Levantine Journal of Applied Sciences, Volume 5 (Issue 2) (2025) Pages 15-20

Levantine Journal of Applied Sciences

journal homepage: https://www.ljoas.com

Evaluation of Consumer Views on Fresh Fruit and Vegetable Waste in Households: Yozgat Central District Example

Merve AYYILDIZ [1*] and Melek CAN [1]

[1] *Department of Agricultural Economics, Agriculture Faculty, Yzogat Bozok University, Yozgat, Türkiye (ORCID: 0000-0002-9012-0756)*

Keywords

Food Waste
Fresh Fruits
Fresh Vegetables
Yozgat

ABSTRACT

The rapid increase in food waste not only leads to economic problems but also contributes to social, political, and environmental challenges. In response, research and initiatives aimed at reducing food waste have gained momentum in recent years. Since consumers play a central role in food waste, their involvement is crucial for tackling this issue effectively. This study aims to assess household perspectives on food waste, with a particulars focus on fresh fruits and vegetables, which are the most commonly wasted food items. The primary data were collected from 384 households in the central district of Yozgat, Türkiye. The findings indicate that fresh fruits and vegetables constitute the leading category of households food waste. Moreover, statistically significant relationships were identified between fruit and vegetable waste and several socio-demographic factors, including household income, marital status, number of children, household size, and shopping frequency. Based on these findings, it is suggested that a combination of public awareness campaigns, regulatory measures, economic incentives, and infrastructure development policies could be effective in reducing fresh the waste at produce at the household level.

1. Introduction

Approximately one-third of food produced globally is wasted each year. This increasinge level of food waste leads not only to economic losses but also to environmental, social, and political problems [1]. Food waste, which has become a significant problem globally, occurs for different reasons in every link of a chain extending from production to consumption [2]. The reasons of waste vary depending on countries' levels of development, consumption habits, production and distribution systems. While food waste in developed economies occurs mainly during the retail and consumption stage, in developing economies it is more common during production and harvesting [3].

Globally, the annual cost of food waste is estimated to have reached 1 trillion dollars [4], representing not only a loss of capital and energy but also an increasing pressure on natural resources. From a social perspective, food waste has become a serious threat to food security [2, 5-8]. At the same time, it is known that food waste causes significant damage to the environment as a result of waste [9].

The loss of one third of edible food highlights the urgency of addressing the issue due toits economic, social and environmental consequences. Moreover, the significant increase in food waste is expected to continue, raising concerns about sustainability and reinforcing the need for effective solutions. It also brings about the search for solutions to reduce food waste [10-14]. While food waste hinders progress toward the Sustainable Development Goals, it is predicted that policies aligned with the SDGs could help reduce waste [15]. Additonally, supporting women through special programs that take into account their knowledge and roles in waste management fosters a holistic approach at both household and

* Corresponding author.
Email address: merve.ayyildiz@yobu.edu.tr
http://dx.doi.org/10.56917/ljoas.24

producer levels, thereby contributing to sustainable food and energy management [12]

Since food waste is more severe at the household level compared to businesses, households are regarded as the main contributors [5, 6, 16, 17]. According to the 2024 Food Waste Index Report, approximately 1.05 billion tons of food were wasted worldwide, including retail, food services and households. This corresponds to 132 kilograms per person annually, and approximately 59.8% of it is directly wasted in households [17].

Wasted foods, fresh fruits and vegetables, stand out as the most discarded items. Globally, they account for more than 42% of total food waste [18]. Non-recoverable fruits and vegetables represent 81% of fruit and vegetable waste and 73% of all non-recoverable food waste. In Türkiye, household food waste is estimated that 102 kg per person per annually, with fruits and vegetables (42%) again being the most wasted category. Short shelf life, post-harvest losses during logistics, limited consumer awareness, and consumption habits are considered the main factors driving this high level of waste [19].

Recognizing that consumers are the main actors in food waste, households play the most important role in reducing it. From this perspective, the present study aimed to investigate household attitudes and behaviors toward food waste. The research specifically focused on was limited to fresh fruits and vegetables, an important component of households, food waste The main material of this study, which aimed to evaluate households opinions on fresh fruit and vegetable waste, consisted of primary data obtained through a survey from households living in the central district of Yozgat province. According to the 2023 data of the Turkish Statistical Institute (TURKSTAT), the population in the central district of Yozgat province is 110,620 people and the average household size is four people. The sample size of the study was calculated as 384 based on the idea that in-depth studies on specific foods would yield more effective results. The findings of this research are expected to contribute to the development of policies aimed at reducing food waste.

2. Material and Method / Experiment

The main material of this study, which aimed to evaluate households opinions on fresh fruit and vegetable waste, consisted of primary data obtained through a survey from households living in the central district of Yozgat province. According to the 2023 data of the Turkish Statistical Institute (TURKSTAT), the population in the central district of Yozgat province is 110,620 people and the average household size is four people. The sample size of the study was calculated as 384 households according to the probability sampling method specified in Equation 1 [20]. In this equation, n represents the sample size, N the total population, d the acceptable margin of error, t the critical value from the t-distribution table at the 95% confidence level, p the proportion of the examined unit in the population, and q is defined as (1–p).

$$n = \frac{N * p * q}{(N-1) * \left(\frac{d}{t}\right)^2 + p * q} = \frac{27\,655 * 0.5 * 0.5}{(27\,655 - 1) * \left(\frac{0.1}{1.96}\right)^2 + 0.5 * 0.5} = 384 \qquad (1)$$

The classification into low, middle, and high income groups was made purposefully since the data did not follow a normal distribution. The grouping considered the general distribution of household incomes in the sample, the minimum wage level, and the average cost of living in Türkiye in 2023, thereby ensuring analytical clarity and practical relevance. The results of the study were presented in cross-tables with percentage distributions according to income groups. The income groups were determined purposively, as the data did not follow a normal distribution. Accordingly, households were categorized into three groups based on total monthly income: low-income (12,000–20,000 TRY), middle-income (21,000–38,000 TRY), and high-income (over 40,000 TRY). For Likert type question, both percentage distributions and mean score calculations were used. Factors influencing consumers opinions on household waste of fresh fruit and vegetables, as well as certain general characteristics of households and the extent of fruit and vegetables waste, were determined based on the results of chi-square analysis.

3. Results and Discussion

The socio-cultural and economic structure, and demographic characteristics significantly influence various aspects such as individuals' and households' consumption habits, levels of knowledge and awareness, and their attitudes and behaviors toward waste. In this context, these characteristics were evaluated, and Table 1 presents demographic information on the household and their heads. In the study, 51.6% of participants were female, while 48.4% were male., with an average age of 41.32 years. The highest rate of participants with undergraduate and graduate education (33.4%) was followed by high school and associate degree, middle school and primary school. As expected, given that this study focused households, 63.2% of the participants were married (Table 1).

Table 1. General information of participants and their households

	Low income	Moderate income	High income	General
Information of participants				
Gender (%)				
Female	50.0	52.1	52.7	51.6
Male	50.0	47.9	47.3	48.4
Age (years)	44.3	39.3	40.4	41.3
Education status (%)				
Primary school graduate	18.5	25.7	20.9	21.8
Secondary school graduate	31.5	12.9	22.7	22.1
High school/Associate degree	25.4	32.1	7.3	22.6
College-Graduate degrees	24.6	29.3	49.1	33.4
Marital status (%)				
Married	55.4	75.7	56.4	
Single	44.6	24.3	43.6	
Information of households				
Household size	2.7	4.0	4.3	3.6
Number of children	0.9	1.8	1.8	1.5
Household income (TRY /month)	16,403.85	29,607.14	49,500.00	30,848.68
Food expenditure of household (TRY /month)	7,142.31	11,930.00	16,690.91	11,670.26
Expenditure of household for fresh fruits and vegetables (TRY /month)	1,752.77	3,197.86	5,559.09	3,387.00

The average household size was 3.6 people, and the average number of children was 1.5. The average monthly household income was 30,848.68 TRY, which was 16,403.85 TRY in the low-income group (34%), 29,607.14 TRY in the middle-income group (37%) and 49,500.00 TRY in the high-income group (29%). It was found that the share of food expenditures in monthly income decreased as income level increaseds, and similarly, the share of fresh fruit and vegetable expenditures within total food expenditures also decreased. In Türkiye, the share of food expenditures in total consumption expenditures has increased rapidly in the past five years, reaching an average of 21.7%. According to the findings obtained in the study, it can be stated that the share of food expenditures in income was relatively high and exceeded the Turkish national average.

Participants were also asked about the level of food waste in their households, and the responses are summarized in Table 2. The most wasted products were fresh fruits (2.8), fresh vegetables (2.7), bakery products (2.7), packaged foods (2.5), and cooked meals (2.4). It was observed that the food waste levels increased from low- to high-income households. The short shelf life of fresh fruits and vegetables appeared to be an effective factor in waste. The fact that cooked meals and bakery products were among the most wasted foods can be explained by the fact that there are many leftover foods associated with them.

Table 2. Participants views towards waste levels of different products in their households

	Low income		Moderate income		High income		General	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Fresh fruit	2.1	0.9	2.8	1.4	3.6	1.4	2.8	1.4
Fresh vegetable	1.9	0.9	2.6	1.2	3.7	1.4	2.7	1.4
Meat and meat products	1.1	0.5	1.2	0.4	1.5	0.5	1.3	0.5
Dairy products	1.5	0.6	1.8	0.7	2.1	0.8	1.8	0.7
Egg	1.3	0.6	1.6	0.6	2.2	0.8	1.7	0.7
Fish and seafood	1.4	0.6	1.6	0.7	2.2	0.8	1.7	0.8
Cooked food	1.9	0.9	2.5	0.8	3.0	0.9	2.4	0.9
Packaged food	1.9	0.9	2.5	0.9	3.2	1.1	2.5	1.1
Bakery	2.1	1.0	2.8	1.0	3.3	1.2	2.7	1.2
Oils/fats	1.3	0.7	1.3	0.5	1.7	0.5	1.4	0.6
Total scores	16.5	5.8	20.7	7.1	26.5	8.1	20.9	8.0

S.D: standard deviation

Table 3 presents the detailed reasons for the waste of fresh fruit and vegetables in participatings households. The primary reason reported was purchasing more products than needed. The second most common reason was the lack of a planning in household shopping. In addition, the participants stated that factors such as not consuming the food at the right

time, not having enough information about storing and preserving, and turning to new and fresh products were effective in wasting food. On the other hand, the waste-oriented behaviors of the participants who stated that the waste of fresh fruit and vegetables in their households was low proved that their waste was indeed low. These participants stated that they planned their shopping, bought small amounts of products more frequently, did not buy more products than they needed, and applying proper storage practices (Table 3).

Table 3. Wasteful behaviors of households according to income groups (%)

	Low income	Moderate income	High income	General
Consumer behavior in households considering themselves wasteful				
We delay the consuming of the food very much	23.1	50.4	33.0	36.0
We make mistakes in shopping planning	25.0	48.7	43.0	39.1
We do not know the right storage and preservation techniques	19.2	46.0	40.0	35.3
We want to buy new and fresh products	8.7	29.2	28.0	22.1
We buy more than we need	37.5	58.4	52.0	49.5
We follow new trends, fashion or diets	6.7	23.0	13.0	14.5
Consumer behavior in households not considering themselves wasteful				
We plan our shopping	53.8	74.1	50.0	61.9
We buy less products but more often	46.2	25.9	70.0	41.3
We use the food we buy first	46.2	29.6	50.0	39.7
We store it correctly	46.2	81.5	90.0	68.3
We do not buy more than we need	76.9	77.8	70.0	76.2
Food is washed when it is to be used	38.5	29.6	60.0	38.1
Spoiled food is sorted to prevent the spoilage of the healthy ones	42.3	18.5	40.0	31.7
We use new generation technologies	23.1	7.4	50.0	20.6

Households classified their waste levels as low, medium and high. The factors potentially influencing these views are presented in Table 4. A chi-square test was used to determine whether a significant differences existed between household waste levels and the demographic and socio-economic characteristics of the participants. Accordingly, it was found that there was a significant relationship between the household views on waste of fresh fruit and vegetables and the marital status of the participants, the spouse's employment, the number of individuals in the household, the number of children, the income level of the household and the frequency of shopping for fresh fruit and vegetables.

4. Conclusion

Fresh fruits and vegetables have the highest share in food waste due to their short shelf life and logistic problems. It is known that they are the product group that has the highest share in food waste in households. Factors such as lack of a shopping planning, failure to store the products properly, and consumption habits increase the level of fresh fruit and vegetable waste. According to the results of this study conducted in Yozgat central town, households stated that they waste fresh fruits and vegetables the most among food products. They are followed by cooked meals and packaged foods, respectively.

Fresh fruits and vegetables are products with high nutritional value and a short shelf life. Therefore, waste experienced in households not only causes economic losses, but also has serious environmental consequences. A considerable amount of fruits and vegetables thrown away every year also means waste of water, energy and labor spent during the production process. In addition, methane gas formed as a result of throwing these wastes in the trash without being separated directly contributes to climate change. Therefore, reducing waste of fresh fruits and vegetables in households is an essential issue. Indeed, reducing waste of fresh fruits and vegetables in households is a critical issue that provides both individual and social benefits. It is considered that reducing and preventing waste will contribute to improvements and developments in the areas of access to healthy food, economic savings, environmental sustainability and social responsibility.

Policies that will promote sustainability at both individual and social levels are needed in reducing waste of fresh fruits and vegetables in households. These policies need to be developed at the level of awareness, regulation, incentive and infrastructure development. In terms of increasing consumer awareness, social programs can be provided to individuals by public and non-governmental organizations for food literacy on topics such as correct storage methods for fresh fruits and vegetables, expiration dates and portion control. In addition, improving food planning and shopping habits in households supports sustainable consumption. Food waste in households can also be reduced with legal regulations, taxes and incentive practices aimed at reducing waste. In this context, it is of great importance for local governments, the private sector and individuals to act with a sense of shared responsibility.

Table 4. Factors affecting households' views on waste levels (%)

	Households' views on the level of waste (%)					
	Fresh fruit			Fresh vegetable		
	Low	Moderate	High	Low	Moderate	High
Marital status						
Single	43.6	8.6	47.9	43.6	15.0	41.4
Married	53.8	21.7	24.6	55.8	19.2	25.0
Chi-Square results		$\chi^2 : 25.280^a$			$\chi^2 : 11.147^a$	
Spouse's employment status						
Employed	48.9	18.4	32.6	52.5	17.0	30.5
Unemployed	61.8	26.5	11.8	61.8	21.6	16.7
Chi-Square results		$\chi^2 : 14.333^a$			$\chi^2 : 6.136^b$	
Household size						
< 4	55.1	20.4	24.5	56.6	18.9	24.5
4 ≥	44.6	13.0	42.4	45.7	16.3	38.0
Chi-Square results		$\chi^2 : 14.336^a$			$\chi^2 : 8.201^b$	
Number of children						
No	56.3	16.7	27.0	57.1	19.0	23.8
<3	49.7	20.4	29.9	52.2	19.7	28.0
≥3	42.3	11.3	46.4	42.3	12.4	45.4
Chi-Square results		$\chi^2 : 12.156^b$			$\chi^2 : 13.457^a$	
Income level						
20,000 TRY ≤	76.9	13.8	9.2	77.7	16.9	5.4
21,000 – 38,000 TRY	45.0	17.1	37.9	47.9	29.3	22.9
≥ 40,000 TRY	24.5	20.0	55.5	24.5	3.6	71.8
Chi-Square results		$\chi^2 : 75.023^a$			$\chi^2 : 145.833^a$	
Shopping frequency						
Daily	40.6	9.4	50.0	40.6	2.1	57.3
A few times a week	45.5	16.4	38.1	49.3	16.4	34.3
Once a week	60.0	22.0	18.0	60.0	28.7	11.3
Chi-Square results		$\chi^2 : 33.709^a$			$\chi^2 : 68.937619^a$	

*a,b significant at %1 and %5 level, respectively.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Cite this article: *Surname, First letter of the name, Surname, First letter of the name, Date. Title of Manuscript. Levantine Journal of Applied Sciences, Volume 5 (2), Pages 15-20*
http://dx.doi.org/10.56917/ljoas.24

References

[1] Lin, B., & Guan, C. (2021). Determinants of household food waste reduction intention in China: The role of perceived government control. *Journal of Environmental Management, 299*, 113577.https://doi.org/10.1016/j.jenvman.2021.113577.

[2] Demirbaş, N. (2018). Dünyada ve Türkiye'de gıda israfını önleme çalışmalarının değerlendirilmesi. *VIII. IBANESS Kongreler Serisi, Plovdiv, Bulgaristan, 21*(22), 521-526.

[3] Tekiner, İ. H., Mercan, N. N., Kahraman, A., & Özel, M. (2021). Dünya ve Türkiye'de gıda israfı ve kaybına genel bir bakış. *İstanbul Sabahattin Zaim Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, *3*(2), 123-128. https://doi.org/10.47769/izufbed.884219

[4] Septianto, F., Kemper, J. A., & Northey, G. (2020). Thanks, but no thanks: The influence of gratitude on consumer awareness of food waste. *Journal of Cleaner Production*, *258*, 120591. https://doi.org/10.1016/j.jclepro.2020.120591

[5] Attiq, S., Chau, K. Y., Bashir, S., Habib, M. D., Azam, R. I., & Wong, W.-K. (2021). Sustainability of Household Food Waste Reduction: A Fresh Insight on Youth's Emotional and Cognitive Behaviors. *International Journal of Environmental Research and Public Health*, *18*(13), 7013. https://doi.org/10.3390/ijerph18137013

[6] Attiq, S., Habib, M. D., Kaur, P., Hasni, M. J. S., & Dhir, A. (2021). Drivers of food waste reduction behaviour in the household context. *Food Quality and Preference*, *94*, 104300. https://doi.org/10.1016/j.foodqual.2021.104300

[7] Li, Y., Wang, L. E., Liu, G., & Cheng, S. (2021). Rural household food waste characteristics and driving factors in China. *Resources, Conservation and Recycling*, *164*, 105209. https://doi.org/10.1016/j.resconrec.2020.105209

[8] Sinha, S., & Tripathi, P. (2021). Trends and challenges in valorisation of food waste in developing economies: A case study of India. *Case Studies in Chemical and Environmental Engineering*, *4*, 100162. https://doi.org/10.1016/j.cscee.2021.100162

[9] Jeswani, H. K., Figueroa-Torres, G., & Azapagic, A. (2021). The extent of food waste generation in the UK and its environmental impacts. *Sustainable Production and Consumption*, *26*, 532-547. https://doi.org/10.1016/j.spc.2020.12.021.

[10] Ündevli. A.. Kadam. G.. Bekdik. Y. L.. Yılmaz. H. İ.. & Çobanoğlu. F. (2019). Gıda İsrafının Belirlenmesi: Aydın İli Örneği. *Turkish Journal of Agricultural Economics*. 25(2). https://doi.org/10.24925/turjaf.v25i2.230-240.3261

[11] Beretta. C.. Stoessel. F.. Baier. U.. & Hellweg. S. (2013). Quantifying food losses and the potential for reduction in Switzerland. *Waste Management*. 33(3). 764-773. https://doi.org/10.1016/j.wasman.2012.11.007https://doi.org/10.1016/j.wasman.2012.11.020

[12] Kaya, A., & Bostan Budak, D. (2022). An assessment of farmers' opinions on biomass, agricultural waste, and environment in Hatay Province. Mustafa Kemal University Journal of Agricultural Sciences, 27(3), 413–423. https://doi.org/10.37908/mkutbd.1109445

[13] Raya-Tapia, A. Y., Sánchez-Zarco, X. G., Cansino-Loeza, B., Ramírez-Márquez, C., & Ponce-Ortega, J. M. (2024). A typology country framework to evaluate the SDG progress and food waste reduction based on clustering analysis. *Trends in Food Science & Technology*, *143*, 104304. https://doi.org/10.1016/j.tifs.2023.104304

[14] Manzoor, S., Fayaz, U., Dar, A. H., Dash, K. K., Shams, R., Bashir, I., ... & Abdi, G. (2024). Sustainable development goals through reducing food loss and food waste: A comprehensive review. *Future Foods*, 100362. https://doi.org/10.1016/j.fufo.2024.100362

[15] Some, S., Roy, J., Chatterjee, J. S., & Butt, M. H. (2022). Low demand mitigation options for achieving Sustainable Development Goals: Role of reduced food waste and sustainable dietary choice. *Journal of Cleaner Production*, *369*, 133432.https://doi.org/10.1016/j.jclepro.2022.133432

[16] Edjabou. M. E.. Petersen. C.. Scheutz. C.. & Astrup. T. F. (2016). Food waste from Danish households: Generation and composition. *Waste management*. 52. 256-268. https://doi.org/10.1016/j.wasman.2016.03.032

[17] United Nations Environment Programme (2024). *Food Waste Index Report 2024. Think Eat Save: Tracking Progress to Halve Global Food Waste*. https://wedocs.unep.org/20.500.11822/45230.

[18] Parsafar, B., Ahmadi, M., Jahed Khaniki, G. R., Shariatifar, N., & Rahimi Foroushani, A. (2023). The impact of fruit and vegetable waste on economic loss estimation. Glob. J. Environ. Sci. Manag, 9(4), 871-884. https://doi.org/10.22034/gjesm.2023.04.14

[19] Türkiye, M. (2022). Otel, Restoran ve Diğer Toplu Tüketim Yerlerinde Gıda İsrafı ile Mücadele Kılavuzu. https://openknowledge.fao.org/server/api/core/bitstreams/35d96e85-5896-4603-83a2-3849fe20cd01/content

[20] Çiçek. A.. & Erkan. O. (1996). Tarım ekonomisinde araştırma ve örnekleme yöntemleri. *Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Yayınları*. 12(6).