessing food.
	Health problems	Food waste poses a biological risk and causes problems that will negatively affect human health due to old and unsafe disposal methods.
	Perception of Injustice and Inequality	While societies or individuals with a high level of socioeconomic development experience high amounts of food waste, societies and individuals with a low level of development experience food poverty.
	Social Unrest	Unrest in various segments of society due to situations such as poverty caused by food waste and increased crime rates.

Table 3 lists the effects of food waste. The impacts in question are classified into environmental, economic, and sociological contexts. Among the environmental effects, while conditions such as air pollution and atmospheric damage, global warming, water pollution, agricultural and forest land pollution, habitat pollution, and natural resource reduction, economic effects include impoverishment, supply-demand imbalance, commercial threat, and loss of labor and time. Among the sociological effects, phenomena and situations such as increasing food poverty, difficulty in accessing food, health problems, perception of injustice and inequality, and social unrest stand out.

Findings on the Management of Food Waste and Surplus Food in Chain Restaurants

Based on the participants' answers to the third question, it can be said that food waste and surplus food generated in chain restaurant establishments are managed in different ways. In addition, data regarding the problems encountered during the food waste management period were also obtained during the interviews. Table 3.4 was created in the light of the data obtained.

Table 4. Management of Food Waste and Surplus Food in Chain Restaurants

THEMES	CATEGORIES	EXPLANATION
Management of Food Waste	Producing Compost or Manure	A mixture consisting of mixing food waste with products such as straw and sawdust and going through certain fermentation processes.
	Producing Biogas	Gas energy obtained by processing food waste in bio-methanization facilities or units.
	Generating Electricity	Electrical energy produced from the steam produced by burning food waste in waste incineration facilities.
	Recycle	The use of food waste to balance the consistency or dilute the content of materials and substances produced in industrial facilities.
Management of Excess Foods	Making a Package	Packaging and giving leftover food products to customers after their consumption.
	Using in Other Products	The use of food products that cannot be used or are left over for any reason during the production process in the production of other products.
	Sharing with People in Need	Sharing excess food with people experiencing food poverty or having difficulty accessing food.
	Sharing with Staff	Sharing food products that are not offered to customers and whose safety is guaranteed, with the business personnel.
	Feeding animals	Sharing food products that are not suitable for human consumption but do not pose a risk to animals with animals such as stray animals, animal shelters and livestock.
Problems Encountered in the Management Process	Lack of Food Waste Management System	Lack of a management system covering the entire food supply chain to manage food waste.
	Lack of Sorting Equipment and Infrastructure	Lack of equipment or infrastructure required to separate, store and deliver food waste.
	Labor, Time, and Space Constraint	Inability to manage food waste due to factors such as production method, financial situation, customer circulation, lack of personnel, and production area.
	Health Risks	Mistakes made in the process of evaluating food waste can lead to consequences that threaten human health.

Table 4 lists the methods for utilizing food waste and surplus food occurring in chain restaurants. In this context, it was stated that the food waste generated in the chain restaurant establishments interviewed was managed in four ways. These methods can be listed as producing compost or fertilizer, producing biogas, generating electricity, and recycling. Methods such as packaging surplus food, using it in other products, sharing it with people in need, sharing it with staff and feeding animals are included. In addition, it was understood that the participants faced serious problems in terms of managing food waste, and the problems encountered in this case were mentioned. In this context, lack of food waste management system, separation equipment and infrastructure; Problems associated with deficiencies and risks such as labor force, time and space constraints, and health risks have been encountered.

Findings on Food Waste Management Process of Chain Restaurants

In the research, information was obtained regarding the food waste management activities implemented in the production process of chain restaurants. The information obtained from the participants was classified according to menu planning, purchasing, storage, preparation, service and consumption stages. In addition, in line with the answers of the participants, it was understood that the activities in question were divided into requirements, policies, plans and practices. In this context, Table 5 was created based on the information obtained from the participants.

Table 5. Food Waste Management Process of Chain Restaurants

	Requirements			Policies and Plans		Applications		
Menu Planning	Menu Planning Based on Knowledge and Experience	Menu Suitable for Physical, Managerial and Seasonal Conditions		Menu Items Suitable for Location and Customer Portfolio	Menu Items Suitable for Personnel Qualifications	Usage of Detailed and Standard Recipe	Proportional and Standard Serving Size	
Purchasing	Conscious and Experienced Purchasing Personnel	Advanced Supplier in Terms of Infrastructure and Technology	Strong Communication with Suppliers	Supplying Standard Quality Products	Local and Natural Product Supply	Usage of Product Acceptance and Control Criteria in the Receiving Process	Planned and Timely Purchasing	
Storage	Usage of Digital Product Tracking Programs	Generator Usage		Usage of FIFO System	Benefiting from External Audits	Hygienic and Sanitized Storage Areas and Equipment	Systematic Classification and Sequencing	Expiration Date and Sensory Feature Control
Preparation	Practitioners with High Experience and Awareness Level	Advanced Product Processing Equipment		Regular Product Processing Areas and Equipment	Management of Food Products	Usage of Professional Production Techniques	Evaluation of Increased Food Products	
Service and Consumption	Service Personnel Knowledgeable About Food Waste Management	Heat Protective Equipment	Waste Separation and Storage Equipment	Wasteless Service Management	Food Management Incentive for Service Personnel	Informing and Guiding Customers	Keeping Foreign Materials Out of Food Waste	Sorting, Measuring, Storing and Delivering Food Waste

From the participants' answers, it was understood that food waste management activities in chain restaurants can be classified into three categories. These three categories are requirements, policies and planning, and practices. In addition, when the relevant literature and the participants' answers were examined, it was seen that the process in question could be classified according to the menu planning, purchasing, storage, preparation, service and consumption stages. For this reason, food waste management activities carried out at the mentioned stages were evaluated in the context of requirements, policies, plans, and practices, and a table was created accordingly.

Conclusion and Recommendations

It was observed that the conceptual framework created in the study and the findings obtained from the participants overlapped. In addition, it has been understood that some original inferences can be made in addition to the findings presented in various studies in the literature. In the conceptual framework of the study, information such as the causes of food waste formation, stages, effects, measurement, prevention, and evaluation methods are included. The data created within the scope of the research was obtained by managers and employees working in chain restaurants. In this context, obtaining data from planners and implementers of the food waste management process has become possible.

The findings regarding the causes of food waste generation in chain restaurants include facts related to the physical and managerial structure, personnel, and customers. Within the scope of physical and managerial structure, reasons such as the physical structure of the production area, faulty menu planning, quality evaluation problems, and service

type selection are included. Kim (2014) emphasized that the production area and service type have decisive effects on food waste generation. He also stated that to control food waste, food service should be carried out autonomously (consumption controlled) or through personnel. In this context, it is understood that processes related to personnel and customers need to be managed and developed. In this respect, while situations such as guaranteed supply, hygiene, and sanitation problems, professional training and experience level, lack of belonging and motivation stand out among the causes of formation associated with personnel, phenomena such as customer portfolio, unconscious attitude, high sensory satisfaction expectation, status display are among the variables related to customers.

When the findings obtained from the participants about the effects of food waste in chain restaurants were examined, it was understood that food waste has effects in ecological, economic, and sociological contexts. Similar effects were found in literature examined within the scope of the research (Cecere et al., 2014; Chalak et al., 2016; Serdar, 2018). In the study, these effects were not measured, but participants' opinions about the impact of food waste were evaluated. Accordingly, the ecological effects of food waste include air pollution and damage to the atmosphere, global warming, water pollution, agricultural and forest land pollution, and habitat pollution. In contrast, its economic dimensions include impoverishment, supply-demand imbalance, commercial threat, and loss of labor and time. Among the sociological effects of food waste, factors such as increased food poverty, difficulty in accessing food, health problems, perception of injustice and inequality, and social unrest stand out. Many of the effects in question are compatible with the findings in the literature (Kotykova and Babych, 2019; Beretta and Hellweg, 2019; Ma and Liu, 2019; Tóth and Zachár, 2021; Huang et al., 2021). However, in studies where participants' thoughts about food waste were evaluated, no findings were found that outlined the effects mentioned. The findings obtained in this respect are considered valuable.

The research also includes findings regarding the methods of managing food waste and surplus food in the chain restaurants interviewed. In addition, the problems encountered by the participants during the management process were mentioned. Considering all these, three primary themes were determined, and categories were created within these themes. The themes in question are differentiated into the management of food waste, the evaluation of surplus food, and the problems encountered in the evaluation process. The reason why food waste and surplus food are separated from each other is that food waste is a high-risk element compared to surplus food, and the management methods differ. Based on this, methods of utilizing food waste include activities such as producing compost or fertilizer, producing biogas, generating electricity, and recycling. Nevertheless, it has been stated that management methods other than compost production cannot be applied in chain restaurants and that professional facilities should be used for this. Martin-Rios et al. (2018) noted that the utilization rate of food waste in the food and beverage sector is meager and argued that even socioeconomically developed countries are inadequate in this regard. However, the same situation does not apply to managing surplus food. Based on the information obtained from the interviews, it is seen that the methods of utilizing surplus food include activities such as packaging, using it in other products, sharing it with people in need, sharing it with personnel, and feeding animals. Apart from these, the problems encountered during the management process were also mentioned. These problems make it difficult or prevent the interviewed chain restaurants and their staff from utilizing food waste. In this context, factors such as the lack of a food waste management system, the lack of separation equipment and infrastructure, the labor force, time and space constraints, and health risks constitute obstacles for chain restaurants in utilizing food waste. Mendocilla et al. (2021) stated in their study that health risks and problems related to FWMS (food waste management system) are an obstacle to food

waste management in restaurants. It was emphasized that local and central government elements should carry out activities such as support and supervision in order to solve the practical problems mentioned in the research. As a result, it was understood that all of the interviewed businesses resorted to traditional methods to manage food waste, and this led to negative results in terms of systematic management, continuity, sustainable development, etc. However, in line with the participants' experiences or ideas about evaluation methods, practically applicable evaluation methods and related problems were stated.

The research also obtained findings regarding the food waste management process of chain restaurants. In the findings section of the study, explanations of information such as the causes of food waste formation, its effects, and management methods are included.

When the literature was examined, it was seen that the subject and concepts of food waste management in restaurants and chain restaurants could not be fully explained. In this study, the intersection points of concepts such as food waste or food loss are mentioned, and their differences are revealed. In addition, processes such as the formation, classification, measurement, prevention, and evaluation of food waste have been clarified. Detailed explanations regarding food waste management and management processes are included in this context. The study also provides practical contributions to food waste management in chain restaurants. It has a structure that can be a resource for practitioners, especially in terms of examining food waste management in the production process of chain restaurants. When all these are evaluated, it is thought that a result that coincides with the purpose and questions of the research has been reached.

It is possible to make some suggestions based on the research findings. These recommendations were created for researchers and restaurants.

Recommendations for Researchers;

The study was carried out on chain restaurants operating in Istanbul. In this context, studies can be carried out on restaurant types operating in different cities of addressing the issue more comprehensively. This way, differences or similarities in food waste management practices between restaurant types can be examined.

Within the scope of the thesis study, data was obtained by interview technique, one of the qualitative research methods. For future studies on food waste management, it is recommended that methods such as observation, content analysis, and focus group interviews be used together. Thus, the food waste management process can be examined closely, and data diversity can be increased.

Restaurant customers’ approaches and attitudes toward food waste management practices can be examined with an experimental study based on ethical values. After this, the observations can be confirmed by meeting with the customers after the observation. Thus, detailed data will be obtained regarding the results of restaurants’ food waste management activities on customers.

Recommendations for Restaurant Administrators;

Food waste management policies should be created by managers who know the facilities and production processes of the businesses. These policies should be included among the work obligations of the business personnel, and they should be implemented in a sustainable manner. In addition, the business's production processes should be analyzed,

and food waste management policies should be examined for compliance with these processes. When faced with elements that disrupt the workflow, it will be helpful to rearrange policies or practices.

To ensure food waste management in chain restaurants, investments should be made in areas such as equipment, infrastructure, and systems. This way, food products will not become wasted, and businesses will not suffer financial damage. It is also recommended that chain restaurants implement innovative, traceable and instantly intervenable food waste management systems in addition to traditional prevention and evaluation methods.

Limitations

The study focused on the food waste management practices of chain restaurants operating in Istanbul. Accordingly, the findings may not be generalized to other types of foodservice establishments such as independent restaurants, hotel-based dining venues, or fine dining establishments, and thus primarily represent the dynamics specific to chain restaurants. The research employed the interview method, a qualitative data collection technique, and gathered insights from a range of personnel including restaurant and kitchen managers, chefs, servers, and dishwashers. Consequently, the study is limited in terms of both data scope and participant diversity. These factors collectively constitute notable limitations of the research.

Declaration

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Appendix 1. Ethics Committee Permission

Evrak Tarih ve Sayısı: 03.02.2022-284119

T.C
AKDENİZ ÜNİVERSİTESİ REKTÖRLÜĞÜ
Sosyal ve Beşeri Bilimler Bilimsel Araştırma ve Yayın Etiği Kurulu
KURUL KARARI

TOPLANTI TARİHİ : 02.02.2022
TOPLANTI SAYISI : 02
KARAR SAYISI : 46

Üniversitemiz Turizm Fakültesi Gastronomi ve Mutfak Sanatları Bölümü öğretim üyesi **Dr. Öğr. Üyesi Adem ARMAN**'ın danışmanlığını, **Hikmet Can ÇETİN**'in araştırmacılığını üstlendiği, *"Yiyecek-İçecek İşletmelerinin Üretim Sürecinde Atık Yönetimi-Zincir Restoranlar Üzerine Bir Araştırma"* konulu çalışmanın, fikri hukuki ve telif hakları bakımından metot ve ölçeğine ilişkin sorumluluğun başvurucuya ait olmak üzere, proje süresince uygulanmasının etik olarak **uygun olduğuna** oy birliği ile karar verilmiştir.

Prof. Dr. Hilmi DEMİRKAYA
Kurul Başkanı

Başkan	**Başkan Yrd.**	**Üye**
Prof. Dr.	**Prof. Dr.**	**Prof. Dr.**
Hilmi DEMİRKAYA	**Sibel MEHTER AYKIN**	**Ebru İÇİGEN**
Üye	**Üye**	**Üye**
Prof. Dr.	**Prof. Dr.**	**Prof. Dr.**
Nurşen ADAK	**Sibel PAŞAOĞLU YÖNDEM**	**Taner KORKUT**
(İzinli)	**(Raporlu)**	
Üye		
Prof. Dr.		
Gökhan AKYÜZ		

Bu belge 5070 sayılı Elektronik İmza Kanununun 5. Maddesi gereğince güvenli elektronik imza ile imzalanmıştır.
03.02.2022 Ali Dikiş