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Food Consumption Habits of Hungarian Organic Food Consumers and Their Policy Implications

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Abstract: Food production and consumption have a major impact on the environment and human health. Therefore, it is important to achieve transformations towards greater sustainability in the food sector. As in other countries around the world, Hungarian organic food consumers are characterised by the fact that they consume organic food primarily for health reasons. Direct forms, including online purchase, are preferred in the choice of channels since direct contact with producers is very important due to mistrust, which is one of the barriers to the further growth of consumption. Empirical tests of well-known and frequently applied theories also shed light on the connections above. First, an examination was conducted through logistic regression to determine if there exists a correlation between organic food consumption and environmentally and socially conscious consumption traits (such as supporting small-scale producers) within the broader sample (1148), encompassing not just organic food consumers. Subsequently, concentrating solely on organic food consumers (944), factor analysis was employed to reveal connections among the analysed variables and to group Hungarian organic food consumers into clusters based on their consumption and purchasing habits. In conclusion, it is reasonable to assume that organic food consumers are more likely to be environmentally conscious, as they are more aware of the environmental impact of their food choices. Three clearly distinguishable groups were obtained using cluster analysis. These groups can be targeted with different means in order to develop the sector.

Keywords: sustainable food; direct food purchasing channels; food waste; cluster analysis

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1. Introduction

The global organic food market experienced a continued growth trajectory in 2021, albeit at a decelerated pace [1]. This growth mirrors the sustained uptrend in organic retail sales observed in Europe and the EU since 2004, peaking in 2019–2020 with a 15% surge due to the COVID-19 pandemic, followed by a more subdued increase of less than 4% in 2021 [1,2]. Notably, Germany and France held the largest organic food markets in Europe/the EU in 2021, with the former's market showcasing unbroken growth except for a few isolated instances [3].

Among the world's top ten countries in per capita expenditure on organic food in 2021, eight were European, highlighting Switzerland and Denmark occupying the leading positions [1]. The burgeoning interest in organic food in Europe is underscored by these figures, indicating a substantial increase in spending from 2012 to 2021 [1,3].

In Hungary, the number of organic food consumers is expanding, which is in line with the global trends [4]. However, the consumption of organic food is still far behind that of other EU member states [4,5]. In 2000, Hungarian organic food consumption accounted for

a minimal share of the total consumption (0.005%), which can be explained by the fact that the organic producers mainly produced for export [6]. The Hungarian organic market share is still not significant compared to that of conventional food products. The leap in organic farmland happened between 2015 (0.129 million ha, 2.43%) and 2016 (0.186 million ha, 3.48%), and the growth kept increasing. By 2020, the organic farmland was 0.3101 million ha, and the percentage of total farmland was 6.03% [7]. Nonetheless, specialised data concerning the scale of Hungary's organic market remain largely uncollected [8], with per capita organic food expenditure in Hungary registering at EUR 3.04 in 2021 [9].

Motivations driving organic food purchases among consumers vary widely, with predominant studies emphasising "health" as the primary driver [10–15]. Consumers consider organic food product purchases "an investment for good health" [16]. Nonetheless, a dichotomy exists, with some studies challenging health as the sole determining factor [17,18]. Environmental concerns also feature prominently in the literature, with consumers perceiving organic products as environmentally friendly compared to conventionally produced items [19,20]. Yet, consensus remains elusive regarding environmental concern as a compelling motivator for organic food purchases [21–25].

Ethical considerations, such as animal welfare, also have a significant impact on organic food purchasing behaviour [26–28]. However, the extension of the organic market through additional ethical characteristics might primarily attract committed consumers, with limitations on market expansion projected due to higher product costs associated with raised standards [29,30].

Hungarian consumer attitudes toward organic food align with international findings, emphasising health, nutritional value, and animal welfare among the pivotal factors [31,32]. The factors affecting organic food consumption cover a complex spectrum, including food safety, environmental sensitivity, and support for ethical farming [33].

In alignment with the Green Deal's objectives, Hungary faces a challenge in stimulating organic sector growth and enhancing sustainable food consumption patterns.

The Objective of This Paper

In this context, this study aims to establish connections between organic food consumption and the environmental and social aspects of food consumption among Hungarian citizens. Furthermore, this study seeks to segment Hungarian organic food consumers based on these variables, intending to offer insights for advancing sustainable food consumption practices in the country.

In essence, this article seeks to uncover the intricate motivations behind organic food consumption in Hungary, employing statistical analysis to segment consumers and extract meaningful insights that can inform both policy and further academic research.

2. Materials and Methods

2.1. Data Sampling

The data were collected using a Google Form between May and June 2022. A total of 1184 evaluable responses were received. From this, those respondents were selected who consume organic food. Thus, we selected and processed a total of 944 questionnaires.

Before the survey, we tested the questionnaire among the employees of the Rural Development and Sustainable Economy Institute and the Agricultural and Food Economics Institute, and some questions were modified or deleted in accordance with their comments.

For data collection, the access link to the questionnaire was distributed among full-time and correspondence students at the Hungarian University of Agricultural and Life Sciences regardless of their major studies.

The questionnaires were asked by the students among their acquaintances based on the following criteria. Each student had to ask at least five other people. Each interviewee had to come from a separate household and be at least 18 years old.

The questionnaire contained demographic questions (6) and questions about the frequency of consumption of the main food categories, followed by questions about envi-

ronmentally friendly food packaging, the use of food waste, attitudes towards local foods and small producers, and the use of various short supply chains.

According to these, the analyses aimed to measure several factors related to consumers' attitudes and behaviour towards organic food. These factors included environmental concerns, health motivations, ethical considerations, packaging and waste avoidance, local and small-scale producers, and knowledge of circularity and direct sale channels.

These factors collectively sought to explore various dimensions shaping consumers' choices and behaviours regarding organic food. The applied methods aimed to reveal the interaction and significance of these factors in influencing the organic food consumption habits of Hungarian consumers

2.2. Data Analysis

At first, a logistic regression was performed by the SPSS program for the whole sample (1184). In this case, the binary variables were used from the questionnaire, as well as those variables that could simply be converted to a binary variable. The relationships among the used variables (social and environmental) and organic food consumption were analysed in this case. This statistical method was well-suited for the study's objectives as it allowed for the analysis of binary outcome variables—in this case, the categorisation of individuals into organic food consumers and non-consumers. By using binary logistic regression, this study could evaluate how different variables related to environmentally friendly food practices, food waste, local food preferences, and knowledge about certain food systems are influenced by the likelihood of an individual becoming an organic food consumer.

The logistic regression also requires the testing of multicollinearity. According to the collinearity statistics, the data are suitable for the analysis, and the VIF (Variance Inflation Factor) values are all below 2 or around 2 (Table 1).

Table 1. Collinearity statistics for the logistic regression model.

Model		Collinearity Statistics	
		Tolerance	**VIF**
1	(Constant)		
	ecowrap	0.945	1.058
	avoidfoodwaste	0.903	1.107
	recyclingfoodwaste	0.910	1.099
	smallfarmer	0.944	1.059
	foodtravelimportance	0.902	1.109
	fromcircular	0.914	1.094
	boxsystem	0.891	1.123

The second step of the analysis took place among organic food consumers. Thus, organic food consumers were selected for further analysis. Only 944 out of a total of 1148 respondents consume organic food. The descriptive statistics of these data can be found in Appendix A.

Factor and cluster analyses were utilised to categorise consumers. These methods were employed specifically to address Q2, and visuals were crafted to illustrate the demographic traits within each segment. Extracting from the cluster analysis results, the pivotal characteristics of the distinct clusters were defined. We performed a principal component analysis (PCA) using SPSS version 29.01 (IBM, Armonk, NY, USA). The analysis included 12 variables Appendix B. PCA was conducted with the extraction method set to Principal Components, and Varimax rotation was applied to aid interpretation. Factors were retained based on the Scree Plot, resulting in four components being retained. Additionally, a cluster analysis was conducted using the K-means method in SPSS, utilising the same variables as in factor analysis to identify natural groupings. The optimal number of clusters was determined through hierarchical cluster analysis with using the Ward method, resulting in three distinct clusters. Bartlett's test of sphericity yielded significant results at

the 0.001 level, while the Kaiser–Meyer–Olkin (KMO) value stood at 0.802, surpassing the required minimum threshold of 0.7 [34].

The total variance explained (TVE) is 61.77% (Table 2), which is satisfactory because, according to Peterson [35] and Merenda [36], 50% TVE is acceptable as a minimum.

Table 2. Total variance explained in factor analysis.

Total Variance Explained									
Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	3.712	30.934	30.934	3.712	30.934	30.934	2.729	22.741	22.741
2	1.566	13.054	43.988	1.566	13.054	43.988	2.253	18.776	41.517
3	1.094	9.114	53.101	1.094	9.114	53.101	1.221	10.179	51.696
4	1.040	8.668	61.770	1.040	8.668	61.770	1.209	10.074	61.770
5	0.889	7.405	69.175						
6	0.785	6.541	75.716						
7	0.698	5.821	81.536						
8	0.622	5.180	86.716						
9	0.516	4.299	91.015						
10	0.445	3.712	94.727						
11	0.366	3.048	97.775						
12	0.267	2.225	100.000						

Extraction Method: Principal Component Analysis.

To summarise the main steps of this research, a table was created for easier overview (Table 3).

Table 3. Main phases and steps of the conducted survey and the analyses.

	Data Collection Steps Were the Following:
1.	Google Form used for data collection.
2.	Pre-testing among institute employees.
3.	Distribution among university students (criteria for selecting respondents).
4.	Participant selection criteria: criteria for questionnaire distribution among students
5.	Questionnaire structure (demographics, food consumption habits, attitudes towards specific aspects).
	Data Analysis Steps:
1.	Logistic regression (whole sample) to explore social/environmental aspects' relation to organic food consumption. Multicollinearity testing as a prerequisite.
2.	Further analyses among organic food consumers in order to better understand organic consumers and the differences between them.
3.	Factor and cluster analysis, which help to discover the main differences. Hierarchical and K-means clustering. a. Exploratory factor analysis to reveal related variables and to easily interpret the results of the cluster analysis. b. Hierarchical factor analysis to determine the number of the clusters, based on the Dendrogram. c. K-means clustering to segment the organic consumers and discover the differences between the segments.
	Results Summary:
1.	Logistic regression findings.
2.	Factor analysis interpretations.
3.	Clusters and their characteristics identified.

3. Results

3.1. Results of the Logistic Regression

As was previously mentioned, a logistic regression was applied at first. It was chosen to understand the relationship between the dependent variable and the independent variables by estimating the likelihood of organic food consumption occurring based on given predictors. The answer for Q1 was intended to find this.

Q1: Do the social and environmental aspects of food consumption in consumer habits increase the likelihood of becoming an organic food consumer? More precisely, is there any connection between organic food consumption and the concerns about the environmental and social effects of food consumption? To answer this question, selected variables about food packaging, avoiding food waste, food recycling, purchasing preferences of small producers, shorter food travel distances, and knowledge of modern food sales forms and the circular economy were used.

The effect of the abovementioned variables was analysed with the help of logistic regression.

The dependent variable was organic food consumption, and the independent variables in this model are detailed below.

In some cases, it was necessary to recode the variables into binary variables. Binary variables are often utilised in logistic regression models, especially when examining categorical responses or behaviours to predict binary outcomes, such as organic food consumption in this case. Transforming responses into binary format simplifies the analysis process by enabling the model to compare and predict outcomes more effectively, making interpretation and results easier to understand. Binary variables help in quantifying qualitative responses, allowing for better prediction and interpretation of the impact of specific factors on the dependent variable (organic food consumption), aiding in drawing meaningful conclusions.

The variable "ecowrap" corresponds to the query: "Are you mindful of environmentally friendly packaging?". The responses were encoded as follows:

(a) Unfortunately, I'm unable to prioritise this—coded as 0.
(b) I bring my own shopping bag and containers (e.g., a jug for milk) and opt for products with eco-friendly packaging—coded as 1.
(c) I bring my own bag and containers but may still purchase items without environmentally friendly packaging (e.g., milk in a plastic bottle)—coded as 0.
(d) I refrain from buying food wrapped in plastic—coded as 1.

Variable "avoidfoodwaste" belongs to the question: "How important do you think it is to avoid food waste?". The encoding of the answers was the following:

(a) I don't have time for this in this fast-paced world—0.
(b) I consider it important, but I cannot avoid it—0.
(c) I consider it important and avoid its occurrence—1.

Variable "recyclingfoodwaste" relates to the question "What do you do with food waste?" and the encoding of the answers was the following:

(a) I throw it in the trash—0.
(b) I mainly throw it and partially compost it or give it to an animal—0.
(c) I give it to an animal, compost it or both—1.
(d) I try to avoid it. I take some to the local composter or to my colleague's dog—1.
(e) I avoid its occurrence—1.

Variable "smallfarmer" relates to the question "Do you think it is important to purchase food from small-scale producers?". The optional answers were the following: No—0, Yes—1.

Variable "foodtravelimportance" relates to the question "Is it important to you how far the food travels?". The encoding of the answers was the following:

(a) Yes, I pay attention to buying locally produced products—1.
(b) No, I didn't think of that—0.

(c) Unfortunately, in my current life situation, I cannot pay attention to this—0.

Variable "fromcircular" relates to the question "Have you ever heard of the circular economy?". The optional answers were the following: No—0, Yes—1.

Variable "boxsystem" relates to the question "Are you familiar with the "box system" (selected foods that can be ordered directly from the producer at a given price)?". The optional answers were the following: No—0, Yes—1.

A total of 240 cases belong to the group that does not eat organic food and 944 cases belong to the group that eats organic food, i.e., 79.7% of the sample (Table 4).

Table 4. Classification table of the logistic regression.

Classification Table [a,b]					
			Predicted		
	Observed		Bioconsumption		Percentage Correct
			0	1	
Step 0	bioconsumption	0	0	240	0.0
		1	0	944	100.0
	Overall Percentage				79.7

[a] Constant is included in the model. [b] The cut value is 0.500.

The Table 5 above shows that all of the variables are significant individually also.

Table 5. The separate significance of the independent variables.

Variables Not in the Equation					
			Score	df	Sig.
Step 0	Variables	ecowrap	1.315	1	0.251
		avoidfoodwaste	11.172	1	<0.001
		recyclingfoodwaste	7.640	1	0.006
		smallfarmer	94.681	1	<0.001
		foodtravelimportance	8.591	1	0.003
		fromcircular	30.771	1	<0.001
		boxsystem	42.284	1	<0.001
	Overall Statistics		138.209	7	<0.001

According to the Nagelkerke index, the variables explain 17.2% of the variance of the dependent variable (Table 6).

Table 6. Variance explained by the independent variables.

Model Summary			
Step	−2 Log Likelihood	Cox and Snell R Square	Nagelkerke R Square
1	1057.024 [a]	0.109	0.172

[a] Estimation terminated at iteration number 5 because parameter estimates changed by less than 0.001.

The classification table (Table 7) shows that the independent variables contribute only slightly to the correct categorisation of the data because the right categorisation of the data was better only with 0.3% according to the expected success of random categorisation.

Table 7. The contribution of the independent variables to the categorisation of the dependent.

Classification Table [a]					
Observed			Predicted		
			Bioconsumption		Percentage Correct
			0	1	
Step 1	bioconsumption	0	59	181	24.6
		1	56	888	94.1
Overall Percentage					80.0

[a] The cut value is 0.500.

The variables "food waste avoidance", "preference of purchasing food from small farmer", and "knowledge about the circular economy principle and food box system" are significant, and based on the Wald statistic, these variables contribute to the model. So, if a consumer tries to avoid food waste, buys food from small producers, and has heard about the circular economy and the box system, it greatly increases their chances of being an organic food consumer. Preference for small farmers increases this chance by more than three times, while knowledge of the circular economy principle and box systems separately increases it by more than two-fold (Table 8).

Table 8. The significance of the independent variables and their contribution to the model.

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 [a]	ecowrap	0.020	0.212	0.009	1	0.924	1.021	0.674	1.546
	avoidfoodwaste	0.433	0.195	4.941	1	0.026	1.542	1.053	2.260
	recyclingfoodwaste	0.054	0.171	0.099	1	0.753	1.055	0.754	1.476
	smallfarmer	1.344	0.170	62.278	1	<0.001	3.834	2.746	5.352
	foodtravelimportance	0.073	0.234	0.098	1	0.754	1.076	0.681	1.701
	fromcircular	0.785	0.212	13.686	1	<0.001	2.191	1.446	3.321
	boxsystem	0.781	0.192	16.594	1	<0.001	2.183	1.499	3.178
	Constant	−0.179	0.174	1.059	1	0.303	0.836		

[a] Variable(s) entered on step 1: ecowrap, avoidfoodwaste, recyclingfoodwaste, smallfarmer, foodtravelimportance, fromcircular, boxsystem.

According to the results obtained, the organic food consumer is more informed about the circular economy, and it is important for them that the food comes from small-scale producers, as well as to avoid food waste, while the importance of environmentally friendly food packaging, the recycling of food waste, and the distance travelled by food are not only typical for this consumer group.

3.2. Results of the Factor Analysis

During the factor analysis, four factors could be determined that highlight the latent constructs or underlying dimensions in our dataset by condensing the information from multiple observed variables into a smaller set of factors. This analysis was used to simplify the data by uncovering correlations among variables to reveal the structure underlying the data. It helps to better understand the findings of the cluster analysis.

The primary component (PC1) comprises variables associated with food origin information, reflecting a preference for direct interaction with farmers. This approach aims to address trust issues linked to organic products by establishing direct contact with farmers. The remaining variables pertain to food-related information, encompassing details found

on food labels and the origin of the food, including restaurant choices emphasising the use of local ingredients. This factor can be labelled as "food information" (Table 9).

Table 9. Rotated component matrix.

	Component			
	1	**2**	**3**	**4**
biopurchase	0.216	0.022	0.102	0.705
directfarmer	0.162	0.777	0.147	0.058
frominternet	−0.070	0.241	−0.041	0.731
traditionalmarket	0.122	0.767	−0.060	0.097
farmermarket	0.127	0.818	0.117	0.162
foodwasteto	0.137	0.001	0.728	0.104
directcontactfarmer	0.564	0.456	0.189	−0.045
travelforfood	0.021	0.154	0.759	−0.044
readlabel	0.694	−0.069	0.034	0.315
foodorigin	0.855	0.136	0.001	0.065
fromHungary	0.807	0.149	0.038	−0.101
restaurantlocal	0.648	0.233	0.161	0.096

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation. Rotation converged in six iterations. Meaning of the labels: "biopurchase"—frequency of bio food purchasing; "directfromfarmer"—frequency of buying from the farm; "frominternet"—frequency of buying food online; "traditionalmarket"—frequency of buying food at a traditional market; "farmermarket"—frequency of buying food at a farmer's market; "foodwasteto"—utilisation of food waste; "directcontactfarmer"—importance of the direct contact with the farmer; "travelforfood"—the inclination to travel a certain distance for food (this meant five categories from 0 to 10 km to more than 50 km); "readlabel" denotes the significance attributed to reading food labels, while "foodorigin" reflects the importance of a product's origin in purchase decisions; "fromHungary" signifies the significance of Hungarian origin in buying choices;"restaurantlocal" gauges the importance of utilising local ingredients in restaurants.

The variables within the second component (PC2) are linked to conventional direct food procurement channels, involving the direct purchase of food from farmers and through traditional farmers' markets (Table 9). The variables in the second component (PC2) connect to the traditional direct food purchasing channels, buying food directly from farmers and from traditional and farmers' markets (Table 9). This factor also contains the direct contact to the farmers as PC1. This can be explained by the fact that this contact with farmers is important in all traditional food purchasing channels. The name of this group of variables can be called "the traditional food sources".

The variables in PC3 belong to the use of food waste recycling methods. This factor also contains the willingness to travel a certain distance for food, in some cases even more than 50 km. This variable can also be linked to the issue of trust, which can be addressed by the consumer travelling to buy the food, meeting the farmer, and getting a glimpse of the farming scene (Table 9). On the other hand, it requires that the consumer makes efforts to support certain farmers. These variables indicate a very high level of awareness and a high level of evaluation of food. This can be called "ascertain food as a value".

The significant variables within the fourth component (PC4) revolve around Internet usage for food purchases and the frequency of buying organic food. These two factors are somewhat interconnected, given that online stores represent a crucial avenue for purchasing organic products (Table 9). This factor can be labelled "organic food purchasing".

3.3. Results of the Cluster Analyses

The related research question (Q2) here was the following: What are the distinctive characteristics of organic food consumers? How many segments of them can be separated and what are the differences between these clusters?

After conducting hierarchical cluster analysis, K-means cluster analysis was applied, resulting in the segregation of three distinct clusters. Based on the ANOVA table (Table 10) derived from the K-means cluster analysis, it can be affirmed that all variables exert a determining influence.

Table 10. ANOVA table.

	Cluster		Error		F	Sig.
	Mean Square	**df**	**Mean Square**	**df**		
biopurchase	22.295	2	0.552	941	40.381	<0.001
directfarmer	253.312	2	0.743	941	340.746	<0.001
frominternet	43.599	2	1.157	941	37.682	<0.001
traditionalmarket	136.735	2	0.823	941	166.219	<0.001
farmermarket	249.866	2	0.815	941	306.399	<0.001
foodwasteto	210.594	2	1.218	941	172.970	<0.001
directcontactfarmer	288.553	2	0.872	941	331.087	<0.001
travelforfood	19.075	2	0.673	941	28.327	<0.001
readlabel	86.374	2	0.991	941	87.123	<0.001
foodorigin	158.239	2	0.798	941	198.283	<0.001
fromHungary	138.721	2	0.869	941	159.597	<0.001
restaurantlocal	174.538	2	0.894	941	195.167	<0.001

Cluster 1 (C1) members achieved the highest average scores in all analysed dimensions except food waste recycling (Figure 1). They are very interested in the localisation and origin of food. They purchase organic food with the highest frequency and also buy food through the Internet and directly from the farmers (Figure 1). This cluster represents itself with the highest rate in the age categories of 41–50 and 51–60 (Figure 2). This is the most educated cluster (Figure 3). Most of the members are employee (Figure 4), live in a city (Figure 5) and have completed college or a university. 20% have an above average income (Figure 6). There is a slight difference between Cluster 1 and Cluster 2 in the main motivations (Figure 7). They spend the most attention on the information related to food (Figure 1). They can be called "information dependent".

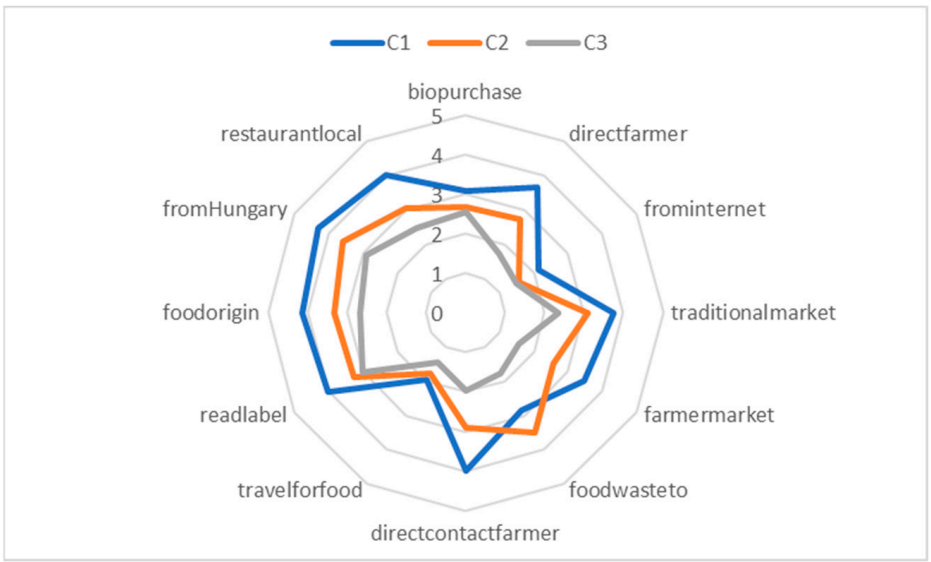

Figure 1. Differences between the three clusters in the analysed variables. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

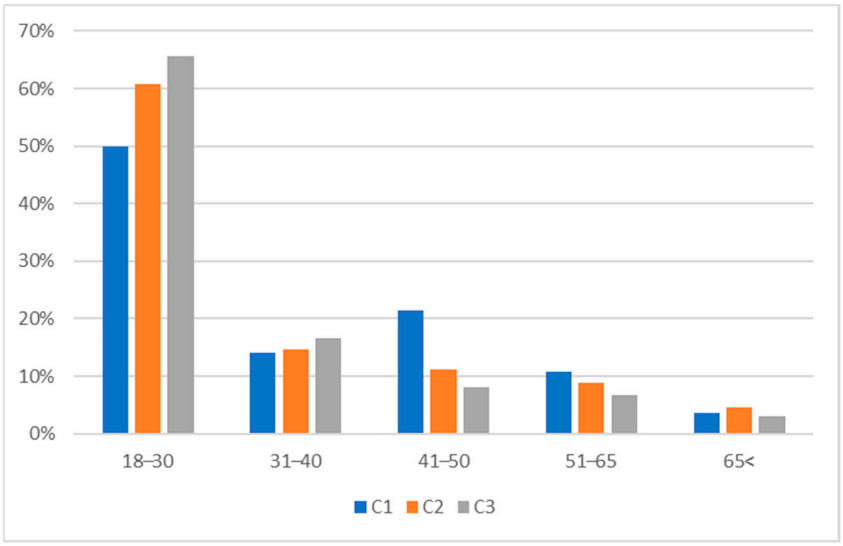

Figure 2. Age distribution in each cluster. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

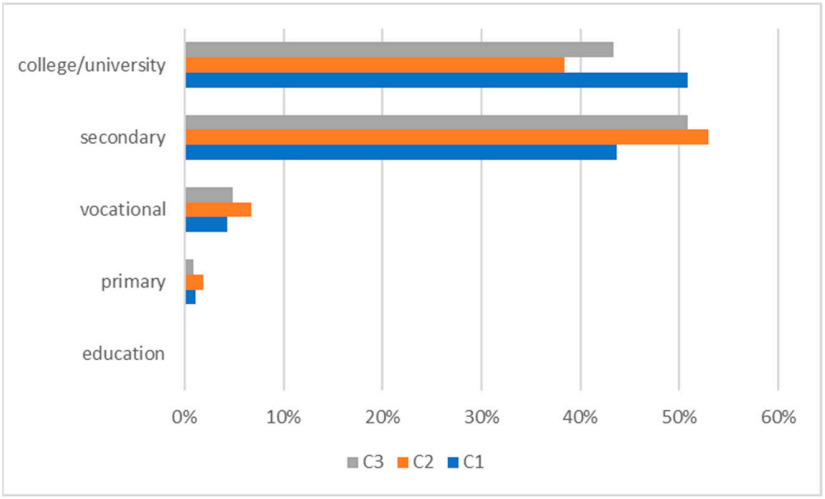

Figure 3. Distribution of qualifications in each cluster. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

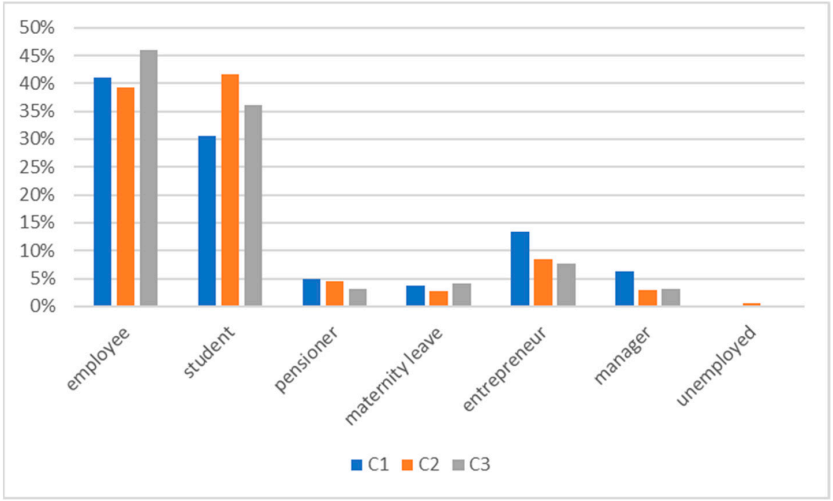

Figure 4. The distribution of occupations in each cluster. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

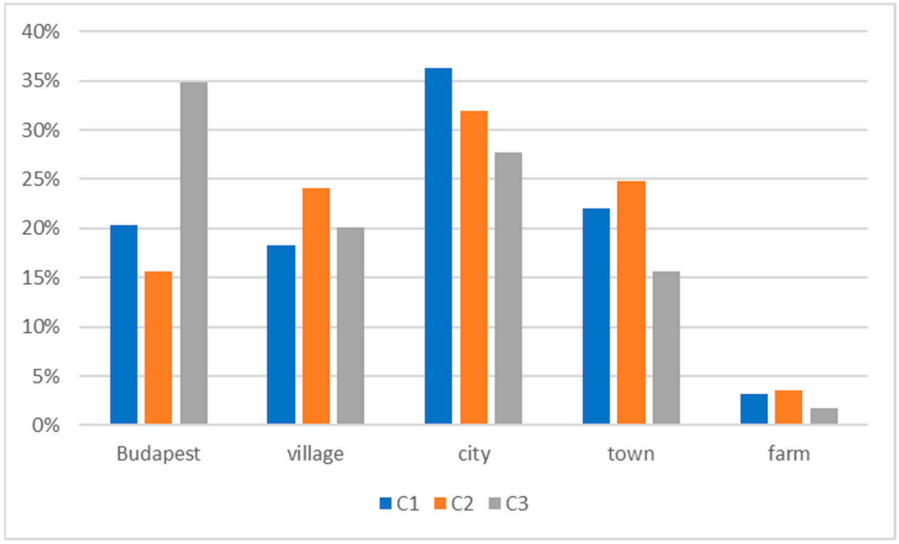

Figure 5. Distribution of residences in each cluster. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

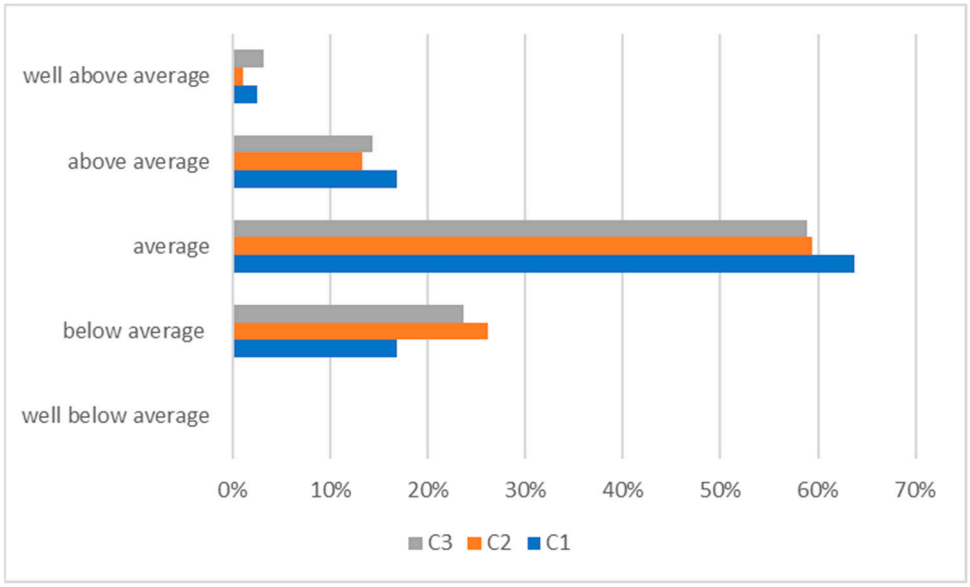

Figure 6. Distribution of income in the different clusters. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

Cluster 2 members are the second most engaged ones in all the investigated aspects exempt two because this cluster outstand from the aspects of food waste recycling ("food-wasteto"), and they use the Internet to purchase food rarely (Figure 1), similarly to Cluster 3. They are in the age categories of 18–30 and 31–40. Most of them finished secondary school and university (Figures 3 and 4). Most of them live in rural areas (Figure 5). They can be called "waste conscious".

The members of Cluster 3 are the least conscious. This cluster's members are the youngest of the three (Figure 2) and most of them finished secondary school (Figure 3). Most of the cluster's membership works as an employee (Figure 4) and lives in Budapest (Figure 5). 59% of them have an average income (Figure 6). They are the least committed, they eat organic food primarily for health reasons, and environmental protection motivates them to the smallest extent to consume organic food (Figure 7).

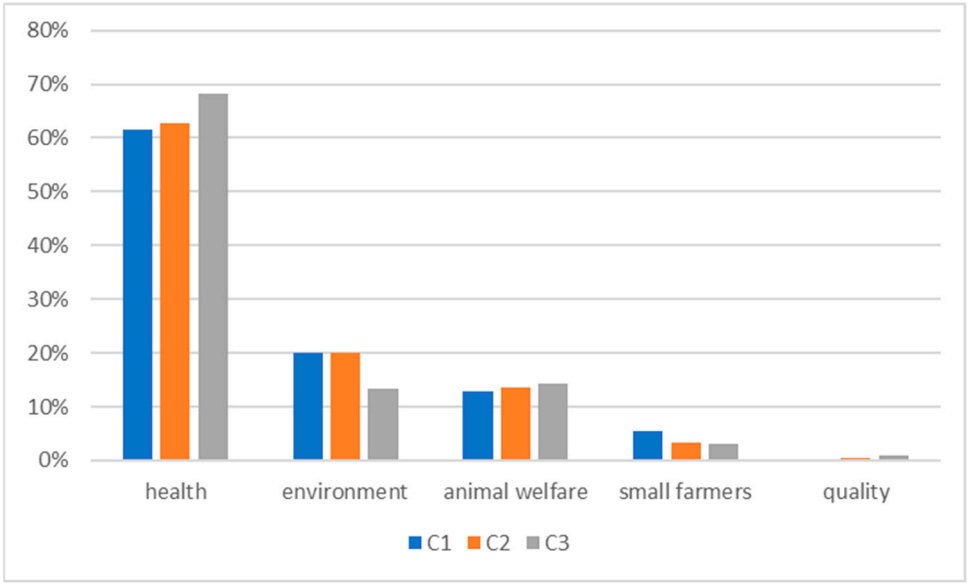

Figure 7. Main motivations for organic food consumption. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

In accordance with the literature review, the examined organic food consumers consume organic food mainly for health reasons and only secondarily for environmental protection reasons (Figure 7). It is interesting that the least engaged cluster listed animal welfare as a motivating factor in second place.

The biggest differences between the food categories can be detected in fruit consumption, fish consumption, wine consumption, and butter consumption (Figure 8). The youngest cluster members have the least healthy diet.

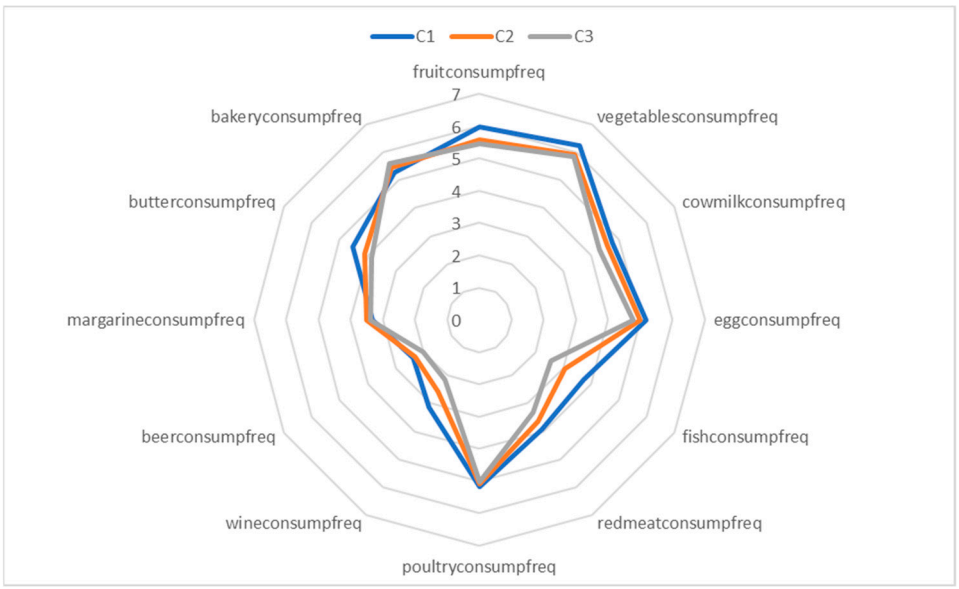

Figure 8. Consumption frequency of the main food categories in each cluster. Note: C1 is Cluster 1, C2 is Cluster 2, and C3 is Cluster 3.

4. Discussion

According to a study by Wang et al. (2020), there is a positive relationship between environmental consciousness and organic food purchase intention. The study also found that perceived food quality mediates the link between environmental consciousness and organic food purchase intention [37]. According to this study's findings, food quality is the

least motivating factor among organic food consumers. At the same time, if we take into account that food safety is a subfield of food quality and largely determines the effect of organic food on health, then it can be stated that according to the present study, health is the most motivating factor in the consumption of organic food.

Another study by Biel and Thøgersen (2018) suggests that attitude is regarded as a central predictor of consumers' intention to buy organic foods, which is due to significant factors, such as environmental friendliness, animal health, and personal well-being [38].

The result of the logistic regression shows that the organic food consumer is more informed about the circular economy, tries to avoid food waste, and it is important for them that the food originates from small-scale producers. The importance of environmentally friendly food packaging, the use of food waste, and the distance travelled for food are not only typical for this consumer group.

The influencing power of these latest variables was also analysed by other authors. According to Stein and Santini, "local food" cannot simply be equated with "sustainable food"; in most cases, it neither can ensure food security nor does it necessarily have a lower carbon footprint. For the environmental sustainability of food systems, many more factors matter than just transportation, not least of which is consumers' dietary choices [39].

In terms of environmental sustainability, in particular, the notion that "food miles" could be used as an indicator of a product's carbon footprint has been widely rejected in the literature; a food product's carbon footprint depends much more on land use, production efficiencies, economies of scale in transport, or whether it is plant-based than the distance it travelled [39].

A study based on a survey of "green" consumers found no correlation between the consumption of organic foods and a reduced tendency to waste food [40]. Hamzaoğlu and Öztürk Göktuna [41], when examining 250 Turkish organic food consumers' behaviour, conclude that in spite of the general tendency of reduced food waste among this type of consumers, a negative correlation between organic food consumption frequency and food waste is observed [41]. On the basis of the results obtained by the logistic regression, it is important for the organic food consumer to avoid food waste. However, it was also found that the most conscious cluster that consumes organic food with the highest frequency pays less attention to food waste recycling, which was also underpinned by the logistic regression. So, they try to avoid it, but if it is produced, its recycling will no longer be typical.

According to the results of the logistic regression, the importance of environmentally friendly food packaging does not feature this consumer group. While there is no direct connection between the preference for environmentally friendly food wrapping and organic food consumption, both are examples of environmentally conscious behaviour. In fact, environmentally sustainable food consumption is a goal-directed behaviour that requires a series of sequential steps, including positively valuing the environment, discerning a discrepancy between the desired versus the actual state of the environment, opting for action to reduce the experienced discrepancy, intending to engage in behaviour that is expected to bring them closer to the desired end state, and acting in accordance with their intention [42].

The findings from the cluster analysis shed light on distinct consumer segments within the organic food market, revealing pivotal insights that can shape policy and industry strategies.

The identification of three distinct clusters among organic food consumers reveals diverse consumption patterns and motivations. Cluster 1 emerges as the most engaged group, demonstrating high interest in localisation, food origins, and frequent organic food purchases, predominantly through direct channels such as farmer markets and online platforms. This cluster, primarily comprising older individuals residing in urban areas, exhibits a strong inclination toward information-dependent food choices.

In contrast, Cluster 2, although equally engaged in most aspects, notably differs in its attention to food waste recycling and Internet-based food purchases. Predominantly

younger and residing in rural areas, this cluster showcases a heightened consciousness towards food waste while being less inclined towards online organic food procurement.

Cluster 3 emerges as the least committed group, characterised by the youngest members, predominantly residing in urban centres. Despite consuming organic food, this cluster exhibits lower overall engagement with environmentally conscious behaviours. Interestingly, health remains a primary motivation for this group, whereas environmental concerns hold less importance in their organic food consumption choices.

The diversity among these clusters highlights the complexity of consumer behaviours within organic food consumption. The findings suggest that while health remains a consistent motivator across clusters, the emphasis on environmental protection and food quality varies significantly. This nuanced understanding is crucial for policymakers and practitioners aiming to tailor interventions and education that resonate with specific consumer segments.

The identification of these clusters underscores the challenges in promoting sustainable food consumption uniformly. It is evident that certain clusters prioritise specific aspects of sustainability over others, signalling the need for targeted strategies to bridge these disparities. Efforts directed at promoting a holistic understanding of sustainability, encompassing both health and environmental concerns, may require varied approaches for different consumer segments.

The segmentation of organic food consumers into distinct clusters reveals variations in consumption habits and motivations. This detailed understanding paves the way for more tailored and effective strategies aimed at promoting sustainable food consumption practices across diverse consumer segments.

5. Conclusions

This study aimed to unravel the intricate relationship between organic food consumption and various social and environmental aspects of food habits among Hungarian consumers. Through a comprehensive analysis encompassing logistic regression and cluster analysis, several key insights have emerged.

The findings highlight that organic food consumers exhibit a heightened awareness of factors such as the circular economy, small-scale producers, and a conscious effort to avoid food waste. These aspects significantly influence the likelihood of an individual becoming an organic food consumer. Notably, a preference for environmentally friendly food packaging, while an environmentally conscious behaviour, does not directly align with increased organic food consumption.

Cluster analysis unveiled three distinct consumer segments with varied consumption habits and motivations. These segments showcase differing levels of engagement with environmental and social aspects of food consumption. While health emerges as a dominant motivator across segments, the level of emphasis on environmental protection and food quality varies significantly among these groups.

Interestingly, this study revealed differences in certain behaviours of organic food consumers. While some make a concerted effort to avoid food waste, there is a subset that, despite frequent consumption of organic food, pays less attention to recycling food waste. This behaviour emphasises the complexity and diversity of sustainable food consumption patterns. MATE (Hungarian University of Life Sciences) places great emphasis on waste composting and uses a number of informative forums for this, the effect of which can be assumed in the segment, where food recycling is very advanced.

Addressing sustainable food consumption presents challenges and opportunities. This study underscores the need for a better understanding of consumers' motivations and behaviours. Contrary to common assumptions, certain environmentally conscious practices do not uniformly align with increased organic food consumption. This highlights the need for targeted interventions and education to bridge these gaps and foster more sustainable consumption practices.

The findings offer valuable insights for policymakers aiming to promote sustainable food consumption. Tailored strategies that acknowledge the diverse motivations and behaviours of consumers can be instrumental. Efforts should focus on not just promoting organic food consumption but also advocating for a comprehensive understanding of sustainability beyond the environmental domain.

6. Limitations

This study might have a sampling bias considering that the data were collected primarily from students and their acquaintances. This could lead to an underrepresentation of certain demographic groups or perspectives. As the study focuses on Hungarian consumers, the findings might not be universally applicable. Cultural, social, or economic factors specific to Hungary might influence organic food consumption differently elsewhere. This study relies on self-reported data, which might introduce response bias or inaccuracies due to respondents' perceptions or social desirability.

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Appendix A

Descriptive Statistics			
	N	**Mean**	**Std. Deviation**
biopurchase	944	2.79	0.773
directfarmer	944	2.84	1.131
frominternet	944	1.76	1.117
traditionalmarket	944	3.17	1.054
farmermarket	944	2.66	1.159
foodwasteto	944	2.84	1.289
directcontactfarmer	944	3.08	1.217
travelforfood	944	1.76	0.844
readlabel	944	3.48	1.083
foodorigin	944	3.48	1.064
fromHungary	944	3.70	1.078
restaurantlocal	944	3.28	1.124
Valid N (listwise)	944		

Appendix B

There are 12 variables used in the factor and cluster analysis:

1. "biopurchase"—frequency of bio food purchasing

The frequency of purchasing organic food ("bio-purchasing") was assessed using specific scores.

Never—1
Occasionally—2
Rarely—3

Often—4
Always—5.

2. Significance of direct contact with producers ("directcontactfarmer"): Rate from 1 to 5 (1 = not important, 5 = very important).
3. Frequency of purchasing directly from farms ("directfrom-farmer"): Mark from 0 to 5 (0 = never, 5 = several times a week).
4. Frequency of buying food online ("frominternet"): Mark from 0 to 5 (0 = never, 5 = several times a week).
5. Frequency of purchasing food at traditional markets ("fromtraditionmarket"): Mark from 0 to 5 (0 = never, 5 = several times a week).
6. Frequency of buying food at farmers' markets ("fromfarmermarket"): Mark from 0 to 5 (0 = never, 5 = several times a week).
7. "foodwasteto"—utilisation of food waste

"What do you do with food waste"? and the encoding of the answers was the following:

(a) I throw it in the trash—1.
(b) I mainly throw it and partially compost it or give it to an animal—2.
(c) I give it to an animal, compost it or both—3.
(d) I try to avoid it. I take some to the local composter or to my colleague's dog—4.
(e) I avoid its occurrence—5.

8. "travelforfood"—the inclination to travel a certain distance for food, it meant five categories from 0–10 km to more than 50 km,
   (a) 0–10 km—1
   (b) 0–30 km—2
   (c) 0–40 km—3
   (d) 0–50 km—4
   (e) more than 50 km—5
9. Importance of reading food labels ("readlabel"): Rate from 1 to 5 (1 = not important, 5 = very important).
10. Consideration of food origin in purchasing decisions ("origin"): Rate from 1 to 5 (1 = not important, 5 = very important).
11. Consideration of Hungarian origin in purchasing decisions ("fromhun"): Rate from 1 to 5!
12. Importance of restaurants using local ingredients ("restaurantlocal"): Rate from 1 to 5 (1 = not important, 5 = very important).

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