

PATTERNS OF SUSTAINABLE FOOD CONSUMPTION IN HUNGARY: A CLUSTER ANALYSIS

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Understanding consumer behaviour related to sustainable food consumption is key to expanding what is still a niche market for sustainable products. While there is no universal definition of sustainable food consumption, the literature agrees on a few core principles, like reducing overconsumption, minimizing food waste, limiting ultra-processed food intake, and shifting diets toward more plant-based and less animal-based products (Hoek et al., 2021). This study explores how these principles are reflected in the behaviour of consumers in the Hungarian market, and which consumer segments can be identified accordingly. Data were collected through an online survey of 750 participants and analysed in IBM SPSS 29.0. Hierarchical and k means clustering were used to identify and assign cluster groups, followed by Chi square tests to examine significant differences between them. Based on the dendrogram and the change of agglomeration schedule coefficients, a five-cluster solution was selected. The Undecided cluster was the largest, characterised by neutral responses towards all principles. The Committed showed consistently high agreement across all statements. Selective Sustainers mainly adopted low-effort practices while expressing a desire for further improvement, whereas low-effort environmentalists limited their engagement to convenient actions without such aspirations. The Disengaged exhibited uniformly low agreement across all dimensions.

1. Introduction

Understanding consumer behaviour related to sustainable food consumption is a key factor in supporting the continued growth of the market for sustainable food products, which currently functions as an expanding market segment. This growth potential is also supported by recent survey data available in the Statista database, according to which nearly 60% of respondents in several EU countries reported a willingness to buy and consume food products with a lower environmental impact (Wunsch, 2025). Although sustainable food consumption is not defined uniformly in the academic literature, a broad consensus has emerged regarding the core principles that constitute its foundations. These principles include reducing excessive food consumption, minimising food waste and food loss, limiting the intake of highly processed yet nutrient-poor foods, and shifting dietary patterns towards a higher share of plant-based foods while reducing the consumption of animal-based products (Hoek et al., 2021).

Several studies have examined how these principles are reflected in consumer behaviour by identifying recurring behavioural patterns. For example, Verain et al. (2015) distinguished four consumer groups along two main dimensions—product choice and consumption reduction—based on concrete behavioural patterns related to sustainable food consumption. Similarly, Schäufele-Elbers and Janssen (2023) identified five consumer groups using three key dimensions: the purchase of organic products, meat consumption, and the purchase of sweets, incorporating multiple behavioural aspects into the analysis. Another study considered various dimensions of food consumption, such as meat-free products, organic and local foods, and waste management practices, and identified four consumer segments based on consumer preferences and interests related to everyday food-related behaviours (O'Neill et al., 2023). Taken together, these studies demonstrate that sustainable food consumption behaviour has been widely examined in the literature, with particular emphasis on identifying distinct behavioural patterns and consumer segments across multiple dimensions. The present study had three main objectives. First, it aimed to examine the extent to which the principles of sustainable food consumption are characteristic of Hungarian consumers. Second, the study sought to identify distinct consumer segments based on these principles. Finally, it aimed to describe the key characteristics and behavioural patterns of each identified segment.

2. Materials and methods

This study examined how the principles of sustainable food consumer behaviour were manifested in the behaviour of Hungarian consumers and identified distinct consumer segments accordingly. The study was based on data obtained from an online survey conducted in December 2024 with a sample of 750 respondents, designed to be representative by sex, age, and region. In addition to demographic and consumer-related characteristics, the questionnaire assessed respondents' agreement with the core principles of sustainable food consumption (Hoek et al., 2021), using scale-based statements based on earlier researches (Clayton and Karazsia, 2020; Hoek et al., 2021). Agreement with each statement was assessed on a five-point Likert scale, where 1 indicated strong disagreement and 5 indicated strong agreement. The composition of the sample is presented in Table 1.

Table 1: Sample characteristics

Characteristics	Sample %	Sample %	Population
Sex	Man	48	47
	Woman	52	53
	Don't want to answer	0.0	-
Age	18-24 y old	9.7	12
	25-34 y old	19.9	20
	35-44 y old	24	23
	45-54 y old	26.5	26
	55-64 y old	19.9	19
Region	Southern Great Plain	12.1	13
	Southern Transdanubia	9.6	9
	Northern Great Plain	14.8	14
	Northern Hungary	11.5	11
	Central Transdanubia	11.3	11
	Central Hungary	31.5	32
	Western Transdanubia	9.2	10

All statistical procedures were carried out using IBM SPSS Statistics version 29.0 (IBM Corp, 2023). To identify an appropriate cluster solution, hierarchical cluster analysis was first employed, after which k-means clustering was used to allocate respondents to the final clusters. To further characterise the resulting clusters, cross-tabulation and Chi-square tests were employed to identify statistically significant differences ($p < 0.05$) between groups.

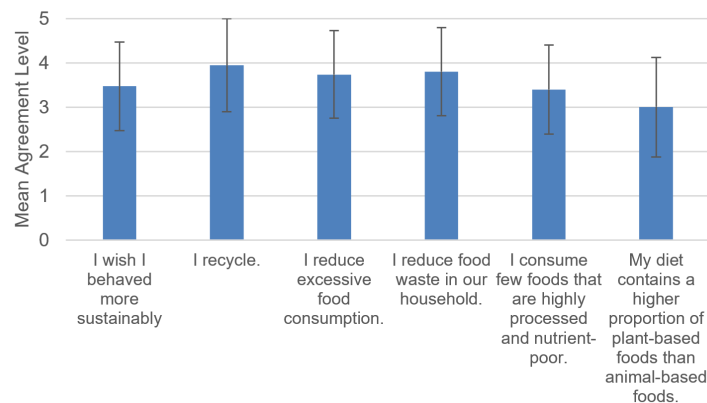
3. Results

3.1 General Attitudes Toward Sustainable Food Consumption

Sustainable food consumption behaviour was examined using six statements. To assess the extent to which the individual principles generally apply to respondents, the mean level of agreement and the mode were analysed for each statement. The results are illustrated in Table 2 and Figure 1.

Table 2: Mode values of agreement with the statements on sustainable food consumption

Items	Mode
I wish I behaved more sustainably	3
I recycle.	5
I reduce excessive food consumption.	4
I reduce food waste in our household.	4
I consume few foods that are highly processed and nutrient-poor.	3
My diet contains a higher proportion of plant-based foods than animal-based foods.	3



3.2 Cluster analysis

Following the primary objectives of the study, cluster analysis was conducted based on the applied statements in order to identify clearly distinguishable consumer groups. The analysis began with the application of hierarchical cluster analysis. The resulting dendrogram, together with the guideline proposed by Essary et al. (2022) was used to support the interpretation of the clustering structure and to identify the appropriate number of clusters. Following this approach, the number of clusters was derived by subtracting the number of cases at which a break occurred from the total sample size. The dendrogram used to determine the number of clusters is presented in Figure 2, while Figure 3 illustrates the agglomeration

schedule coefficients used to identify the point at which a significant break occurred.

Based on the agglomeration schedule coefficients shown in Figure 3, the following calculation was performed to determine the number of clusters, indicating that the separation of five clusters was appropriate.

$$n_{clusters} = \text{full sample} - \text{stage of clustering brake} = 750 - 745 = 5 \quad (1)$$

Based on the results of the hierarchical cluster analysis, the separation of five clusters was deemed appropriate. To assign cluster membership, k-means cluster analysis was subsequently applied using the same set of statements as those employed in the previous analyses.

The resulting cluster sizes varied considerably, reflecting substantial heterogeneity in sustainability-related attitudes and behaviours among respondents. The largest segment was the “Undecided” cluster (n = 234), indicating that a substantial proportion of respondents exhibited uncertainty or ambivalence towards sustainable food consumption. The prominence of this group is noteworthy, as its neutral stance suggests potential openness to positive change under appropriate external influences. The second-largest cluster, “The Committed” (n = 197), demonstrated consistently high levels of engagement with sustainability-related principles, both in terms of attitudes and reported behaviours.

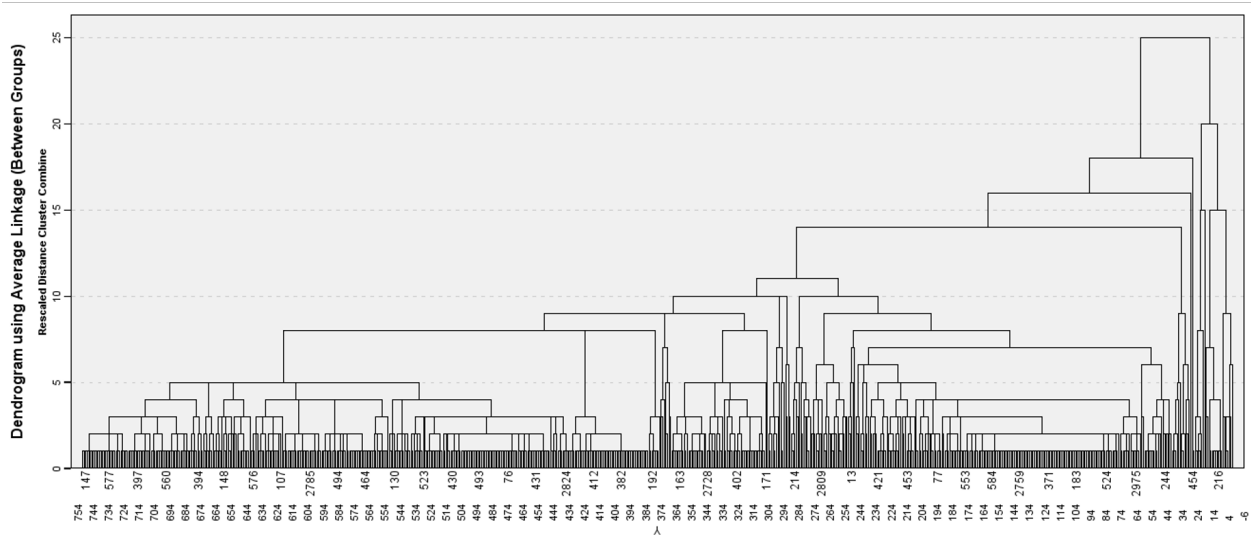


Figure 2: Dendrogram used to determine the optimal number of clusters

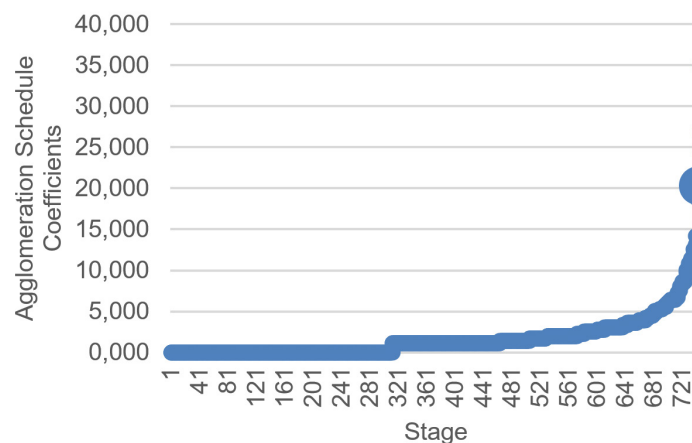


Figure 3: Line graph of agglomeration schedule coefficients

“Selective Sustainers” (n = 134) showed partial commitment, typically adopting low-effort practices such as waste separation, while being less engaged in dietary changes despite expressing an intention to develop more sustainable habits. The “Low-effort Environmentalists” cluster (n = 123) generally supported sustainability, primarily in forms that could be easily integrated into everyday routines, such as selective recycling, without substantial lifestyle or dietary modifications. Finally, “The Disengaged” (n = 62) exhibited consistently low levels of concern for sustainability across all examined dimensions. The results of the k-means cluster analysis are summarised in Table 3.

Table 3: Final cluster centres obtained from k-means clustering

	CLUSTERS				
	Selective Sustainers (n=134)	The Committed (n=197)	The Undecided (n=234)	The Disengaged (n=62)	Low-effort environmentalists (n=123)
I wish I behaved more sustainably.	4.31	4.12	3.24	2.35	2.55
I recycle.	4.72	4.44	3.14	2.58	4.56
I reduce excessive food consumption.	4.24	4.42	3.13	2.06	4.14
I reduce food waste in our household.	4.21	4.46	3.24	2.16	4.23
I reduce food waste in our household.	3.26	4.35	3.08	1.89	3.42
I consume few foods that are highly processed and nutrient-poor.	2.37	4.27	3.11	1.68	2.15
My diet contains a higher proportion of plant-based foods than animal-based foods.	4.31	4.12	3.24	2.35	2.55

In addition to the identification and characterisation of the clusters, the third key focus of the study was to examine how the clusters differ in terms of respondents’ socio-demographic and household-related characteristics. Cluster membership was cross-tabulated with several variables, including region of residence, age, sex, type of residence, highest level of education, perceived income, and the respondent’s role in household food purchasing. Statistically significant differences were identified in three cases.

First, significant differences were observed across regions of residence ($p < 0.05$). Respondents living in the Northern Great Plain region were most frequently assigned to The Committed cluster, whereas respondents from Central Transdanubia were overrepresented in The Disengaged cluster. Members of the Low-effort Environmentalists cluster—characterised by engagement in low-effort sustainability-related practices without a strong intention to change—were predominantly concentrated in Central Hungary. To a lesser extent, respondents expressing uncertainty or neutrality towards sustainability-related statements (the Undecided cluster) were also relatively prevalent in this region.

Significant differences were also found across age groups ($p < 0.01$). With increasing age, a growing proportion of respondents belonged to the Low-effort Environmentalists cluster, which was most prevalent

among individuals aged 55–64. Members of The Committed cluster were most frequently drawn from the 45–54 age group, while The Disengaged cluster was most common among respondents aged 35–44. In contrast, younger respondents (aged 18–24 and 25–34) exhibited a more even distribution across clusters, with a substantial share belonging to either the Undecided or The Disengaged clusters.

A third significant difference emerged with respect to the respondent's role in household food purchasing. The Undecided cluster was markedly overrepresented among respondents who purchased food for their household only occasionally. Those who typically did not engage in food purchasing were more likely to belong to either The Committed or The Undecided clusters. Among respondents who regularly purchased food for their household, cluster membership was more evenly distributed; nevertheless, more than half of these respondents were classified as The Committed or The Undecided, while only a small proportion belonged to The Disengaged cluster.

4. Conclusions

The results of the study highlight the diverse nature of sustainable food consumption among Hungarian consumers. The cluster analysis identified five different consumer groups, with the largest segment being the Undecided cluster, accounting for nearly one-third of the sample. This group was characterised by predominantly neutral attitudes. As such, it represents a segment that may be particularly responsive to external influences, including targeted marketing communication or other interventions aimed at identifying and addressing the factors that could shift consumers from a neutral position towards more sustainable behaviour.

At the same time, only a limited share of respondents belonged to The Committed cluster, which demonstrated consistently high agreement across all sustainability-related principles. A considerable proportion of consumers were classified as Selective Sustainers or Low-effort Environmentalists, suggesting that sustainability-related actions are often restricted to low-effort behaviours, while more demanding changes—such as dietary shifts—remain less prevalent. An important distinction between these two clusters lies in their underlying orientation: members of the Selective Sustainers cluster expressed a desire to behave more sustainably, whereas such aspirations were largely absent among Low-effort Environmentalists. Similar to the Undecided cluster, Selective Sustainers therefore represent a group with greater openness towards more sustainable food consumption, suggesting that future research should explore the motivational factors that could facilitate progress in this direction. The observed regional and age-related differences further underline that sustainable food consumption is not evenly distributed across socio-demographic groups. Significant associations were found with region of residence ($p < 0.05$) and age ($p < 0.01$), indicating that targeted approaches may be more effective than uniform strategies.

Overall, the findings demonstrate that while positive attitudes towards sustainable food consumption are widespread, they do not automatically translate into comprehensive behavioural change. The dominance of intermediate clusters suggests that future interventions should focus on identifying and lowering perceived barriers and supporting transitions towards sustainable food consumer behaviour.

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References

- Clayton S., Karazsia B. T., 2020, Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, 69, 101434, DOI: 10.1016/j.jenvp.2020.101434.
- Essary C.R., Fischer L.M., Irlbeck E., 2022, A Statistical Approach to Classification: A guide to hierarchical cluster analysis in agricultural communications research. *Journal of Applied Communications*, 106(3), 3, DOI: 10.4148/1051-0834.2431.
- Hoek A.C., Malekpour S., Raven R., Court E., Byrne E. 2021, Towards environmentally sustainable food systems: decision-making factors in sustainable food production and consumption. *Sustainable Production and Consumption*, 26, 610-626, DOI: 1016/j.spc.2020.12.009.
- IBM Corp, 2023, IBM SPSS Statistics for Windows. Version 29.0.1.0, IBM Corp Armonk, NY, USA.
- O'Neill C., McCarthy M.B., O'Reilly S., Alfnes F., 2023, Food interests, preferences and behaviours: a profile of the sustainable food consumer. *British Food Journal*, 125(13), 352-374, DOI:10.1108/BFJ-09-2022-0762.
- Schäufele-Elbers I., Janssen M., 2023, Consumer segmentation based on three dimensions of sustainable food consumption: A simultaneous analysis of meat, organic food, and sweet snack purchases based on household panel data in Germany. *Frontiers in Nutrition*, 10, 1140636, DOI: 10.3389/fnut.2023.1140636.
- Verain M.C., Dagevos H., Antonides G., 2015, Sustainable food consumption. Product choice or curtailment? *Appetite*, 91, 375-384, DOI: 10.1016/j.appet.2015.04.055.
- Wunsch N.-G., 2025, Consumers' likeliness of buying & eating sustainable food in selected EU countries in 2021 to 2023. <https://www.statista.com/statistics/1372578/consumers-likeliness-of-buying-and-eating-sustainable-food-in-eu-countries/>, accessed 17.04.2025.