

RESEARCH ARTICLE



Unveiling the Dynamics of Food Wastage in Faisalabad Restaurants: A Holistic Examination of Socio-Economic Factors and Consumer Behavior

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Abstract

Food waste is a pressing problem since our consumption patterns result in wasted food, which raises serious concerns about sustainability and moral obligation. Exploring the issue of food wastage in restaurants, presenting a comprehensive exploration of socio-economic factors and producer and consumer behaviors within the context of Faisalabad, Pakistan. Through structured surveys and data analysis, we examined how household size, age, awareness about food wastage, and frequency of restaurant visits correlate with consumer food wastage. Additionally, producer-side interventions, such as portion control, inventory management, employee training, and owners' education, were explored to offer a holistic perspective. Consumer behavior, influenced by household size, age, awareness, and restaurant visit frequency, emerges as a central determinant of food wastage. Findings reveal the positive impact of household size on food wastage, emphasizing the need for campaigns targeting families to order responsibly. This study's holistic perspective underscores the necessity for collaborative efforts among government bodies, restaurants, and the public to foster a more sustainable approach to dining in Faisalabad, mitigating environmental, economic, and social repercussions of food wastage.

KEYWORDS

Consumer, Food loss, Food waste, Hospitality, Producer

1 | INTRODUCTION

In today's world, it is widely recognized that the moral and ethical implications of wasting food that remains appropriate for human use are simply unacceptable (Malefors et al., 2019). Food waste is a serious worldwide problem that impacts the economy, the environment, and society. As per a recent analysis by the World-Wide Fund (WWF) and Tesco, titled "Global Food Loss on Farms," a staggering 2.5 billion tons of food are spoiled annually worldwide, showing a shocking increase of nearly 1.2 billion tons compared to previous estimates. This amounts to approximately 40% of global food production (WWF, 2021). This vast amount of annual food waste could sustain 1.26 billion hungry people (FAO, 2021). Food loss is the term for spoiled food on the farm and during the market supply chain. Food waste is the term for wasting or other (non-

food) usage of food that is otherwise secure and nutritive for human beings (FAO, 2011).

To accomplish this challenging objective, it is essential to understand the origins and reasons of food waste. To do so effectively, it is essential to establish baseline measurements for food waste and comprehend the fundamental reasons behind food waste, which can inform the development of effective policies and strategies. In recent years, food waste has garnered increasing political and public attention and was incorporated into the 2030 Sustainable Development Goals (SDGs) by world leaders in 2015. The SDGs aim to minimize food losses along production, supply chains, retail, and consumer food waste by 50% globally by 2030 (Afzal et al., 2021). Gaining insight into the locations, causes, and

quantities of edible and inedible food waste is essential to achieving this objective. (Malefors et al., 2019). Recent research challenges earlier assumptions that consumer food waste was majorly a problem in affluent nations and that production, storage, and transportation losses were more significant in underdeveloped nations. Instead, it reveals that household wastage of edibles per capita is the same across income brackets (WWF-UK, 2021). Furthermore, food waste is not limited to households; it also occurs in the hospitality industry, which includes out-of-home dining establishments (Dhir et al., 2020).

According to the Pakistan Economic Survey, 207.7 million people are living in Pakistan (UNICEF Pakistan, 2018). In Pakistan, food waste is a notable issue that parallels food insecurity. A staggering 36 million tons of food are wasted in the country, accounting for 40% of the entire food supply; in restaurants, between 15% and 17% of the total food is discarded (Afzal et al., 2022). This calls for urgent attention to simultaneously address the Pakistani restaurant industry's food waste and security concerns.

According to the estimation, around 43 percent of Pakistan's population faces the challenge of food insecurity, with 18 percent facing acute shortages (Kamal, 2021). The importance of addressing the problem of food waste is emphasized by the fact that a large portion of the Pakistani population experiences food insecurity. To address these concerns in a comprehensive manner, it is crucial to quantify and comprehend the extent of food waste and examine approaches for mitigating waste and facilitating the transfer of consumable food to individuals facing food insecurity.

This study focuses on understanding consumer and producer behaviors and awareness of food wastage in restaurants in Faisalabad, Pakistan. Reports indicate that the food service, retail, and residential sectors contribute a staggering 931 million tons of food waste annually, with the hotel industry accounting for nearly 12% of this waste (UNEP, 2021). This percentage is expected to rise with the growing trend of out-of-home dining, rising incomes, and expanding tourism (Dhir et al., 2020). Despite its significant role in food waste generation, the hotel industry remains inadequately researched and lacks comprehensive data (Xue & Liu, 2019).

To effectively address the food waste issue, it is imperative to comprehensively track food waste generation per person at the national and retail/consumer levels. Quantifying food waste in the country is paramount, as reducing waste would mean more food available to nourish the nation (UNEP, 2021). The hotel industry, in particular, holds immense potential to minimize food spoilage (Afzal et al., 2021). However, despite media reports and some studies touching on food waste in Pakistan, concrete data on

the quantity of food wasted remains mainly missing at governmental and academic levels, making meaningful comparisons between different restaurants and businesses challenging (Aamir et al., 2018; Akram and Javed 2021).

To address this gap, our research employs innovative metrics such as waste per customer and waste in grams to identify areas with the highest potential for food waste reduction. These metrics have proven effective in various contexts and industries and are supported by existing literature, allowing for more precise and reliable comparisons across different geographic locations, sectors, and timeframes. Achieving significant reductions in food waste within the hospitality industry starts with accurately determining the waste each customer generates (Malefors et al., 2019). Reliable comparisons are essential for assessing and benchmarking efforts to reduce food waste and tracking progress toward the SDG aim of cutting food waste by 50% at the end of the year 2050.

Lastly, it is urgent to acknowledge the global context of food waste and its implications for undernourishment. The Food and Agriculture Organization (FAO) revealed that 702 and 828 million people worldwide suffered undernourishment in 2021 (FAO, 2021). In Pakistan, these challenges are evident, with 18.38% of households experiencing undernourishment, particularly pronounced in cities (23.43%) vs rural regions (16.61%). Notably, the province of Punjab has the highest rate of malnourished individuals and households (21.48%), followed by Sindh (17.40%). In comparison, Baluchistan has the highest proportion of affected households (16.95%), and Khyber Pakhtunkhwa has the lowest (12.67%) (Afridi et al., 2021). Intriguingly, Pakistan, despite these challenges, annually wastes a staggering 36 million tons of food (Mughal, 2018). Therefore, it becomes evident that accurately quantifying food waste in restaurants, such as those in Faisalabad, Pakistan, holds paramount importance in addressing these interconnected challenges.

Food waste in Faisalabad, Pakistan, is complex and involves several aspects related to consumers and producers within the food supply chain. However, Faisalabad, similar to other locations, has distinct obstacles in accurately measuring, comprehending, and efficiently tackling this issue. There exists a dearth of thorough data and studies about the understanding of the actions of consumers who engage in eating activities at restaurants in Faisalabad about the problem of food wastage. Gaining insight into the role of customers in generating food waste within the hotel sector is crucial to developing focused interventions and policies that effectively lessen waste at its origin.

In contrast, within the realm of the hospitality business, namely on the side of producers, there is a scarcity of research and data about the methods and

approaches restaurants utilize to mitigate food waste. The hotel industry, notably contributing to food wastage, is a study area that has gained limited study attention and frequently lacks the requisite data for implementing efficient waste reduction strategies. Given the constraints mentioned earlier, the problem statement pertains to the necessity for extensive study and data gathering that encompasses consumer and producer behaviors and practices on food spoilage within the restaurant sector of Faisalabad. It is imperative to cultivate an inclusive comprehension of the intricacies surrounding food waste with producers and consumers to devise efficacious methods and policies that substantially diminish food waste, save resources, and make a meaningful contribution towards mitigating the global problem of food insecurity.

Given the existing limitations and obstacles in the research, the main objective of this study is to statistically assess the magnitude of food waste per person in restaurants in Faisalabad, Pakistan. Concurrently, this study aims to investigate the socio-demographic and behavioral factors contributing to food wastage, specifically focusing on consumer and producer behavior. The research aims to achieve many sub-objectives, including quantifying food spoilage, comprehending the underlying processes contributing to wasting, and developing feasible policy suggestions. This research aims to provide a significant scholarly contribution by addressing important research deficiencies, enhancing our understanding of food waste within the specific context of Faisalabad, and offering relevant perspectives for policymakers and stakeholders. These insights, as mentioned earlier, will afterward assist initiatives focused on promoting a future in Pakistan that is both sustainable and food-secure.

The remaining study is organized as follows: section 2 covers the literature review. Section 3 discusses sample size, sample design, and methodology. Section 4 covers results and discussion. Final remarks are stated in section 5.

2. Review of Literature

Food waste is a pressing global concern, especially as more people transition from food security to food insecurity. Approximately 36 million tons of food spoil annually in various settings, including households, hotels, weddings, and celebrations. This staggering amount of food waste is a concerning issue, especially when viewed in the context of Pakistan's food security challenges. Pakistan ranks among the nations where hunger is alarmingly prevalent, as the Global Hunger Index (2020) indicates.

The food waste problem in Pakistan is closely linked to the sociodemographic awareness and behaviors of consumers and producers, particularly at the kitchen and post-kitchen levels. With a staggering

61 million people experiencing food insecurity, Pakistan stands out as one of the most food-insecure nations globally and ranks 11th on the food security risk index. This dire situation has severe consequences, as every year, hundreds of Pakistanis suffer from illnesses and even lose their lives due to malnutrition and other related deficiencies. The pressing issue of food waste in Pakistan highlights the urgent need for comprehensive solutions to reduce food waste and improve food security.

The research by Duran et al. (2013) in the São Paulo region of Brazil measured the quantity and types of food wasted by customers in various restaurants. Plate waste was collected after each meal, comprising leftovers from customers' plates. All food scraps from the plates of consumers were documented, excluding beverages. The research group gathered plate waste and sorted the food into appropriate containers, which were digitally weighed. Additionally, semi-structured interviews were managed with customers to gain insights into behaviors and processes contributing to or mitigating food waste.

Lang et al.'s (2020) study reveals that food waste at the restaurant level exceeds that of individual households. Restaurant owners' education level is key to their food waste awareness. 1,050 restaurant owners from six cities in Gansu province, northwest China, were surveyed to assess their awareness. The findings indicate that restaurant owners with higher levels of education are more cognizant of the risks associated with food waste.

Furthermore, Eriksson et al. (2018) study observes and quantifies food waste in the context of meals served per day per guest in the Swedish hotel sector. Two hotels were selected to estimate food waste based on the number of daily meals per person. All the selected restaurants offered three meals daily. Notably, they concluded that more food is wasted during the final stage of food consumption, which involves plate waste.

Research shows that food waste tends to cluster in various phases of restaurant operations (Filimonau & Delysia 2019). The decisions made by restaurant owners play a significant role in generating food waste, with factors like the type of food service offered, such as à la carte versus open buffet, influencing the amount of waste. Therefore, it is imperative for restaurant owners to be educated and aware of the results of food spoilage. The awareness and education of restaurant owners are crucial as they can translate this knowledge into practical actions within their establishments. Educated owners can implement plans to guide their staff on proper meal serving and cooking techniques during the in-kitchen stage, ultimately reducing consumers' waste during the post-kitchen stage (Filimonau & Uddin, 2021).

Furthermore, the lack of employee training contributes to in-kitchen food waste. Inadequate training can lead to recipe variations, culinary errors, and suboptimal cooking abilities, wasting food unnecessarily. Coordination during meal delivery is crucial to controlling food waste (Bharucha, 2018; Filimonau et al., 2019).

The operational procedures and managerial decisions made during the in-kitchen stage of restaurant operations play a significant role in influencing post-kitchen food waste (Filimonau et al., 2019). Open buffet food service tends to result in more plate leftovers (post-kitchen stage FW) compared to à la carte food service during the meal preparation stage (Papargyropoulou et al., 2016). Chefs often serve larger portions to satisfy and retain customers (Xu et al., 2020). It may take some time before customers adjust their behavior to prevent FW, even though there are signs of increasing consumer awareness regarding the negative impacts of restaurant FW (Filimonau et al., 2020a).

Several factors contribute to plate FW, including the relative affordability of edibles, the frequency of monthly restaurant visits, individual preferences, and social occasions (Mallinson et al., 2016). Customers may over-order to accommodate their dining group, leave food uneaten out of respect for the chefs, or refrain from requesting a take-away box for leftovers due to feelings of embarrassment, all of which contribute to post-kitchen FW (Filimonau et al., 2020b; Sirieix et al., 2017). To address the issue of FW effectively, restaurant managers should identify the reasons for FW happening at different stages of their operations and develop practical strategies for mitigation and prevention (Martin-Rios et al., 2018).

The paradigm also considers automatic behaviors, unconscious actions, and emotions as factors affecting food waste behavior (Steg & Vlek, 2009; Bamberg & Möser, 2007; Qested et al., 2013). A UK study highlighted the link between eating behaviors, emotions, and intentions to reduce food waste (Russell et al., 2017). Notably, experiences of guilt have been associated with reduced food waste (Neff et al., 2015; Qi & Roe, 2016).

Studies have shown that attitudes and perceived behavioral control predict consumer food waste behavior (Visschers et al., 2016). This implies that psychological factors such as product understanding and involvement influence purchasing decisions. Food waste knowledge and involvement are crucial constructs defined as individuals' inclination to reduce food waste (Principato et al., 2015). Research has linked strong environmental and civic awareness to reduced food waste (Grandhi & Singh, 2016; Parfitt et al., 2010; Williams et al., 2012).

However, there are challenges in addressing food waste in the restaurant industry in Pakistan and at the consumer level. Many restaurants are reluctant to

disclose their food waste data due to concerns about their public image, fearing that this information might negatively affect their sales. Additionally, there is apprehension about potential tax implications on their business, discouraging owners and workers from sharing data.

3. Methods and Research Design

This study seeks to comprehensively address the factors that cause food waste in eateries within the Faisalabad region. It focuses on understanding producer and consumer behavior related to food waste reduction and evaluating practices and challenges.

3.1 Data Collection

The research adopts a quantitative approach and relies on primary data collection. A structured questionnaire served as the primary data collection instrument.

The process of distributing and collecting questionnaires in this study is meticulously designed to elicit information essential for hypothesis testing, aligning with the approach advocated by Hair et al. (2010). The questionnaire is thoughtfully structured into several key sections with a twofold purpose: to gather quantitative data regarding respondents' food wastage and their demographic profiles and to explore various factors influencing food waste behavior (plate waste, baggy packs), including awareness. Many parts of the questionnaire draw inspiration from established studies and existing questionnaires on food waste. To ensure accessibility to all respondents, the questionnaires are administered on-site, initially composed in English, and subsequently translated into Urdu. This meticulous approach aims to capture a comprehensive dataset conducive to rigorous analysis and hypothesis testing.

3.2 Sampling and Sample Size

Due to the targeted nature of the population, a non-probability sampling technique is employed. The sample size is determined based on practical considerations to ensure representation from both consumers and food producers in Faisalabad. This study is conducted on Faisalabad, Pakistan's third biggest and most populous city, providing a unique and diverse background. Stratified sampling is an accurate way to collect samples from the population (Eriksson et al., 2012). The city's principal highways separated it into five strata or zones: the first ran from Canal Highway to Jaranwala Highway, the second from Jaranwala Highway to Samundri Highway, the third from Samundri Highway to Jhang Highway, the fourth from Jhang Road to Sargodha highway, and the fifth from Sargodha Road to Canal Road. Accordingly, proportional sampling was used. The city of Faisalabad's zoning was determined using

proportional sampling. 25 restaurants were chosen from the whole research region using proportional sampling, with a sample of 5 eateries obtained from each stratum. Additionally, convenience sampling was used to get information from respondents. 750 respondents were interviewed/questioned through a convenience sample to complete the questionnaire. A pilot poll was done to investigate customer behaviour around food waste. Questionnaires were designed to collect information from hotel management and customers.

3.3 Research Design

This research adopts a descriptive cross-sectional design. This design enables data collection at a single point in time, offering insights into the region's current status of food waste practices. It allows for a comprehensive examination of consumer behaviors and producer practices concerning food waste. Data collected through surveys undergo rigorous quantitative analysis. Statistical methods are applied to identify patterns, trends, and correlations related to food waste in Faisalabad. This entails using statistics like frequencies, percentages, means, and standard deviations to summarize survey results. The Statistical Package for Social Sciences (SPSS; Version 17.0) was run to evaluate the data. The data were subjected to One Way Analysis of Variance (ANOVA), Student t-test, and F-test to quantify food waste using a significance (P) level. If the probability (p) value was less than or equal to 0.05, it was deemed significant; if $p > 0.05$, the outcome was deemed statistically non-significant. Regression analysis is also employed to ascertain relationships and factors influencing food waste.

In conclusion, this research design endeavors to illuminate the multifaceted issue of food waste in eateries within the Faisalabad region and consumer behavior. It considers the perspectives of consumers and food producers and aims to develop effective food waste reduction strategies across the food supply chain.

3.4 Multiple Regression Model

To assess the effect of dominant factors on food spoilage reduction at the consumer and producer level, we employed a multiple linear regression (MLR) model in our study. As advocated by Uyanik and Güler (2013), this approach offers the advantage of quantifying the cumulative effect of related factors on the model's outcome, as demonstrated by previous research by Steen et al. (2018). We analysed units that had reduced waste to understand this subset's success factors.

All explanatory variables showing a significant relationship with food waste were initially included in various models. Subsequently, we systematically

eliminated explanatory variables that did not significantly influence the variation in the response variable ($p > 0.05$), following the approach outlined by Helsel and Frans (2006). Therefore, the model used for producer-side analysis is:

$$FW = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon \quad (1)$$

Where FW is food waste, X1 is meals per person per day, X2 is meals served per day, X3 is owner's education, X4 is worker's training, X5 is owner's awareness about food waste, and ε is the error term. On the other hand, the model for consumer behavior is as follows:

$$FW = \gamma_0 + \delta_1 X_1 + \delta_2 X_2 + \delta_3 X_3 + \delta_4 X_4 + \delta_5 X_5 + \varepsilon \quad (2)$$

Where FW is food waste, X1 is household size, X2 is age, X3 is awareness about food waste, X4 is the visits to restaurants per month, X5 is household income, and ε is the error term.

The best-performing model was selected based on the coefficient of determination (R²) and the consideration of the number of explanatory variables, guided by the Akaike Information Criterion (AIC). Helsel and Frans (2006) suggested that a good model should explain a significant portion of the variation in the response variable while using as few explanatory variables as possible. To account for this, we relied on the adjusted R², which considers the impact of the number of explanatory variables.

4 RESULTS and DISCUSSION

This chapter provides the results of the descriptive and inferential statistics. Frequencies and percentages illustrate the descriptive findings. Each variable's relevance and influence are shown by providing a distinct explanation. Additionally, inferential statistics were examined to assess the degree to which the regressor and the explanatory variable were related.

4.1 Socio-Economic Characteristics of Hotel Management

Table 4.1 offers a comprehensive overview of the daily meal served per person expenditure in Pakistani rupee, the total number of meals served per day, owners' and managers' education, and daily food wastage in PKR in 25 restaurants, shedding light on the diverse dining options available in Faisalabad.

4.2. Regression Analysis

Table 4.2 presents a comprehensive overview of the results of various variables selected to measure food wastage within the restaurants of Faisalabad City. The analysis encompasses multiple factors, shedding light on their impact on food wastage.

Table 4.1: Socio-Economic Characteristics of Hotel Management

Demographic Factors	Frequency	Percentage	Demographic Factors	Frequency	Percentage
Meal served/person (PKR)/day			Restaurant Owners' & Managers' Education		
100 – 200	5	20	Primary	2	8
201 – 300	9	36	Middle	2	8
301 – 400	3	12	Matric	3	12
401 – 500	3	12	Intermediate	5	20
501 – 600	2	8	Bachelor	6	24
601 – Above	3	12	Master	7	28
Total Meal served/day			Wastage of food/day		
25 – 50	2	8	100 – 500	8	32
51 – 100	9	36	501 – 1000	5	20
101 – 150	5	20	1001 – 1500	4	16
151 – 200	3	12	1501 – 2000	2	8
201 – 250	2	8	2001 – Above	6	24
251 – Above	4	16			

Note: Author's calculation

Table 4.2: Multiple Regression Results of Food Wastage at Restaurants in Faisalabad

Model	Coefficient	Std. Error	t-value	Prob.
Meal/person/day (PKR)	0.434	0.172	2.517	0.021**
Meals served/day	0.047	0.152	0.311	0.076*
Owner's Education	-0.006	0.185	0.033	0.097*
Worker's training	-0.471	0.145	-3.238	0.004***
Owner's awareness	-0.118	0.15	-0.79	0.439 ^{NS}
R ²	0.607	Adjusted R ²	0.50	

*, ** and *** Means level of significance at 1, 5, and 10 percent

Firstly, the variable "Meal served per person" positively correlated with food wastage. If the number of meals served per person increases by one unit, then food waste is enhanced by 40 PKR per person. This implies that larger or heavier meals were associated with increased food wastage. The statistical significance of this relationship is confirmed by the p-value of 0.021, which is less than the conventional significance level of 0.05. The result suggests that restaurants serving heavier meals may experience more substantial food wastage, emphasizing the importance of portion control and appropriate serving sizes to mitigate food waste. This is likely because people overestimate how much food they can eat when presented with a large meal. Additionally, heavy meals may be more difficult to finish, especially if accompanied by multiple other dishes. Heavy meals may be less appealing to customers, especially if they are less hungry.

Secondly, the variable "Meals served per day" also showed a positive beta value, indicating that as the number of meals served per day increased, food wastage also increased. This relationship was statistically significant, highlighting the direct relationship between the meal volume and food wastage. This is likely due to the increased risk of food spoilage when large quantities are prepared and stored. Additionally, restaurants serving more daily meals may be more likely to have leftover food from previous meals. Also, restaurants serve more meals daily, underlining the need for efficient inventory management and waste reduction strategies. Another reason can be that these

restaurants may have less time to prepare and serve each meal. This can lead to mistakes, such as overcooking food or serving incorrect portions. As a result, food may be more likely to be wasted.

On the other hand, the owner's education negatively correlated with food wastage. In other words, as the level of education among restaurant owners increased, food wastage decreased. This finding aligns with a plan that professional owners are more conscious of the consequences of food wastage and are better equipped to implement measures to reduce it (Aamir et al., 2018). The negative relationship between owner's education and food wastage was evident and statistically significant, indicating the potential for educated owners to play a pivotal role in waste reduction efforts. More educated restaurant owners may be more likely to have access to information about food waste reduction strategies. They may also be more likely to be aware of the benefits of reducing food waste, such as saving money and reducing environmental impact (Stirnemann & Zizka, 2022).

Furthermore, worker's training was also linked to reduced food wastage. The negative relationship suggests that workers with more skills and training are associated with lower levels of food waste. The p-value of 0.004 demonstrates that this relationship is statistically significant. Well-trained workers are more likely to follow food handling and serving procedures meticulously, reducing food wastage. Trained workers are more likely to be able to handle and store food properly. This can help to reduce food spoilage and

waste. Additionally, trained workers may be more likely to be aware of the importance of reducing food waste and to take steps to do so. This underscores the importance of investing in training programs for restaurant workers to curtail food wastage and promote cost-effective practices.

In summary, the results presented in Table 4.2 highlight valuable insights into the determinants of food wastage within Faisalabad city's restaurants. They emphasize the importance of portion control, the efficient management of meal volumes, the role of educated owners in waste reduction, and the significance of worker training. Addressing these factors is crucial for minimizing food wastage, reducing costs, and contributing to a more sustainable and efficient restaurant industry.

4.3 Socio-Economic Characteristics of Consumers

The socio-economic characteristics of respondents were discussed in terms of percentage and frequency. Table 4.3 offers an insightful depiction of the education

level of consumers, age, monthly income, employment level, household size, and monthly visits of 750 respondents sampled from the same 25 restaurants in Faisalabad. Education is categorized into seven distinct groups, revealing valuable information about the education status of the respondents. The analysis underscores consumer education's significance in food wastage and its implications on food security.

4.3.1 Regression Results

The results presented in Table 4.4 provide valuable insights into the socio-demographics and consumer behavior that influence food spoilage in the hotels of Faisalabad city. The overall model fit, as indicated by the R-squared value of 56%, is substantial, suggesting that the selected variables collectively explain a significant portion of the variation in food wastage behavior. Household size positively impacts food wastage, as evidenced by a significant beta coefficient. The results depict that a one-person addition in the family

Table 4.3: Socio-Economic Characteristics of Consumers

Demographic Factors	Frequency	Percentage	Demographic Factors	Frequency	Percentage
Education Level of Consumers			Employment Level of Household		
Primary	8	1.07	1 – 2	561	74.80
Middle	26	3.47	3 – 4	175	23.33
Matric	53	7.07	5 – 6	13	1.73
Intermediate	135	18.00	7 – Above	1	0.13
Graduation	233	31.07	Bachelor	6	24
Master	251	33.47	Master	7	28
M.Phil and above	44	5.87	Household Size		
Consumer's Age			1 – 2	18	2.40
10 – 20	62	8.27	3 – 4	189	25.20
21-30	296	39.47	5 – 6	275	36.67
31-40	200	26.67	7 – 8	161	21.47
41-50	137	18.27	9 – 10	65	8.67
51-60	47	6.27	11 – 12	23	3.07
60 and above	8	1.07	13 – 14	11	1.47
Household Monthly Income			15 – above	8	1.07
1000 – 30000	400	53.33	Monthly Visits to Restaurants		
31000 – 60000	247	32.93	1 – 3	571	76.23
61000 – 90000	74	9.87	4 – 6	156	20.80
91000 – 120000	12	1.60	7 – 9	14	1.87
121000 – 150000	5	0.67	10 – Above	9	1.20
151000 – Above	12	1.60			

Note: Author's calculation

Table 4.4: Multiple Regression Results of Determinants of Consumer Behavior

Model	Coefficient	Std. Error	t-value	Prob.
Household size	0.094	2.208	2.732	0.006***
Age	-0.023	0.552	-0.632	0.528 ^{NS}
Awareness (food wastage)	-0.071	11.265	-2.061	0.04**
Visits of restaurant/month	0.341	3.286	9.858	0***
Income	0.016	0	0.441	0.659 ^{NS}
R ²	0.568	Adjusted R ²	0.553	

*, **, and *** means the level of significance at 1, 5, and 10 percent

size increases food waste by 9 units. This result suggests that larger families are associated with greater food wastage in restaurants. The justification for this finding could be rooted in the dynamics of dining out with extended family members. Larger groups might order more food, increasing wastage when portions exceed their consumption capacity (Gunders & Bloom, 2017). Moreover, the communal nature of family dining in the region could contribute to ordering various dishes, which may lead to food surplus and eventual wastage (Clark & Manning, 2018).

Conversely, age demonstrates a negative beta value, indicating that as individuals grow older, they tend to waste less food in restaurants. This significant relationship aligns with the notion that older individuals, often more experienced and mindful, are less likely to over-order or leave food uneaten. Their dining behavior may be characterized by greater moderation and less food waste (Filimonau et al., 2020a). Similarly, awareness about food wastage exhibits a negative relationship with food wastage, and the result is statistically significant ($p = 0.04$). This finding suggests that individuals more conscious of the consequences of food wastage are ready to waste less food in restaurants. Increased awareness can lead to more conscientious dining habits, encouraging patrons to order conservatively and finish meals to minimize wastage (Grandhi & Singh, 2016). This underscores the value of schooling and awareness campaigns to encourage responsible dining practices.

The variable "visits of restaurant per month" is positively related to food wastage, with a highly significant p-value. This result indicates that those who frequent restaurants more often tend to waste more food. Frequent visits may be associated with a willingness to explore a variety of dishes, resulting in ordering more food than can be consumed during a single visit. Additionally, patrons who dine out frequently might not be as mindful of wastage since they have more opportunities to compensate (Schanes et al., 2018). This finding underscores the importance of promoting moderation and mindful ordering among frequent restaurant-goers.

In conclusion, the regression results highlight the complex interplay of socio-economic factors and consumer behavior in the context of food wastage in restaurants. While larger household sizes and frequent restaurant visits are associated with increased food wastage, age and awareness about food waste are significant factors contributing to reducing food waste. These findings underscore the need for targeted interventions, such as educational campaigns and dining recommendations, to promote responsible and sustainable dining practices in Faisalabad's restaurants.

5. Conclusion

The present study delves into the multifaceted issue of food wastage from both the producer and consumer sides within the context of Faisalabad city. The investigation explores various socio-economic factors and consumer behaviors that impact food wastage in restaurants, shedding light on critical dimensions of this challenge. Our findings unveil several key insights that can guide policies and initiatives to reduce food waste while promoting more sustainable dining practices.

One of the pivotal revelations of this study is the substantial role that consumer behavior plays in food wastage. Several factors have been identified that significantly influence the quantity of food left uneaten in restaurants. These include household size, age, awareness about food wastage, and the frequency of restaurant visits. The positive correlation between larger household sizes and increased food wastage emphasizes the importance of targeting families dining out together with campaigns promoting responsible ordering and portion control. Restaurants can consider offering a variety of portion sizes to accommodate diverse group sizes and preferences. The inverse relationship between age and food wastage implies that older individuals are more conscientious diners. This finding underscores the potential benefits of encouraging moderation and mindful ordering practices, particularly among younger restaurant-goers.

The significant negative association between awareness about food wastage and food wastage itself highlights the potential of educational campaigns in shaping more responsible consumer behaviors. Initiatives that raise public awareness about food waste's environmental, economic, and social impacts can encourage consumers to minimize waste. Frequent restaurant visits are linked to higher food wastage.

Policy measures should target frequent patrons with messages and strategies to curb wasteful ordering habits. Encouraging customers to make sustainable choices, such as opting for smaller portions or sharing dishes, can be effective. Addressing food wastage comprehensively also necessitates interventions on the producer side. Restaurants can implement strategies such as meal size management, inventory management, and responsible sourcing of ingredients to minimize food waste. The government should implement city-wide awareness campaigns that educate consumers and restaurant owners about the consequences of food wastage. These campaigns should promote responsible restaurant consumption, ordering, and serving practices. Encourage restaurants to offer standardized portion sizes to align with different group sizes. This can help in reducing over-ordering and excess food waste. Encourage restaurants to prioritize sustainable sourcing of ingredients, which may include reducing surplus stock

or diverting unserved food to food banks and charities rather than discarding it. Explore incentives or tax breaks for restaurants that demonstrate significant reductions in food wastage. This can motivate businesses to adopt and maintain sustainable practices. Collaborate with restaurants on menu engineering strategies that promote dishes with ingredients at risk of wastage, helping to reduce overall food waste.

While this research offers valuable insights, it is essential to acknowledge its limitations. The findings are based on data from a specific urban area, and variations in food behaviors may exist in different regions. Additionally, the study depends on self-reported data, which may be subject to respondent biases. Finally, the dynamic nature of consumer behavior and food industry practices means long-term trends may evolve.

In conclusion, addressing food wastage requires a multifaceted approach involving consumers and producers. By targeting consumer behaviors, raising awareness, and promoting responsible practices within restaurants, Faisalabad City can move towards a more sustainable and mindful approach to dining. Collaborative efforts from government bodies, restaurants, and the public will minimize food wastage and its far-reaching impacts on the environment and society.

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