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From Plate to Bin: Consumer Segments and Food Waste in Greece

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Abstract: This study investigates key demographic and behavioural factors influencing food waste behaviours among Greek consumers, offering insights into effective waste reduction strategies. Using k-means clustering, Greek consumers were segmented into three groups based on data from a structured online survey: 'Moderate Consumers', who demonstrate moderate awareness of food waste but lack consistent practices; 'Indifferent Consumers', primarily younger urban residents, with limited concern and significant contributions to waste; and 'Conscious Consumers', generally older individuals with structured habits that actively minimise waste. The findings reveal distinct engagement levels across these groups, highlighting the importance of tailored interventions. Conscious Consumers can serve as community advocates for sustainable practices, while Indifferent Consumers require targeted awareness campaigns to foster engagement. Moderate Consumers, with their sporadic efforts, could benefit from practical tools such as meal-planning apps. By exploring these unique consumer profiles, this research provides a culturally contextualised understanding of food waste attitudes in Greece and lays the groundwork for designing targeted strategies to encourage sustainable consumption.

Keywords: consumer behaviour; food waste reduction; Greek consumers; cluster analysis; socio-demographic factors; sustainability

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1. Introduction

Food waste is a complex global issue with significant environmental, economic, and social implications [1,2]. In developed economies such as Greece, food waste predominantly occurs at the household level in the later stages of the food supply chain with substantial environmental impacts [3–5]. Waste generation is shaped by socio-demographic factors, including age, income, household size, and education, which collectively influence consumer behaviours [6–9]. Furthermore, policies affecting both producers and consumers play critical roles, either exacerbating or mitigating household food waste [10]. Studies have identified household composition as a key factor, where larger households face challenges in managing food for multiple individuals, potentially leading to higher waste levels [11,12]. However, research also shows that single-member households equally struggle with waste due to difficulties in purchasing and consuming food in appropriate quantities [13,14]. These findings highlight the need to investigate diverse consumer segments to comprehend the food waste drivers.

Johnson et al. (2017) posit that market segmentation serves as an essential strategy for identifying consumer groups with comparable needs, who are likely to exhibit similar responses to marketing communications [15]. Each distinct segment requires tailored products or marketing strategies [16,17].

Consumer segmentation often focuses on demographic aspects such as age and gender [18,19]. Women, for instance, tend to be more engaged in waste reduction behaviours than men [20–23], while older consumers with experience and established food management practices generally waste less than younger individuals [24,25]. However, inconsistencies across studies suggest that demographic impacts may vary based on cultural and individual attitudes [9,26]. Recent segmentation studies provide insights into the behavioural profiles associated with food waste. For example, Ananda et al. (2021) found that in Australia, high food waste correlates with higher income and lower environmental awareness. Similarly, Vásquez Neyra et al. (2022) noted that pandemic-driven lifestyle changes effectively reduced waste for specific groups [27,28]. Studies in Italy and Spain have also identified distinct consumer profiles based on waste attitudes and practices, suggesting that interventions should be tailored to group-specific needs [11,29].

European research has extensively explored the classification of consumers based on their food waste practices, encompassing various factors such as waste generation, food-related behaviours, personal characteristics, attitudes, and awareness levels. These taxonomic investigations have examined multiple determinants of consumer food waste behaviour. Aschemann-Witzel et al. (2018) identified five distinct food-related lifestyle patterns among consumers in Denmark. Italian studies conducted by Di Talia et al. (2019), Gaiani et al. (2018), Romani et al. (2018), and Vittuari et al. (2020) revealed diverse consumer segments, ranging from three to seven clusters, based on attitudes towards food waste management and specific perceptions of the food waste phenomenon. Research in Lithuania by Eicaite et al. (2021) and in Ireland by Flanagan and Priyadarshini (2021) both identified two main consumer groups based on food waste-related behaviours, attitudes, and knowledge of date labelling. Swiss studies by Delley and Brunner (2017) and Funk et al. (2021) recognise six consumer clusters based on planning, shopping, and food waste management practices. Beyond Europe, Coskun's (2021) study in Turkey identified four clusters, aiming to capture the factors influencing household food waste behaviour. In the United States, Roe (2024) discerned four clusters based on skills related to food purchasing, storage, management, and preparation [1,22,24,30–37].

Psychological and behavioural traits are important for understanding waste reduction efforts. Individuals who regularly plan meals and use shopping lists tend to waste less food [38]. Conversely, those with low sustainability motivation, as found by Borg et al. (2022), often exhibit higher waste behaviours [12]. This highlights the need for interventions that address both practical behaviours and underlying motivations to foster waste reduction. Consumer segmentation helps enhance understanding of food waste behaviours by identifying common patterns and socio-demographic factors that define specific groups, assisting policymakers in tailoring specific need-based interventions [12,30]. However, the literature reveals no uniform impact of factors such as age, gender, education, and household size, indicating the need for localised analysis to capture context-specific variations in waste behaviours.

Segmentation methodologies have proved successful in certain regions; hence, implementing this approach in Greece could provide insights into distinctive socio-economic and cultural factors affecting household waste. European studies highlight varied motivations for waste reduction, with Southern European consumers in particular exhibiting a greater reluctance to waste food due to cultural appreciation for food [39]. Exploring these local cultural dynamics within Greece could yield more targeted interventions. Thus, this study

aims to develop Greece-specific segmentation, drawing on methods used effectively in other contexts to understand behavioural variations [8]. Existing literature offers frameworks for identifying behaviour patterns based on factors such as age, education, and household size, yet more clarity is needed on how these variables interact within Greece's socio-economic landscape [8,12].

Consumer awareness and attitude are frequently linked to food waste behaviours, particularly regarding pro-environmental and waste-conscious actions [40]. High levels of environmental knowledge and concern are often associated with reduced waste [41]. In Greece, awareness-driven waste reduction behaviours are reportedly less prevalent than in other EU countries, indicating a need for policies that improve environmental consciousness [39]. Psychological theories like the Theory of Planned Behaviour (TPB) offer insights into waste behaviours, suggesting that attitude, perceived behavioural control, and subjective norms influence actions [42]. This theoretical framework explains why consumers, especially those with low perceived control or motivation, may struggle with waste reduction. Research across various regions supports TPB's relevance, indicating that increased perceived control via resources like meal-planning guides can positively influence food waste behaviours [8,43].

The COVID-19 pandemic altered household consumption patterns, and studies document shifts towards reduced food waste due to limited shopping and more home-cooked meals [44]. In Japan, Qian et al. (2020) observed similar patterns of reduced food waste as households adapted to pandemic restrictions [45]. These temporary shifts suggest the potential for longer-term changes in waste behaviours, though studies caution that these effects may fade once typical behaviours resume [46]. Moreover, heightened mindfulness around food purchases and preservation during the pandemic has been documented in Italy and Spain, with many previously high-waste households practicing more careful purchases [47]. Although these changes highlight the impact of crisis-driven behaviour on waste reduction, they also suggest that targeted messaging, even outside crisis periods, may effectively encourage sustainable behaviours [28].

Despite extensive research on food waste across Europe, Greece remains underexplored, particularly regarding segmentation. Given Greece's unique economic and cultural landscape, as shaped by post-2008 economic challenges that significantly influenced household spending, there is a need to examine how socio-demographic and cultural factors affect waste behaviours specifically in this context [48]. Applying a focused approach to segmentation could yield localised insights into Greek consumer attitudes, motivations, and practices that influence food waste, thereby enabling the design of targeted reduction initiatives. The literature underscores the influence of specific socio-demographic factors such as age, gender, education, and household composition, yet consistent patterns across studies remain elusive. For example, age-related demographic factors have been explored to understand how waste behaviours differ among households, while consumer groups defined by these behaviours suggest that effective engagement strategies vary significantly [11,12]. Studies indicate that cluster analysis provides a robust method for developing consumer profiles and understanding behavioural segmentation in waste practices, which can inform targeted interventions [36,38]. A profound examination of these factors within the Greek context could produce culturally sensitive and practical strategies to reduce food waste [11,12].

To address these needs, this study explores the following research questions:

- (RQ1) How do socio-demographic factors, including age, gender, education, and household size, shape Greek consumers' food waste behaviours?
- (RQ2) What are the key behaviours associated with food waste, and how do these differ across socio-demographic groups?

- (RQ3) How can consumer profiles based on food waste behaviours be developed using cluster analysis, and what factors most significantly define these profiles?
- (RQ4) What insights from Greek consumer clusters can guide targeted waste reduction strategies?

In conclusion, the current literature identifies socio-demographic and behavioural drivers of food waste; however, inconsistencies and gaps specific to the Greek context remain. This study aims to bridge these gaps by applying cluster analysis to reveal consumer behaviour patterns, supporting the development of culturally sensitive interventions for effective waste reduction across Greek households.

2. Materials and Methods

2.1. Sampling and Data Collection

The study's sample spans all 13 administrative regions of Greece, with participants from areas across Attica, Central Greece, Macedonia, Crete, and the Aegean Islands. The initial survey reached 1108 consumers, resulting in a final sample size of 1021 after excluding incomplete responses. Data collection, conducted via Google Forms, took place from July to October 2021, utilising a 'snowball' technique through university networks and social media, which, while efficient for broad outreach, may introduce selection bias [49]. The sample size aligns with recommendations for k-means cluster analysis, supporting robust clustering [49]. The statistical analysis for this study was conducted using the IBM SPSS Statistics 29.0 software package.

2.2. Survey Design

The survey design was based on a thorough review of the literature and prior surveys, such as those by Williams et al. (2012), Stefan et al. (2013), and Graham-Rowe et al. (2015) [8,14,40]. Questions were closed-ended, utilising a five-point Likert scale from 'Strongly Disagree' (1) to 'Strongly Agree' (5). Questions were translated into Greek, reviewed for clarity, and pilot-tested with 20 undergraduate students whose feedback guided minor revisions [50,51].

The questionnaire targeted specific research questions (RQ), aligning questions on shopping habits, meal planning, and waste reduction efforts with RQ2 and socio-demographic questions like age and education with RQ1. Sections covered general environmental awareness, food waste knowledge, and specific behavioural actions, following frameworks from studies by Pereponova et al. (2023), Casonato et al. (2023), and Qi and Roe (2016) [46,52,53] (Appendix A).

2.3. Data Analysis

To identify behavioural clusters among consumers regarding food waste, a k-means cluster analysis was performed using Kruskal–Wallis and chi-square tests for statistical validation due to the non-parametric nature of the data. K-means clustering, chosen for its effectiveness in grouping similar behaviour patterns, segmented consumers based on three key variables: use of shopping lists, meal planning, and efforts to reduce food waste. These variables have been widely validated as indicators of consumer food waste behaviours [44,45,47].

The optimal number of clusters was determined using the elbow method, ensuring minimal within-cluster variance while balancing homogeneity within groups with distinctiveness across groups [49]. Clusters were further analysed with Kruskal–Wallis and chi-square tests, assessing demographic variables such as living area, age, and household size concerning waste behaviours, consistent with research methodologies used by Aschemann-Witzel et al. (2021), Graham-Rowe et al. (2015), and Garson (2014) [21,40,54].

2.4. Sample Profile

The final sample profile reflects diverse socio-demographic backgrounds across Greece (Tables 1 and 2). Attica accounted for the largest segment (36.4%), aligning with population distributions. The sample was 54.3% female, with the majority of respondents aged 18–39 years (34.2%) or 30–39 years (25.9%), consistent with the methodology of capturing a broad age distribution to inform cluster analysis [11]. Education levels were high, with 59% holding a university degree. The household compositions varied, with the most common size being four members (14.7%). Monthly income distribution ranged from less than EUR 500 (7.6%) to over EUR 2000 (25%), ensuring economic diversity in the sample [52,53].

Table 1. Geographical distribution of participants.

Region	N	%
Attica	372	36.4
Eastern Central Greece	23	2.3
Western Central Greece	82	8.0
Peloponnese	158	15.5
Central Macedonia	98	9.6
Western Macedonia	32	3.1
Eastern Macedonia and Thrace	19	1.9
Epirus	85	8.3
Thessaly	37	3.6
Crete	68	6.7
Aegean Islands	19	1.9
Ionian Islands	28	2.7

Source: Author's own work.

Table 2. Demographic characteristics of participants.

Demographic Characteristic	N	%
Gender		
Male	467	45.7
Female	554	54.3
Age Group		
18–29	349	34.2
30–39	264	25.9
40–49	250	24.5
≥50	158	15.5
Household Size		
1	74	7.2
2	143	14.0
3	213	20.9
4	426	41.7
≥5	165	16.2
Monthly Income		
≤EUR 500.00	78	7.6
EUR 501.00–EUR 1000.00	225	22.0
EUR 1001.00–EUR 1500.00	272	26.6
EUR 1501.00–EUR 2000.00	191	18.7
≥EUR 2001.00	255	25.0
Living Area		
Urban	631	61.8
Semi-Urban	223	21.8
Rural	167	16.4
Educational Level		
Secondary Education	166	16.3
Higher Education	602	59.0
Postgraduate Studies	253	24.7

Source: Author's own work.

The urban, semi-urban, and rural distribution of participants (61.8%, 21.8%, and 16.4%, respectively) supports a nuanced analysis of waste behaviours by location. Participants'

educational background and household structure were similarly balanced, contributing to the strength and generalisability of the findings in this context [12,30,38].

2.5. Clustering Approach

This study used k-means clustering in conjunction with non-parametric statistical tests to validate the clusters' significance due to the non-normality of data. K-means was applied based on established methodologies in consumer segmentation for waste behaviour studies [49,54]. Variables measuring meal planning, shopping list use, and efforts to minimise waste were selected following extensive literature, indicating their efficacy in consumer waste segmentation [45,47].

The clusters—identified as 'Moderate Consumers', 'Indifferent Consumers', and 'Conscious Consumers'—reveal distinct demographic and behavioural profiles concerning food waste. Each group's behaviours were explored further through chi-square and Kruskal–Wallis tests, assessing socio-demographic associations [38,40].

This methodology ensures a robust analysis of consumer food waste behaviours using reliable clustering techniques validated across diverse studies [11,12,22].

3. Results

After evaluating multiple clustering models, the analysis identified three distinct consumer groups based on analysis of variance (ANOVA), which supported the selection of this model. As shown in Table 3, each variable used in the clustering process was statistically significant, with p-values < 0.001, underscoring the robustness of the clusters.

Table 3. Analysis of variance.

Variable	Mean Square (Cluster)	df (Cluster)	Mean Square (Error)	df (Error)	F	Sig.
I use a shopping list for purchasing the food I need	553.814	2	462	1018	1198.785	0.001
I plan meals for the upcoming days	391.577	2	632	1018	619.446	<0.001
We make every effort to reduce food waste at home	166.067	2	841	1018	197.483	<0.001

Source: Author's own work.

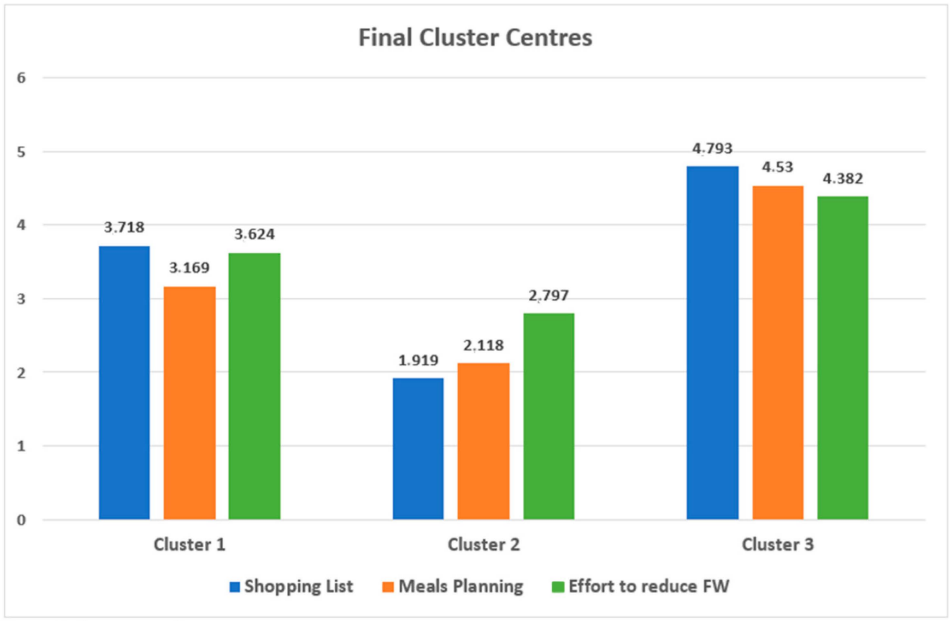
Table 4 presents the number of cases within each cluster, while Figure 1 illustrates the 'Final Cluster Centres' for the three clusters, providing a visual representation of the grouping.

Table 4. Number of cases per cluster.

Cluster	Number of Cases
1	490.000
2	246.000
3	285.000
Valid	1021.000
Missing	0

Source: Author's own work.

Building upon the clustering results, Table 5 provides a detailed breakdown of the average scores for the key behavioural variables across the identified clusters ('Moderate Consumers', 'Indifferent Consumers', and 'Conscious Consumers') as well as the overall sample. These behavioural variables include the use of shopping lists, meal planning practices, and efforts to reduce food waste.



Source: Authors own work

Figure 1. Final cluster centres.

Table 5. Average scores for behavioural variables.

	Clusters			Sample
Means	**1**	**2**	**3**	
I use a shopping list for purchasing the food I need	3.71	1.91	4.79	3.58
I plan meals for the upcoming days	3.16	2.11	4.53	3.30
We make every effort to reduce food waste at home	3.62	2.79	4.38	3.64

Source: Author's own work.

The 'Conscious Consumers' exhibit the highest scores across all variables, indicating structured and waste-conscious behaviours. This group consistently uses shopping lists (mean score: 4.79) and plans meals (4.53), reflecting proactive habits to minimise food waste (4.38). In contrast, the 'Indifferent Consumers' demonstrate the lowest scores for all variables, highlighting minimal engagement in shopping list use (1.91), meal planning (2.11), and waste reduction efforts (2.79). Meanwhile, the 'Moderate Consumers' fall between these extremes, with average levels of shopping list use (3.71), meal planning (3.16), and efforts to reduce waste (3.62). The overall sample averages provide context for these clusters, illustrating general tendencies within the dataset.

These results emphasise significant behavioural variability among the clusters, highlighting the need for tailored interventions. The 'Conscious Consumers' may serve as advocates for waste-conscious practices, while 'Indifferent Consumers' require strategies to increase awareness and motivation. The 'Moderate Consumers', with their mixed behaviours, present opportunities for reinforcement through structured guidance and tools such as meal-planning apps.

Following cluster identification, Chi-square (χ^2) and Kruskal–Wallis tests were conducted to further explore the demographic and behavioural characteristics within each group. This analysis covered variables such as gender, age, household size, monthly income, place of permanent residence, living area, and education level, aiming to reveal differences in environmental awareness and food waste attitudes among the groups.

Chi-square tests highlighted age and living area as statistically significant factors, which are detailed in Tables 6–9. These results underscore the importance of socio-demographic diversity in shaping consumer approaches to food waste.

Table 6. Crosstabulation age group clusters.

			Cluster Number of Case			Total
Age Group			**1**	**2**	**3**	
	18–29	Count	178	95	76	349
		% within Cluster Number of Case	36.3%	38.6%	26.7%	34.2%
	30–39	Count	129	58	77	264
		% within Cluster Number of Case	26.3%	23.6%	27.0%	25.9%
	40–49	Count	104	68	78	250
		% within Cluster Number of Case	21.2%	27.6%	27.4%	24.5%
	≥50	Count	79	25	54	158
		% within Cluster Number of Case	16.1%	10.2%	18.9%	15.5%
Total		Count	490	246	285	1021
		% within Cluster Number of Case	100.00%	100.00%	100.00%	100.00%

Source: Author's own work.

Table 7. Chi-square test (age group).

	Value	**df**	**Asymptotic Significance (2-Sided)**
Pearson Chi-Square	18.405	6	0.005
Likelihood Ratio	19.235	6	0.004
Linear-by-Linear Association	5.678	1	0.017
N of Valid Cases	1021		

Source: Author's own work.

Table 8. Crosstabulation living area clusters.

			Cluster Number of Case			Total
Living Area			**1**	**2**	**3**	
	Urban	Count	299	142	190	631
		% within Cluster Number of Case	61.0%	57.7%	66.7%	61.8%
	Semi-Urban	Count	105	54	64	223
		% within Cluster Number of Case	21.4%	22.0%	22.5%	21.8%
	Rural	Count	86	50	31	167
		% within Cluster Number of Case	17.6%	20.3%	10.9%	16.4%
Total		Count	490	246	285	1021
		% within Cluster Number of Case	100.00%	100.00%	100.00%	100.00%

Source: Author's own work.

Table 9. Chi-square test (living area).

	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	9.918	4	0.042
Likelihood Ratio	10.432	4	0.034
Linear-by-Linear Association	3.631	1	0.057
N of Valid Cases	1021		

Source: Author's own work.

The clustering analysis segmented Greek consumers into three distinct groups: Moderate Consumers, Indifferent Consumers, and Conscious Consumers. Addressing RQ1, which examines how socio-demographic factors influence food waste behaviours, results show clear differences based on age and living area. Moderate Consumers are predominantly younger, with 62.6% under 39 years old and largely urban (61%), indicating urban and youth-oriented waste patterns. Indifferent Consumers, also younger, with 38.6% aged 18–29, are similarly concentrated in urban areas (57.7%). Conscious Consumers, however, are older, with the majority aged 40–49 (27.4%) and residing in semi-urban areas (22.5%), suggesting a relationship between age, location, and responsible waste practices (Tables 8 and 9).

In response to RQ2, which investigates behaviours associated with food waste across these groups, the results reveal varying engagement levels in waste reduction practices. Moderate Consumers exhibit moderate awareness and sporadic use of shopping lists and meal planning. They show some interest in reducing waste, albeit inconsistently. Indifferent Consumers display low engagement with waste reduction, rarely using shopping lists or meal plans, aligning with research indicating that younger, urban groups often contribute more to waste. Conscious Consumers, by contrast, are highly proactive, consistently employing shopping lists and meal planning to minimise waste, indicating a structured approach to food management.

RQ3 focuses on profiling these consumer groups based on food waste behaviours. Moderate Consumers, representing moderate waste awareness but inconsistent action, sit between the other two groups. Indifferent Consumers are generally disinterested in waste reduction, resonating with 'careless' profiles in other studies, where minimal planning correlates with high waste levels. Conscious Consumers, who actively engage in waste reduction, align with 'well-organised' consumer segments, whose structured management practices lower waste. These profiles, detailed in Table 3, highlight the diverse socio-demographic and behavioural traits influencing food waste across Greek households.

In answer to RQ4, which seeks to inform targeted waste reduction strategies, the findings suggest that customised approaches would enhance effectiveness. Moderate Consumers could benefit from practical resources that encourage regular use of shopping lists and meal planning, building on their existing awareness. Indifferent Consumers may be more responsive to engaging digital campaigns or social media content tailored to raise their awareness and encourage waste-conscious behaviours. Conscious Consumers, already actively managing waste, could take on community roles, promoting sustainable practices across regions. Targeting each group's specific characteristics promises to maximise waste reduction impact and foster responsible consumption across Greece. In sum, these findings confirm the influence of age, location, and lifestyle on waste behaviours, underscoring the need for interventions tailored to each consumer group.

4. Discussion

This study's findings provide valuable insights into the distinct consumer behaviours towards food waste among Greek households, revealing three consumer segments through k-means cluster analysis: Moderate Consumers, Indifferent Consumers, and Conscious

Consumers. These segments display unique demographic profiles and waste behaviours, which underline the need for tailored interventions to address Greece's waste reduction challenges effectively, especially in urban settings where waste prevalence is significant. Aligning with RQ1, the findings support that socio-demographic factors like age and residence area critically shape consumer responses to food waste, highlighting essential targets for policy [35,55].

Moderate Consumers, generally younger and urban, exhibit moderate engagement with waste reduction, often through inconsistent use of meal planning and shopping lists. Although aware of waste reduction practices, they have not fully integrated these behaviours into their routines. Their focus appears more directed at household organisation than intentional waste reduction, though their positive tendencies show potential for developing sustainable habits with structured guidance [35]. These consumers share characteristics with 'conservative' profiles from studies in Switzerland, where basic household organisation indirectly contributes to waste reduction without strong waste-conscious motivations [55].

Addressing RQ2, the behaviours associated with waste reduction differ markedly across the groups. Indifferent Consumers, composed primarily of younger urban individuals, exhibit minimal concern for waste reduction. This segment rarely engages in meal planning or shopping list use and tends to disregard waste management practices altogether, which positions them as higher contributors to food waste. Studies associate this demographic with elevated waste levels, aligning with findings that suggest younger, urban residents often overlook waste reduction as a priority [4,7,43,46,56]. This group's lack of planning and limited sense of responsibility echo patterns in global research, suggesting an urgent need for intervention strategies that engage young, urban lifestyles and motivate change [29,57].

The Indifferent Consumers also align with 'careless' profiles found in studies in Romania and Germany, where minimal planning and low perceived control contribute to significant waste levels [1,58–60]. To foster change in this group, targeted engagement strategies, such as interactive social media campaigns or waste awareness apps, may resonate more effectively with their lifestyle, promoting awareness and developing habits that reduce waste over time.

In contrast, Conscious Consumers, predominantly older and often in semi-urban or rural areas, demonstrate a strong commitment to waste reduction practices. This group consistently employs meal planning and shopping lists, showing high waste-consciousness, which aligns with findings that older age groups are less wasteful due to accumulated life experience and the value placed on resources [25,39,43,61] Their semi-urban setting also reinforces studies suggesting that proximity to food production fosters a greater sense of resource conservation [62,63].

Supporting RQ3, the development of these consumer profiles through cluster analysis reflects diverse consumer approaches to waste, aligning with 'well-organised' consumer segments in similar studies. Conscious Consumers manage food resources effectively through structured household practices, aligning with sustainable behaviours identified in Switzerland and Italy, where household planning and organisation reduce waste [21,35]. This segment could serve as community advocates, sharing their effective practices in waste management and fostering broader waste-conscious habits within Greek communities.

The findings related to RQ4 underscore the importance of tailoring waste reduction strategies to different consumer segments. For Moderate Consumers, who demonstrate some awareness of waste issues, implementing straightforward interventions could yield significant results. Providing easy-to-follow guides on creating and adhering to shopping lists, as well as offering simple meal planning templates, may help this group establish more

consistent waste reduction habits. These practical tools can bridge the gap between their existing moderate awareness and more effective action, potentially leading to substantial reductions in household food waste. Addressing the Indifferent Consumers presents a greater challenge, necessitating more innovative and engaging approaches to address their apathy for waste issues [38]. Digital campaigns leveraging popular social media platforms could be particularly effective in reaching this demographic. For instance, creating viral challenges or interactive content that seamlessly integrates waste reduction concepts into everyday activities could help overcome their apathy towards environmental issues. Additionally, gamification elements or incentive-based programmes might motivate this group to participate in waste reduction efforts, gradually shifting their attitudes and behaviours. For Conscious Consumers, who already exhibit strong waste management practices, the focus should be on leveraging their expertise and commitment. Establishing mentorship programmes or community-led initiatives where these individuals can share their knowledge and experiences could create a ripple effect, inspiring others and fostering a broader culture of sustainability within their communities.

The findings not only contribute to Sustainable Development Goal 12 but also provide a foundation for developing targeted waste-reduction interventions in Greece. By identifying specific consumer behaviours within different segments of the population, policymakers and environmental organisations can design more effective strategies to promote responsible consumption and production. This tailored approach recognises that different groups may have varying attitudes, motivations, and barriers when it comes to waste reduction, allowing for more precise and impactful interventions.

Furthermore, these insights can help Greece move closer to its waste-reduction targets by enabling a more efficient allocation of resources and efforts. By understanding the unique characteristics and behaviours of each consumer segment, interventions can be customised to address the most relevant issues for each group. This approach aligns with broader research emphasising the importance of targeted strategies in addressing complex environmental, economic, and social challenges. By focusing on specific behavioural patterns and motivations, Greece can potentially achieve more significant and lasting changes in waste reduction practices, ultimately contributing to a more sustainable and circular economy [38].

To enhance the success of these interventions, policies should support infrastructure that encourages sustainable consumption, including educational initiatives in schools, community programmes, and public awareness campaigns that reach younger demographics. Promoting urban food-sharing initiatives and waste-reduction competitions could especially engage Indifferent Consumers, encouraging small but impactful changes [11,38]. For example, insights drawn from semi-urban consumer habits could help inspire urban communities to adopt waste-conscious practices that emphasise food preservation, especially through community gardening or local food-sharing networks.

Future research can build upon these findings by exploring cultural and economic pressures unique to Greece that shape food waste behaviours. Longitudinal studies could provide a deeper understanding of how socio-economic or environmental changes influence waste practices over time, particularly in urban centres where waste is most prevalent. Examining seasonal variations in waste behaviours may further support context-specific interventions that encourage year-round sustainable habits.

This study has several limitations that should be acknowledged. First, reliance on self-reported data introduces potential social desirability and recall biases, which may compromise the accuracy of responses regarding food waste practices. For instance, participants might underreport waste generation or exaggerate their sustainable behaviours to conform to perceived societal expectations. Moreover, while the snowball sampling

technique facilitated access to a diverse participant pool, it inherently limits the sample's representativeness, potentially under-representing certain demographic groups. Furthermore, although this study examines socio-demographic and behavioural variables, it does not delve deeper into psychological factors such as attitudes, values, or perceived behavioural control, which could provide valuable insights into food waste behaviour patterns. To address these limitations and gain a more comprehensive understanding of food waste behaviours, future investigations could employ mixed methodologies or longitudinal study designs.

In conclusion, this study highlights the importance of a segmented approach to reducing food waste across Greek households. Understanding the unique characteristics and demographic influences on waste behaviours within each consumer group allows for the development of culturally relevant and targeted waste-reduction strategies. Such an approach can pave the way for impactful, data-driven policies that address the diverse needs of Greek consumers, promoting responsible consumption aligned with national and global sustainability goals [25].

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Data Availability Statement: Data are available upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

This questionnaire was designed by the Laboratory of Agricultural Business Organisation and Management of the University of Patras for the purpose of investigating consumer behaviour for research purposes. It is confidential and anonymous, and no personal data will be published. Your participation and honesty are highly valuable for the completion of the research we are conducting. We kindly ask you to answer the following questions based on your knowledge and behaviour. Thank you very much.

General Questions Regarding Environmental and Climate Change Issues
I know what the following terms mean:

Term	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Climate Crisis					
Global Warming					
Air Pollution					
Desertification Coastal Erosion					

Food Waste **To what extent do you agree with the following statements?**					
Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am knowledgeable about food waste					
I understand the meaning of 'Expiration Date' on food products					
I know what the 'Recommended Consumption Date' means					
I am aware of ways to reduce food waste					
I understand the impact of food waste on the environment					

Opinions on Food Waste **To what extent do you agree with the following statements?**					
Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Our efforts to reduce food waste today will help combat the issue for future generations					
Reducing food waste in Greece is an important issue					
It is important to increase consumer awareness about food waste in Greece					
More actions need to be developed in Greece to reduce food waste					
I feel bad/guilty when I throw food or cooked meals in the trash					

Environmental Consciousness **To what extent do you agree with the following statements?**					
Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
When I have the choice, I always choose the product that causes the least pollution					
The household products I buy are always environmentally friendly					
I try to buy energy-efficient appliances to reduce home energy consumption					
I separate my household waste for recycling					
I feel bad/guilty when I throw food or cooked meals in the trash					
The recyclability of a product is one of the most important criteria when I make a purchase					
I try to buy products made from recycled paper					
I try to buy only the amount of food I need					
The quantities of food I cook usually match what I can consume					

Meal Planning and Food Preservation **To what extent do you agree with the following statements?**					
Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I try not to throw away food or cooked meals					
I use a shopping list when buying food					
I plan my meals for the next few days					
I try to store and preserve food properly					

Food Waste Reduction Efforts To what extent do you agree with the following statements?					
Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
At home, we make a special effort to reduce food waste					
I consume leftover meals in the following days					
I always check the expiration date on the food I buy					
I always check the recommended consumption date on the food I buy					

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