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Characterizing the US Market for Salad Mixes through the Lens of Environmental Preferences

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Abstract. **The consumption of salad mixes has increased because of their convenience and nutritional value, resulting in significant sales increases during the past decade. Conversely, the uses of pest-control chemicals, long-distance transportation of salad mixes, and plastic packaging have raised environmental concerns among "green consumers." Because proenvironmental products are becoming more widespread, this study delved into market segments of salad mix consumers based on their preferences for proenvironmental labels. Data for this study were collected via a 2020 web-based survey of 2100 salad mix consumers in the United States. We performed a comprehensive two-stage cluster analysis that integrated both hierarchical and partitioning methods. This analysis was based on consumers' preferences and evaluations of production (low energy use, low fertilizer use, low greenhouse gas emissions, low water use, and pollinator-friendly) and marketing-related (biodegradable packaging, low carbon footprint, and low food miles) proenvironmental labels. Three segments were identified. We used ordered probit regression to assess the impact of consumer demographic characteristics, market preferences, and environmental perceptions on cluster membership. The deep-rooted segment, which represented 36% of the sample, highly valued all proenvironmental labels related to salad mixes and had a particular preference for labels that included low fertilizer use, pollinator-friendly production methods, and low greenhouse gas emissions. The indecisive segment comprised 40% of the sample and moderately valued all proenvironmental labels; this group mainly comprised individuals with lower income levels and those living in rural areas. The skeptic segment represented 23% of the sample and valued environmental labels less than the deep-rooted and indecisive segments did; additionally, they reported the lowest consumption of salad mixes. These findings can help retailers and policymakers communicate information about proenvironmental labels more effectively to each segment of salad mix consumers.**

Increases in food production and consumption have had major impacts on the environment, including increased greenhouse gas emissions, loss of biodiversity, and greater pollution from chemicals (Azzurra et al. 2019; Crippa et al. 2021; Vermeulen et al. 2012). The environmental footprints of food production, distribution, and consumption have caused consumers to be more aware of and more concerned about the impact of their food choices (Halpern et al. 2022). Consequently, individuals who are often referred to as "green consumers" are increasingly influencing the demand for environmentally friendly food products (Jin et al. 2018; Rahman et al. 2021). A study by the Food Marketing Institute (2023) revealed that "Gen Z" (individuals born between 1997 and 2008) and "Millennials" (individuals born between 1981 and 1996) prioritize sustainable and environmentally friendly foods when making purchasing decisions. Compared with more conventionally grown foods, environmentally friendly products claim to have less impact on the environment and claim to be less damaging to human health. Some of the more common terms on environmentally positive labels of foods include carbon footprint, organic production, pollinator-friendly, fair trade, chemical-free, and others (Lin and Nayga 2022).

The proenvironmental trends have motivated food retailers to leverage consumers' preferences for environmentally friendly foods, thus making proenvironmental labels popular for food retailers (De Canio et al. 2024). Many food companies are using proenvironmental labels to communicate the environmental benefits of their products through product labels, phrases, and logos (De Canio et al. 2021). These proenvironmental labels are intended to influence consumer behavior and raise awareness about the relationship between consumption and the environmental impact of food choices. Previous studies have discussed the efficiency and value of proenvironmental labels in the food industry (Donato and D'Aniello 2021; Kaczorowska et al. 2019).

Although various researchers have indicated that consumers are more likely to choose products with environmentally friendly labels (Riskos et al. 2021), others have suggested that the impact of these labels on consumer behavior is limited or inconclusive (Grunert et al. 2014). One explanation for this inconsistency may be the heterogeneity of consumers. This heterogeneity is compounded by the wealth of products and labels available in the marketplace. Studies have also reported that there are challenges involved in the accurate measurement of environmental impacts, resulting in inconsistencies in labeling standards and leading to consumer confusion (Deconinck and Hobeika 2023; Sörqvist et al. 2020). Rondoni and Grasso (2021) identified a lack of understanding regarding how consumers perceive and behave after viewing proenvironmental food labels; however, the main factors that influence their behavior are not well-known.

Americans are eating more greens, and salad mixes (i.e., spring mix, salad kits, packaged salad) are among the top drivers of this increased consumption (Sebastian et al. 2018). Salad mixes include different varieties of lettuce, spinach, cabbage, arugula, and other leafy greens. Salad mixes have gained popularity as a modern alternative to traditional vegetables, primarily because of their nutritional value and freshness (Zhan et al. 2022). The ease of consumption of salad mixes because of their well-known and convenient grab-and-go feature further contributes to their widespread appeal (Ehmke 2008). Market reports have conveyed that the worldwide salad mixes market was valued at $10.78 billion in 2020, and that a compound annual growth rate of 8.2% is expected from 2021 to 2028 (Grand View Research 2023).

Because approximately 75% of Millennials and Gen Z base their purchase decisions on the perceived level of sustainability of a product (Beltrami et al. 2020), food producers and retailers have strong incentives to inform consumers about their environmentally friendly practices. Yet, the uses of pest-control chemicals, long-distance transportation of salad mixes, and plastic packaging have raised concerns among "green," health-conscious, and young consumers (Heller and Keoleian 2015). Moreover, perceived greenwashing, which is the practice of misleading consumers about the environmental benefits of a product, is an increasing threat to consumer trust in the food industry (Nygaard and Silkoset 2023), especially because proenvironmental

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and green labels are typically not audited by third-party agencies. These factors make it crucial to investigate the impact of proenvironmental labels on consumers' purchases of salad mixes (Fusi et al. 2016; Guthman 2003).

This study characterized the United States market for salad mixes by segmenting consumers based on their preferences for proenvironmental labels. Market segmentation is a widely used strategy that includes the segmentation of a marketplace into clusters of consumers with dissimilar requirements, features, or behaviors across clusters (Ahani et al. 2019). Thus, segmenting the market can help businesses identify the preferences and needs of niche markets and tailor marketing strategies for targeting segments. Our study contributes to the literature by segmenting consumers based on their valuation of proenvironmental labels, including biodegradable packaging, low carbon footprint, low energy use, low fertilizer use, low food miles, low greenhouse gas emissions, low water use, and pollinator-friendly labels. By understanding consumer preferences for proenvironmental labels on salad mixes, we can help food companies tailor labels and establish lasting trust with customers. Our findings can also help researchers investigate marketing practices that support the sustainability of the leafy green industry.

Literature Review

Proenvironmental labels. As consumers' awareness of environmental issues grows, the consideration of their environmental footprint—which represents the overall impact of their activities on the environment—becomes increasingly crucial. Larranaga and Valor (2022) proposed that their food preferences are likely driven by labels that highlight the sustainability and eco-friendliness of foods. This is especially true because proenvironmental information strongly resonates with environmentally conscious consumers (Echeverria et al. 2014). Moreover, Rondoni and Grasso (2021) reported that emphasizing information about the positive impact that food production has on the environment can motivate consumers to make more sustainable choices. Because labeling can shape consumers' preferences and decision-making, highlighting proenvironmental labels on packages of salad mixes is a common marketing strategy used to positively influence consumers' willingness to purchase as well as pay price premiums for these products (Rihn and Yue 2016).

Multiple studies have investigated the carbon footprint of food production and distribution (Saarinen et al. 2012; Virtanen et al. 2011). Jones et al. (2016) studied proenvironmental indicators such as water, land, and energy use, as well as greenhouse gas emissions. Gallo et al. (2023) found that the growing consumer concern about the environmental impact of water and energy usage in food production emphasizes the need for information regarding product labeling and marketing strategies. Rani et al. (2019) investigated water use efficiency and proposed key measures for producers to adopt sustainable practices and meet the growing consumer demand for water-friendly products. Pearce et al. (2005) emphasized the environmental impact of food miles and played a pivotal role in lowering carbon emissions associated with both transportation and food production. Lang et al. (2014) and Jungbluth et al. (2000) reported that a segment of consumers favors locally sourced foods to actively reduce carbon emissions associated with packaging, transportation, and distribution. Heller and Keoleian (2015) investigated the greenhouse gas emissions associated with food production and stressed the need for energy-efficient technologies and sustainable practices to combat climate change.

Research of biodegradable packaging (Popa et al. 2011; Shaikh et al. 2021) and fertilizer use (Alston and Sumner 2012; Fernandez et al. 2018) also contribute to the understanding of environmental impacts on food production. Ragaert et al. (2004) found that consumers value biodegradable packaging because it aligns with their desire to minimize waste and reduce their environmental footprint (Song et al. 2009). Rahman et al. (2021) reported a segment of consumers who prefer salad mixes treated with reduced or zero synthetic fertilizers as a way to promote ecosystem health, minimize harm, and advocate for sustainable farming practices. Smith et al. (2022) discussed the urgent need to encourage eco-friendly farming practices that support pollinators by minimizing harmful pesticides and fostering pollinator habitats. The significance of these labels is closely tied to consumer preferences for avoiding or reducing the use of harmful pesticides and supporting pollinator habitats.

Factors driving consumers preferences. Researchers have investigated the impact of sociodemographic and behavioral factors on consumer preferences for environmentally friendly products. Age, gender, education, and income are influential factors among environmentally conscious consumers. Thomas et al. (2020) found that older consumers valued biodegradable packaging and pollinator-friendly practices more than younger consumers did. Gracia et al. (2017) found that younger consumers and women exhibit greater enthusiasm for purchasing environmentally friendly products relative to their counterparts. Consumers with higher education levels and incomes were likely to seek out environmentally friendly products (Meyer 2015; Thakur and Gupta 2012).

Researchers have found that the environmental consciousness of consumers and the market where they purchase foods influence their choices. Krystallis and Chryssochoidis (2005) highlighted that consumers who identify themselves as environmentally conscious are more inclined to seek out products with labels that have sustainability claims. The marketplace seems to play a crucial role among consumers seeking foods with lower environmental footprints as well. Barbu et al. (2022) reported that farmers' markets are preferred marketplaces for "green consumers" because of the local sourcing and sustainability focus of products sold at these outlets. This aligns with the findings of Marques et al. (2021), who identified "localness" as a major driver of purchasing at farmers' markets. Together, these recent studies emphasized the significance of farmers' markets to environmentally conscious consumers.

Market segmentation. Consumers are heterogeneous. This heterogeneity implies that not all consumers are equally concerned about the environment, and their preferences for proenvironmental products can vary significantly (Jolibert and Baumgartner 1981; Tan and Lau 2010; Verain et al. 2012). Market segmentation is a widely used and effective strategy of connecting consumers with similar beliefs and behaviors in nonuniform markets (Foxall and Goldsmith 1998). Among various clustering techniques, a two-stage cluster analysis that uses hierarchical and partitioning clustering methods is a reliable method of performing consumer research because of its high performance compared with that of other procedures (Zhllima et al. 2015). When both the hierarchical and partitioning clustering techniques group similar data, the resulting clusters tend to be stable and resistant to significant changes attributable to external influences (Reynolds et al. 2006).

Insights from market segmentation can assist marketers with developing tailored targeting, communication, and persuasive messages to make proenvironmental labels more relevant and build consumer trust. Funk et al. (2021) identified key consumer segments based on a stated environmentally friendly behavior in the food domain, including the uncommitted, green activists, and undefined segments. The uncommitted segment consists of young individuals with higher education levels who have negative views of environmental issues. Green activists are characterized by higher education levels and express favorable attitudes but skepticism about promotional claims. The undefined segment comprises older individuals with lower education levels who exhibit negative environmental views. Verain et al. (2012) reviewed market segments based on consumers' sustainable food preferences and identified three general consumer groups: the green segment, characterized by strong concerns for the environment; the potential green segment, who emphasize factors such as price, health, and "naturalness" in addition to environmental aspects; and the nongreen segment, who demonstrate negative attitudes toward the environment. Torres (2020) reported the existence of the following four customer segments based on explicit (organic and local) and implicit (small-family farms and sustainable) sustainable attributes of fresh produce committed, farm-to-fork, unattached, and skeptic. The committed segment highly values all four produce attributes. The farm-to-fork segment favors features related to local food systems. The unattached segment does not exhibit strong preferences for any of the attributes. Lastly, consumers in the skeptic segment reported the lowest valuation for all food attributes.

Data and Methodology

Survey design and data collection

Data for this study were collected using a web-based survey of salad mix consumers in the United States. The survey was approved by the university institutional review board (IRB-220–1474) for ethical compliance in human research. The questionnaire was distributed to a proprietary panel of consumers in all 50 United States by an online provider (Qualtrics LLC, Provo, UT, USA) and conducted from 11 Nov to 11 Dec 2020. The survey collected 2100 responses from individuals 18 years or older who had purchased salad mixes within the past 12 months.

The sample of participants was recruited based on the 2020 census estimates using American Consumer Survey (ACS) demographics and household parameters to ensure a representative sample of the United States population in terms of age, sex, income, race, and ethnicity (US Census Bureau 2020). For example, the proportion of 18- to 34-year-old individuals in the sample was 29%, and that of the 2020 ACS was 23%. Similar comparison rates were achieved for respondents between 35 and 44 years of age, between 45 and 64 years of age, and those 65 years and older. The proportion of women in our sample was 51%, and that of the 2020 ACS was 51%. Respondents who earned less than $50,000 in 2020 represented 38% of our sample (compared with 38% in the 2020 ACS). Respondents with household incomes ranging from $50,000 to $150,000 comprised 29% of our sample (compared with 29% in the ACS). Finally, those respondents who earned more than $150,000 per year comprised 32% of the sample (compared with 34% in the ACS) (US Census Bureau 2020).

We segmented consumers based on their valuation of proenvironmental labels. We also measured the influence of demographic characteristics, marketplace preferences, market characteristics, and consumers' environmental perceptions on the probability that consumers would belong to each cluster. Participants were asked to rate the importance of each proenvironmental label when purchasing salad mixes, including biodegradable packaging, low carbon footprint, low energy use, low fertilizer use, low food miles, low greenhouse gas emissions, low water use, and pollinator-friendly. Responses were rated using a scale from 0 to 100 (0 = not at all important; 100 = extremely important). The questionnaire gathered information regarding consumer demographic factors, such as age, sex, race, household income, ethnicity, marital status, number of children (younger than 18 years old) and adults living in the household, education level, area of living, geographic location, and daily fresh vegetable consumption.

To obtain a better understanding of how market attributes impact consumers' preferences for certain proenvironmental labels, we categorized the markets where consumers tend to purchase salad mixes as direct-to-consumer (i.e., farm or roadside stand, community-supported agriculture, at-farm or roadside stand, and farmers markets), large chain stores (i.e., large chain stores and warehouse/clubhouse), retail stores (i.e., local grocery stores, discount grocery stores, ethnic grocery stores, and independent grocery stores), and online markets (i.e., meal delivery services and online grocery delivery). The survey asked respondents about the importance they placed on marketplace characteristics that motivated them to buy in the preferred marketplace, such as price, seasonality, availability of locally grown and organically grown fresh vegetables, and fresh vegetables sourced from family-owned farms. The importance consumers place on market attributes was measured using a scale from 0 to 100 (0 = not at all important; 100 = extremely important).

We adapted previously used statements from Schäufele-Elbers and Janssen (2023) and Do Paco et al. (2019) to measure consumers' environmental perceptions by asking respondents about the importance they attached to statements including the following: "Sustainability is a topic that is important to me in my purchasing decisions;" "When I buy food, I prefer organic products;" and "I am concerned about wasting the resources of our planet." These statements were rated using a 5-point Likert-like scale (1, strongly disagree; 5, strongly agree). For analysis, we considered only responses indicating a strong agreement (rating of 5). The environmental perceptions variables were dichotomized such that if the participant responded, "strongly agree" (5 points), then the variable would be equal to 1; otherwise, it was considered equal to 0.

This study included common proenvironmental labels on salad mixes and fresh market leafy greens. We categorized proenvironmental labels as production (low energy use, low fertilizer use, low greenhouse gas emissions, low water use, and pollinator-friendly) and marketing-related (biodegradable packaging, low carbon footprint, and low food miles). A review of the literature guided the development of the questionnaire (Fusi et al. 2016; Gracia et al. 2017; Thomas et al. 2020). These reports provided valuable insights into sustainable behavior, eco-conscious values, and the factors that influence consumers' choices of environmentally friendly products.

Methodology

The data were analyzed using Stata software (release 16; StataCorp, College Station, TX, USA). The statistical methodology for this study consisted of a two-step approach including a cluster analysis and ordered probit regression. Table 1 provides the descriptive statistics and description of the variables used in the study.

Cluster analysis. We performed a two-stage cluster analysis using responses to the proenvironmental labels (i.e., biodegradable packaging, low carbon footprint, low energy use, low fertilizers use, low food miles, low greenhouse gas emissions, low water use, and pollinator-friendly). This methodology, which was endorsed by Zhllima et al. (2015), offers a robust market segmentation strategy and contrasts with conventional clustering approaches. To assess potential collinearity issues, Mooi et al. (2018) suggested a pairwise variable correlation as a preclustering procedure. Our results indicated that collinearity among clustering variables was not an issue because correlation coefficients were less than 0.5 (Hahs-Vaughn 2023).

During the first stage, we performed hierarchical clustering using Ward's linkage method to reduce the within-cluster variance based on observations of similarity regarding the importance consumers attributed to proenvironmental labels (Ward 1963). After performing hierarchical clustering, the number of clusters was determined by a combination of the Duda-Hartand index, Kalinksi-Harabasz pseudo F-index, and w_k criterion. Using indices together suggested a three-cluster solution that minimizes the w_k criterion. The second stage included a partitional clustering with the k-means method by adopting the previous group from Ward's linkage analysis as an input for the starting clusters' partition. The k-means method selects the centers of the initial clusters from the first observations and designates other observations to the nearest cluster to minimize the within-cluster variation (Yadav and Sharma 2013). Using a cross-tabulation procedure, we examined the overlap between the two cluster procedures and found a valid and reliable percentage of overlap (88%). Finally, clusters were profiled by making multiple comparisons among means during the analysis of variance (ANOVA) using Tukey's honestly significant difference method at the 1% significance level.

Ordered probit analysis. Ordered probit regression was selected to assess the impact of the demographics of consumers of salad mixes, market preferences and characteristics, environmental perceptions, and proenvironmental labels on cluster membership. The ordered probit is an appropriate framework to model cluster membership in which the observed variable has a natural ordering (Greene 2008). Based on results in Table 2, this study assumed that cluster membership follows a natural order; individuals in the cluster with higher values (cluster 1, i.e., deep-rooted cluster) highly valued all proenvironmental labels, followed by the indecisive cluster (i.e., cluster 2, halfway between cluster 1 and cluster 3) and the skeptic cluster (cluster 3).

In other words, the skeptic cluster was composed of consumers who place the lowest valuation on all proenvironmental labels on salad mixes. Torres (2020) used a similar maximum likelihood procedure to study cluster valuation as an ordered process. The order probit model is grounded in a latent (i.e., unobserved) variable Y_i. This latent variable underlines the ordinal clusters, where $i = 1, 2 \ldots$, n index of consumers of salad mixes. During this study, i represents one of the three ordered outcomes [i.e., $Y_i \in (1,2,3)$]. The dependent variable can be identified as follows:

$$Y_i^* = \beta X_i + \varepsilon_i,\ i = 1,\ 2,\ \cdots,\ n \quad [1]$$

where Y_i is the linear combination of some observed explanatory variables X_i (i.e., demographic factors, market preferences, market characteristics, and environmental perceptions), β is a vector of (unknown) parameters/coefficients to be estimated, and ε_i is the random error term that follows a standard normal distribution [$\sim$N (0,1)].

In Eq. [1], the observed dependent variable Y_i is determined by Eq. [2].

$$\begin{aligned} Y_i &= j \text{ if } \alpha_{j-1} < y_i^* \leq \alpha_j \\ Y_i &= 1 \text{ if } y_i^* \leq \alpha_1 \text{ (first cluster)} \\ Y_i &= 2 \text{ if } \alpha_1 < y_i^* \leq \alpha_2 \text{ (second cluster)} \\ Y_i &= 3 \text{ if } \alpha_2 < y_i^* \text{ (third cluster)} \end{aligned} \quad [2]$$

where α_1, α_2 are the threshold values for categories of segments and are unknown parameters to be estimated.

The probability that a consumer belongs to a j segment is represented by Eq. [3]:

$$P_{ij} = \mathrm{P}(\mathrm{Y}_i = j) = \Phi(\mathrm{X}'_{ij}\beta) = \int_{-\infty}^{x'\beta} X'\beta \ \mathrm{dx} \quad [3]$$

where Φ represents the probability function that follows a standard normal distribution. Coefficients represent the impact of each independent variable on the probability of consumers belonging to group *j* compared to the baseline group. Finally, we used the marginal effects found with the derivative of the prediction function to interpret the results. The marginal effects outcomes are presented as percentage points and represented by Eq. [4]:

$$\frac{\partial P}{\partial X_j} = \emptyset(X'\beta)\beta_j \quad [4]$$

Results

Descriptive statistics. Table 1 presents the descriptive statistics of the proenvironmental labels and the variables used in the cluster and ordered probit analyses. The results elucidated the consumers' valuations of proenvironmental labels for salad mixes for the entire sample. The most valued labels were low fertilizer use (average score of 61), followed by pollinator-friendly practices (average score of 60) and low greenhouse gas emissions (average score of 59). Other labels valued by consumers were low food miles (score of 56), low carbon footprint (score of 54), biodegradable packaging (score of 53), low water use (score of 52), and low energy use (score of 52). These results are consistent with prior research that emphasized the importance of chemical-free labels for influencing consumer decisions when purchasing foods (Gundala and Singh 2021).

The average respondent was 47 years old. Female participants accounted for 51% of the respondents. Regarding race, approximately 72% of respondents identified as White, and the remaining 28% identified as other racial backgrounds, including African American, Asian, and others. In terms of ethnicity, 18% of respondents self-identified as Latino. Similar to the 2020 ACS data from the US Census Bureau, the average household size in our sample comprised approximately three adults and two children (i.e., younger than 18 years old). Regarding annual family income, 38% declared that they earned less than $50,000 per year, 30% reported an income between $50,000 and $100,000 per year, and 32% declared income more than $100,000 per year. Regarding residential areas, 41% of participants lived in suburban areas, 40% lived in urban areas, and only 19% lived in rural areas. According to the US Census Bureau, this study categorized participants into the following five economic regions in the United States: west, southwest, southeast, midwest, and northeast regions (US Census Bureau 2023). The southeast region accounted for almost one-third of our sample, followed by the northeast (26%) and west (20%) regions. Consumers reported consuming an average of 2.84 cups of fresh vegetables, which is close to the recommended daily range of 2 to 3 cups of vegetables suggested by the Centers for Disease Control and Prevention (US Department of Agriculture and US Department of Health and Human Services 2020).

Market preferences and market characteristics are highlighted in Table 1. Approximately 38% of consumers purchased most of their salad mixes from retail stores, 34% bought from large chain stores, 23% preferred direct-to-consumer markets, and only 5% opted for online market purchases when purchasing most salad mixes.

We also measured the market attributes most important to consumers in our sample. Seasonality had the highest importance rating (72 on a scale of 0 to 100), followed by a preference for locally grown produce (69 on a scale of 0 to 100). Valuing the supply of salad mixes from family-owned farms received a rating of 58 on a scale of 0 to 100, whereas low prices were assigned the least importance, with an average score of 53 on a scale of 0 to 100. Finally, the survey assessed environmental perceptions among the respondents. Approximately one-third of respondents strongly agreed with the following statement: "I am concerned about wasting our planet's resources." Additionally, 23% of respondents strongly agreed that they prefer to purchase organic salad.

Cluster analysis. Using the Calinski-Harabasz VRC criterion, the two-stage cluster analysis suggested that the market for salad mixes can be categorized into three clusters. The findings showed a significant overlap of 88% between the two cluster processes, thus confirming the validity and reliability of the three-cluster solution. Table 2 presents the cluster analysis results as well as the ANOVA and Tukey's honest significance test results with mean differences across clusters at a 1% significance level. Table 3 presents each consumer segment's demographic characteristics, market preferences, market characteristics, and environmental perceptions.

Cluster 1, which was labeled as deep-rooted, represented the second-largest group and included 760 respondents (36% of the market segment). The deep-rooted consumers of salad mixes reported the highest valuation for all proenvironmental labels compared with the other clusters ($P < 0.01$). Specifically, consumers in the deep-rooted cluster gave high rankings to labels such as low fertilizer use (average score of 87 out of 100), low greenhouse gas emissions (average score of 87 out of 100), and pollinator-friendly (average score of 87 out of 100). When comparing the three clusters, the deep-rooted cluster included the highest proportion of high-income households, Latino consumers, those with more children in the household, consumers with higher educational levels, those living in urban areas, and those with more daily consumption of fresh vegetables ($P < 0.01$). Compared with the other clusters, deep-rooted consumers preferred to purchase salad mixes from direct-to-consumer and online markets ($P < 0.01$). Overall, consumers in this cluster gave the highest importance rating to all measured market characteristics and represented the largest percentage of respondents who considered all environmental perceptions extremely important ($P < 0.01$).

Cluster 2, the largest market segment, comprised 40% of the sample (843 respondents). Cluster 2 was called indecisive because the responses of consumers in this segment for all environmental labels ranged between those of the first cluster and the third cluster. The most important labels for the indecisive consumers were low fertilizer use (average score of 60 out of 100), pollinator-friendly (average score of 58 out of 100), and low greenhouse gas emissions (average score of 58 out of 100). The least valued labels for cluster 2 were low energy consumption (average score of 47 out of 100) and low water use (average score of 49 out of 100). The indecisive cluster had the highest proportion of low-income households and consumers living in rural areas. Compared with the other clusters, this group placed midpoint importance on market characteristics.

Cluster 3 was called skeptic because, compared with the other two groups, these individuals placed the least importance on all proenvironmental labels on salad mixes. Representing 23% of the market (497 consumers), this segment preferred labels related to low fertilizer use (average score of 23 out of 100), pollinator-friendly (average score of 21 out of 100), and low food miles (average score of 17 out of 100). The skeptic cluster had the highest proportion of older consumers and female participants, as well as medium-income households. They were characterized as residing in the midwest region, living in suburban areas, and having the least daily consumption of vegetables. The skeptic cluster placed the lowest valuation on market characteristics and represented the lowest percentage of respondents who considered all environmental perceptions extremely important relative to the other clusters.

Ordered probit analysis. Table 4 provides the marginal effects from the ordered probit regression for each cluster. The marginal effects express the probability (%) of a consumer being part of a cluster given their demographics,

Table 1. Descriptive statistics and description of proenvironmental labels, demographics, market preferences, market characteristics, and environmental perceptions variables for the full sample of 2100 United States consumers who participated in an online survey regarding proenvironmental labels on salad mixes (N = 2100).

Variable	Mean[i]	*SD*	Description
Proenvironmental labels			
Biodegradable packaging	52.76	32.04	Importance ranging from 0 (not important) to 100 (very important) for biodegradable packaging when purchasing salad mixes
Low carbon footprint	54.12	31.85	Importance ranging from 0 (not important) to 100 (very important) for low carbon footprint when purchasing salad mixes
Low energy use	52.02	31.81	Importance ranging from 0 (not important) to 100 (very important) for low energy use when purchasing salad mixes
Low fertilizer use	61.26	32.12	Importance ranging from 0 (not important) to 100 (very important) for low fertilizer use when purchasing salad mixes
Low food miles	55.64	31.32	Importance ranging from 0 (not important) to 100 (very important) for low food miles when purchasing salad mixes
Low greenhouse gas emissions	58.51	32.25	Importance ranging from 0 (not important) to 100 (very important) for low greenhouse gas emissions when purchasing salad mixes
Low water use	52.15	31.45	Importance ranging from 0 (not important) to 100 (very important) for low water use when purchasing salad mixes
Pollinator-friendly	59.86	31.80	Importance ranging from 0 (not important) to 100 (very important) for pollinator-friendly when purchasing salad mixes
Demographic factors			
Age	46.50	17.17	Age in years
Female[i]	0.51	0.50	1 = female; 0 = otherwise
White[i]	0.72	0.45	1 = white; 0 = otherwise
Low income[i]	0.38	0.49	1 = income <$50,000; 0 = otherwise
Medium income[i]	0.30	0.46	1 = income between $50,000 and $100,000; 0 = otherwise
High income[i]	0.32	0.47	1 = income >$100,000; 0 = otherwise
Latino[i]	0.18	0.39	1 = Latin; 0 = otherwise
Single[i]	0.26	0.44	1 = single; 0 = otherwise
Adults in HH	3.16	1.11	Number of adults in household (>18 years old)
Children in HH	1.76	1.05	Number of children in the household (<18 years old)
College[i]	0.51	0.50	1 = Bachelor's degree or higher; 0 = otherwise
Urban[i]	0.40	0.49	1 = live in urban area; 0 = otherwise
Suburban[i]	0.41	0.49	1 = live in suburban area; 0 = otherwise
Rural[i]	0.19	0.39	1 = live in rural area; 0 = otherwise
West[i]	0.20	0.40	1 = respondent lives in Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, or Wyoming; 0 = otherwise
Southwest[i]	0.10	0.30	1 = respondent lives in Arizona, New Mexico, Oklahoma, or Texas; 0 = otherwise
Southeast[i]	0.28	0.45	1 = respondent lives in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, or West Virginia; 0 = otherwise
Midwest[i]	0.17	0.37	1 = respondent lives in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, or Wisconsin; 0 = otherwise
Northeast[i]	0.26	0.44	1 = respondent lives in Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, or Vermont; 0 = otherwise
Consumption	2.84	2.11	Number of fresh vegetable cups consumed during 1 d
Market preferences			
DTC[i]	0.23	0.42	1 = if the respondent buys most of the salad mixes in DTC market channels such as at-farm or roadside stands, CSA, or community-supported agriculture, and farmers' markets; 0 = otherwise
Large chain[i]	0.34	0.47	1 = if the respondent buys most of the salad mixes in large chain market channels such as large chain stores and warehouse/clubhouse; 0 = otherwise
Retail[i]	0.38	0.48	1 = if the respondent buys most of the salad mixes in a retail market such as local grocery stores, discount grocery stores, ethnic grocery stores, and independent grocery stores; 0 = otherwise
Online[i]	0.05	0.21	1 = if the respondent buys most of the salad mixes in online market channels such as meal delivery services, and online grocery delivery; 0 = otherwise
Market characteristics			
Family-owned farms	57.94	31.10	Importance ranging from 0 (not important) to 100 (very important) for markets offering salad mixes sourced from a family-owned farm
Locally grown	68.82	27.50	Importance ranging from 0 (not important) to 100 scale (very important) for markets offering locally grown salad mixes
Organic	56.81	34.06	Importance ranging from 0 (not important) to 100 (very important) for markets offering organic salad mixes
Price	53.15	30.11	Importance ranging from 0 (not important) to 100 (very important) for prices in the market for salad mixes
Seasonality	71.74	26.61	Importance ranging from 0 (not important) to 100 scale (very important) for markets offering seasonal salad mixes
Environmental perceptions			
Preference for organic[i]	0.23	0.42	1 = respondent strongly agreed that it is important to purchase organic salad mixes; 0 = otherwise
Sustainability[i]	0.27	0.45	1 = respondent strongly agreed that sustainability is important when purchasing salad mixes; 0 = otherwise
Wasting the planet's resources[i]	0.29	0.46	1 = respondent strongly agreed that is important to worry about wasting the planet's resources when purchasing salad mixes; 0 = otherwise

[i] The mean is the percentage of respondents with that attribute.

CSA = community-supported agriculture; DTC = direct-to-consumer; HH = household.

Table 2. Mean comparisons of clusters of 2100 salad mix consumers who participated in an online survey regarding the importance of proenvironmental labels on salad mixes. Values range from 0 (not at all important) to 100 (extremely important).

	Clusters								
	Deep-rooted			Indecisive			Skeptic		
	Mean	*SD*		Mean	*SD*		Mean	*SD*	
Biodegradable packaging	80.55	18.95	A	50.28	22.06	B	14.47	17.44	C
Low carbon footprint	84.27	14.92	A	51.07	19.93	B	13.18	13.76	C
Low energy use	83.00	15.27	A	47.32	19.68	B	12.59	14.20	C
Low fertilizer use	87.44	14.89	A	60.21	22.69	B	23.00	25.17	C
Low food miles	83.99	15.21	A	52.73	20.44	B	17.24	19.12	C
Low greenhouse gas emissions	87.28	12.67	A	57.57	20.71	B	16.12	18.88	C
Low water use	80.08	19.35	A	49.02	21.10	B	14.75	15.57	C
Pollinator-friendly	87.06	13.96	A	58.46	21.80	B	20.66	22.29	C
Market size (%)	36			40			23		
Market size (no.)	760			843			497		

The value of the mean was obtained from responses using a scale of 0 to 100, with 0 = not at all important and 100 = extremely important.

Different uppercase letters across columns indicate significant differences at $P < 0.01$ using Tukey's honest significant difference test (A, B, and C represent distinct groups/categories).

market preferences, market characteristics, and environmental perceptions. Marginal effects provide the impacts of changes in the explanatory variables on cluster membership and are expressed in percentage points. Our results suggest that demographics, market preferences, market characteristics, and environmental perceptions are key drivers of cluster membership.

Table 3. Descriptive statistics of the demographics, market preferences, market characteristics, and environmental perceptions of the three clusters of 2100 salad mix consumers who participated in an online survey regarding the importance of proenvironmental labels.[i]

	Deep-rooted[ii]			Indecisive			Skeptic		
Independent variables	Mean[i]	*SD*		Mean	*SD*		Mean	*SD*	
Age	44.88	15.68	B	45.62	17.76	B	50.46	17.76	A
Female[iii]	0.47	0.50	B	0.53	0.50	AB	0.55	0.50	A
White[iii]	0.74	0.44		0.70	0.46		0.73	0.44	
Low income[iii]	0.32	0.47	B	0.42	0.49	A	0.42	0.49	A
Medium income[iii]	0.26	0.44	B	0.30	0.46	AB	0.35	0.48	A
High income[iii]	0.42	0.49	A	0.28	0.45	B	0.23	0.42	B
Latino[iii]	0.21	0.41	A	0.20	0.40	A	0.12	0.32	B
Single[iii]	0.20	0.40	B	0.30	0.46	A	0.29	0.45	A
Adults in HH	3.21	1.21		3.14	1.09		3.12	0.99	
Children in HH	2.03	1.11	A	1.73	1.04	B	1.42	0.83	C
College[iii]	0.59	0.49	A	0.48	0.50	B	0.46	0.50	B
Urban[iii]	0.50	0.50	A	0.38	0.49	B	0.26	0.44	C
Suburban[iii]	0.34	0.48	B	0.40	0.49	B	0.54	0.50	A
Rural[iii]	0.15	0.36	B	0.22	0.41	A	0.20	0.40	AB
West[iii]	0.19	0.39		0.22	0.42		0.19	0.39	
Southwest[iii]	0.10	0.30		0.10	0.30		0.10	0.30	
Southeast[iii]	0.27	0.44		0.27	0.44		0.30	0.46	
Midwest[iii]	0.14	0.34	B	0.16	0.36	B	0.23	0.42	A
Northeast[iii]	0.31	0.46	A	0.25	0.44	A	0.18	0.38	B
Consumption	3.58	2.98	A	2.81	2.38	B	2.11	1.38	C
DTC[iii]	0.30	0.46	A	0.23	0.42	B	0.14	0.34	C
Large chain[iii]	0.31	0.46		0.34	0.48		0.37	0.48	
Retail[iii]	0.31	0.46	C	0.38	0.49	B	0.47	0.50	A
Online[iii]	0.08	0.27	A	0.04	0.19	B	0.01	0.12	B
Price	62.12	31.71	A	50.06	26.59	B	44.67	29.76	C
Seasonality	84.99	18.19	A	67.88	24.43	B	58.01	31.50	C
Locally grown	84.42	18.39	A	65.87	24.17	B	49.95	30.77	C
Organic	76.72	26.96	A	53.92	29.76	B	31.26	31.92	C
Family-owned farms[iv]	76.61	24.54	A	54.72	26.11	B	34.86	30.46	C
Sustainability[iv]	0.50	0.50	A	0.19	0.39	B	0.08	0.27	C
Preference for organic[iv]	0.41	0.49	A	0.15	0.36	B	0.09	0.28	B
Wasting the planet's resources[iv]	0.49	0.50	A	0.21	0.41	B	0.13	0.34	C
Observations, no.	760			843			497		
Market size (%)	36			40			23		

[i] The identification of the optimal number of clusters was based on objective (i.e., numerous clustering algorithms) and subjective criteria.

[ii] Different uppercase letters across columns indicate significant differences at $P < 0.01$ using Tukey's honest significant difference test.

[iii] The mean is the percentage of respondents with that attribute.

[iv] The mean is the percentage of respondents who answered "extremely important" using a scale of 0 to 100.

CSA = community-supported agriculture; DTC = direct-to-consumer; HH = household.

Table 4 shows that residence location was a significant predictor of cluster membership. Consumers from the west or midwest regions were approximately 7% more likely to be part of the skeptic segment ($P < 0.01$). Additionally, the probability of being in the deep-rooted cluster decreased for salad mix consumers in the west (12%) and midwest (11%) regions. These findings aligned with those of previous research of regional differences in sustainable behavior (Barr et al. 2010), suggesting that consumers may have different levels of commitment to sustainable behaviors, depending on the region where they live.

Market preferences also played a significant role in determining cluster membership. For example, purchasing salad mixes online was associated with a 17% higher likelihood of being part of the deep-rooted segment ($P < 0.01$). Consistent with the findings of Barska and Wojciechowska-Solis (2020), these finding suggested that a group of consumers positively associated online grocery shopping and highly valued proenvironmental labels. We found that buying salad mixes from large chains increased the likelihood of being part of the deep-rooted cluster ($P < 0.05$). Thus, chain store managers who target environmentally conscious consumers should highlight proenvironmental labels to potentially appeal to this segment.

Additionally, market characteristics significantly influenced cluster membership. Consumers who prioritized price when purchasing salad mixes were more likely to be in the deep-rooted segment ($P < 0.01$). Our results suggest that environmentally conscious consumers can highly value proenvironmental labels but consider price an important factor when choosing markets. Consumers who valued seasonality, organic foods, and sustainable food production were more likely to be in the deep-rooted segment and less likely to be in the skeptic or indecisive segments ($P < 0.01$). Our results are consistent with those of Siegrist et al. (2015), who found that proenvironmental consumers tend to highly value labels that convey environmentally friendly food production.

The environmental perceptions of consumers significantly influenced cluster membership. Consumers who perceived that sustainability is important when purchasing salad mixes were 20% more likely to be part of the deep-rooted cluster ($P < 0.01$). In contrast, sustainability perceptions and drivers were not relevant to skeptic consumers when buying salad mixes ($P < 0.01$). To illustrate, consumers who reported being concerned about wasting our planet's resources were 10% less likely to be part of the skeptic cluster. Because of the influential role of consumer perceptions in shaping a more sustainable food system (Lazzarini et al. 2018), our findings emphasize the importance of developing consumer information alongside incentives and policies. This strategic approach aims to boost demand for sustainable foods, thereby aligning with our earlier suggestion to emphasize knowledge and proenvironmental benefits.

Table 4. Marginal effects (ME) of the demographics, market preferences, market characteristics, and environmental perceptions variables affecting cluster membership of 2100 salad mix consumers who participated in an online survey regarding the importance of proenvironmental labels.

	Deep-rooted		Indecisive		Skeptic	
	ME	*SE*	ME	*SE*	ME	*SE*
Age	−0.04	0.01	0.01	0.01	0.02	0.01
Female	0.99	0.02	−0.36	0.01	−0.63	0.01
White	−0.37	0.02	0.13	0.01	0.23	0.02
Medium income	−0.86	0.02	0.32	0.01	0.55	0.02
High income	1.74	0.03	−0.64	0.01	−1.10	0.02
Latino	5.56	0.03	−2.04	0.01	−3.52	0.02
Single	−3.13	0.03	1.15	0.01	1.99	0.02
Adults in HH	1.84	0.01	−0.67	0.00	−1.16	0.01
Children in HH	−1.25	0.01	0.46	0.00	0.79	0.01
College	−2.05	0.02	0.75	0.01	1.30	0.01
Urban	3.52	0.03	−1.29	0.01	−2.23	0.02
Suburban	0.34	0.03	−0.12	0.01	−0.21	0.02
West	−11.64	0.03**	4.26	0.01**	7.37	0.02**
Southwest	−7.98	0.04*	2.92	0.01*	5.06	0.02*
Southeast	−7.53	0.03**	2.76	0.01**	4.77	0.02**
Midwest	−10.94	0.03**	4.01	0.01**	6.93	0.02**
Consumption	0.73	0.00	−0.27	0.00	−0.46	0.00
DTC	0.12	0.03	−0.04	0.01	−0.07	0.02
Large chain	5.56	0.02*	−2.04	0.01*	−3.52	0.02*
Online	16.77	0.05**	−6.14	0.02**	−10.63	0.03**
Expenditure	0.00	0.00	0.00	0.00	0.00	0.00
Price	0.18	0.010**	−0.07	0.00**	−0.11	0.00**
Seasonality	0.21	0.00**	−0.8	0.00**	−0.13	0.00**
Locally grown	0.21	0.00**	−0.08	0.00**	−0.13	0.00**
Organic	0.31	0.00**	−0.11	0.00**	−0.20	0.00**
Family-owned farms	0.36	0.00**	−0.13	0.0**	−0.23	0.00**
Sustainability	20.15	0.03**	−7.38	0.01**	−12.76	0.02**
Preference for organic	2.32	0.03	−0.85	0.01	−1.47	0.02
Wasting the planet's resources	15.99	0.03**	−5.86	0.01**	−10.13	0.02**

Number of observations = 2100.

Prob > X^2 = 0.00.

MEs are expressed in percentage points.

*$P < 0.05$; **$P < 0.01$.

CSA = community-supported agriculture; DTC = direct-to-consumer; HH = household.

Discussion and Conclusions

The main contribution of this study is the categorization of the United States salad mixes market into the following three market segments: deep-rooted, indecisive, and skeptic clusters. The deep-rooted cluster highly valued all the proenvironmental labels and had a particular preference for labels such as low fertilizer use, pollinator-friendly methods, and low greenhouse gas emissions. Compared with the other clusters, the deep-rooted cluster comprised consumers with high incomes, more children at home, high education levels, those who resided in urban areas, and those who preferred direct-to-consumer and online marketplaces to purchase salad mixes. Even 8 years later, our findings support the recommendations of Verain et al. (2015) that highlight the significance of environmental sustainability to consumers' food choices and the importance of promoting sustainable agricultural practices such as methods that are pollinator-friendly and require low fertilizer use to meet the growing demand for environmentally conscious food products (Gundala and Singh 2021). Additionally, our findings align with those of previous studies that indicated that individuals with high incomes and education levels were more likely to be driven by environmental sustainability when purchasing foods (Luchs and Mooradian 2012). Finally, the fact that individuals with a preference for buying salad mixes through online markets were more likely to be part of the deep-rooted cluster suggests that companies should show environmental footprint labels on their websites. The findings also suggest that emphasizing proenvironmental features, including the carbon footprint, can attract deep-rooted consumers and potentially boost salad mix sales by encouraging increased purchases and consumption.

The indecisive group reported valuations of proenvironmental labels that were midway between those reported by cluster 1 and cluster 3. This cluster mainly comprised individuals with lower incomes and those living in rural areas. Consistent with Smith et al. (2013), who highlighted the reliance on convenience stores in rural communities, our findings suggest that to appeal to this segment, salad mix retailers should emphasize affordability and convenience attributes, such as long shelf life and discounts. Finally, the skeptic consumers valued all environmental labels the least and reported the lowest consumption of vegetables, thus potentially implying that food retailers should develop environmental education programs focused on the benefits of salad mixes for the community and the environment and provide discounts and coupons where these consumers tend to buy the most (i.e., chain stores) to target skeptic consumers.

After market segmentation, we performed ordered probit regression to examine the factors that influence cluster membership. The findings revealed that consumers' demographic characteristics, market preferences, market characteristics, and environmental perceptions significantly impacted cluster membership. For example, consumers in different regions value proenvironmental labels differently, suggesting that efforts to increase support for environmentally friendly agriculture may be more effective at the local and regional levels than at the national level.

Our findings highlight that environmental perceptions significantly influenced cluster membership. Consumers who prioritized the sustainability of salad mixes were more likely to be part of the deep-rooted cluster, which also comprised consumers with the highest consumption of salad mixes. Thus, local governments and retailers can educate consumers to support environmentally friendly food production by raising consumers' awareness of the proenvironmental benefits of foods.

Market preferences and market characteristics also played a crucial role in determining cluster membership. Purchasing salad mixes online was associated with being part of the deep-rooted segment, indicating a preference of online purchasers for environmentally responsible behavior. This finding supports the growing trend of online sales of foods and provides evidence to support the development of outreach programs for farmers and local food retailers to engage in online marketing.

This study found that demographics, market preferences, market characteristics, and environmental perceptions influenced consumer cluster membership related to preferences for salad mixes. Our study also found that among all proenvironmental labels, those conveying low fertilizer use and low greenhouse gas emissions were the most valued attributes among all consumers. Our findings can help farmers selling in direct-to-consumer markets and market managers to identify consumer segments based on their environmental values and tailor marketing strategies accordingly to promote their salad mixes. Our findings also provide insights into the drivers of consumer segments based on the value of proenvironmental labels. One possible limitation of this study was the reliance on self-reported data and the potential oversimplification of consumer behavior through clustering. Future research should expand to complementary research methods and consider longitudinal approaches. Addressing these limitations would enhance our understanding of consumer attitudes and behaviors toward sustainable food choices, including salad mixes, and inform more effective marketing strategies.

References Cited

Ahani A, Nilashi M, Ibrahim O, Sanzogni L, Weaven S. 2019. Market segmentation and travel choice prediction in spa hotels through TripAdvisor's online reviews. Int J Hospit Manag. 80:52–77. https://doi.org/10.1016/j.ijhm.2019.01.003.

Alston JM, Sumner DA. 2012. Proposition 37 - California food labeling initiative: Economic implications for farmers and the food industry if the proposed initiative were adopted. https://www.academia.edu/17441780/Proposition_37_California_Food_Labeling_Initiative_Economic_Implications_for_Farmers_and_the_Food_Industry_if_the_Proposed_Initiative_were_Adopted. [accessed 31 Oct 2023].

Azzurra A, Massimiliano A, Angela M. 2019. Measuring sustainable food consumption: A case study on organic food. Sustain Prod Consum. 17:95–107. https://doi.org/10.1016/j.spc.2018.09.007.

Barbu A, Catană ȘA, Deselnicu DC, Cioca LI, Ioanid A. 2022. Factors influencing consumer behavior toward green products: A systematic literature review. Int J Environ Res Public Health. 19(24):165. https://doi.org/10.3390/ijerph192416568.

Barr S, Gilg AW, Ford N. 2010. The household energy gap: Examining the divide between habitual- and purchase-related conservation behaviors. Energy Policy. 33(11):1425–1444. https://doi.org/10.1016/j.enpol.2003.12.016.

Barska A, Wojciechowska-Solis J. 2020. E-consumers and local food products: A perspective for developing online shopping for local goods in Poland. Sustainability. 12(12):4958. https://doi.org/10.3390/su12124958.

Beltrami M, Kim D, Rolkens F. 2020. The state of fashion 2020. McKinsey and Company. https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/the%20state%20of%20fashion%202020%20navigating%20uncertainty/the-state-of-fashion-2020-final.pdf. [accessed 4 Nov 2023].

Crippa M, Solazzo E, Guizzardi D, Monforti-Ferrario F, Tubiello FN, Leip A. 2021. Food systems are responsible for a third of global anthropogenic GHG emissions. Nat Food. 2(3):198–209. https://doi.org/10.1038/s43016-021-00225-9.

De Canio F, Martinelli E, Endrighi E. 2021. Enhancing consumers' pro-environmental purchase intentions: The moderating role of environmental concern. Int J Retail Distrib Manag. 49(9):1312–1329. https://doi.org/10.1108/IJRDM-08-2020-0301.

De Canio F, Viglia G, Lombart C. 2024. Package-free products: How to improve pro-environmental buying behaviors among consumers. Technol Forecast Soc Change. 198:122995. https://doi.org/10.1016/j.techfore.2023.122995.

Deconinck K, Hobeika M. 2023. Understanding the impact of consumer-oriented assurance schemes: A review of voluntary standards and labels for the environmental sustainability of agri-food products. OECD Food Agric Fish Work Pap. 200. https://doi.org/10.1787/af917674-en.

Do Paco A, Shiel C, Alves H. 2019. A new model for testing green consumer behavior. J Clean Prod. 207:998–1006. https://doi.org/10.1016/j.jclepro.2018.10.105.

Donato C, D'Aniello A. 2021. Tell me more and make me feel proud: The role of eco-labels and informational cues on consumers' food perceptions. Br Food J. 124(4):1365–1382. https://doi.org/10.1108/BFJ-04-2021-0416.

Echeverria R, Moreira HV, Sepulveda C, Wittwer C. 2014. Willingness to pay for carbon footprint on foods. Br Food J. 116(2):186–196. https://doi.org/10.1108/BFJ-07-2012-0292.

Ehmke C. 2008. Strategies for competitive advantage. Niche Markets: Assessment and strategy development for agriculture. Western Exte Market Comm. 5:1-8. https://www.valueaddedag.org/nichemarkets/NicheMarketscompletebook6-17-08.pdf. [accessed 17 Sep 2023].

Fernandez JA, Orsini F, Baeza E, Oztekin GB, Muñoz P, Contreras J, Montero JI. 2018. Current trends in protected cultivation in Mediterranean climates. Eur J Hortic Sci. 83(5):294–305. https://doi.org/10.17660/eJHS.2018/83.5.3.

Food Marketing Institute. 2023. Younger consumers spotlight sustainability. https://www.fmi.org/blog/view/fmi-blog/2023/07/12/younger-consumers-spotlight-sustainability. [accessed 3 Nov 2023].

Foxall G, Goldsmith R. 1998. Consumer psychology for marketing. Routledge. https://www.researchgate.net/publication/278016938_Consumer_Psychology_for_Marketing. [accessed 19 Jul 2022].

Funk A, Sütterlin B, Siegrist M. 2021. Consumer segmentation based on Stated environmentally-friendly behavior in the food domain. Sustain Prod Consum. 25:173–186. https://doi.org/10.1016/j.spc.2020.08.010.

Fusi A, Castellani V, Bacenetti J, Cococetta G, Fiala M, Guidetti R. 2016. The environmental impact of the production of fresh cut salad: A case study in Italy. Int J Life Cycle Assess. 21:162–175. https://doi.org/10.1007/s11367-015-1019-z.

Gallo T, Pacchera F, Cagnetti C, Silvestri C. 2023. Do sustainable consumers have sustainable behaviors? An empirical study to understand the purchase of food products. Sustainability. 15(5):4462. https://doi.org/10.3390/su15054462.

Gracia A, de-Magistris T, Barreiro-Hurle J. 2017. Do consumers care about European food labels? An empirical evaluation using the best-worst method. Br Food J. 119(12):2698–2711. https://doi.org/10.1108/BFJ-11-2016-0562.

Grand View Research. 2023. Packaged salad market size and share report, 2021–2028. https://www.grandviewresearch.com/industry-analysis/packaged-salad-market. [accessed 3 Nov 2023].

Greene WH. 2008. Econometric analysis. Prentice Hall, Upper Saddle River, NJ, USA.

Grunert KG, Hieke S, Wills J. 2014. Sustainability labels on food products: Consumer motivation, understanding, and use. Food Policy. 44:177–189. https://doi.org/10.1016/j.foodpol.2013.12.001.

Gundala RR, Singh A. 2021. What motivates consumers to buy organic foods? Results of an empirical study in the United States. PLoS One. 16(9):e0257288. https://doi.org/10.1371/journal.pone.0257288.

Guthman J. 2003. Fast food/organic food: Reflexive tastes and the making of 'yuppie chow'. Soc Cult Geogr. 4(1):45–58. https://doi.org/10.1080/1464936032000049306.

Hahs-Vaughn DL. 2023. Foundational methods: Descriptive statistics, bivariate and multivariate data (correlations, associations). Int Encycl Educ. 734–750. https://doi.org/10.1016/B978-0-12-818630-5.10084-3.

Halpern BS, Frazier M, Verstaen J, Rayner PE, Clawson G, Blanchard JL, Cottrell RS, Froehlich HE, Gephart JA, Jacobsen NS, Kuempel CD, McIntyre PB, Metian M, Moran D, Nash KL, Többen J, Williams DR. 2022. The environmental footprint of global production. Nat Sustain. 5:1027–1039. https://doi.org/10.1038/s41893-022-00965-x.

Heller MC, Keoleian GA. 2015. Greenhouse gas emission estimates of US dietary choices and food loss. J Ind Ecol. 19(3):391–401. https://doi.org/10.1111/jiec.12174.

Jin J, Dou X, Meng L, Yu H. 2018. Environmental-friendly eco-labeling matters: Evidence from an ERPs Study. Front Hum Neurosci. 12:417. https://doi.org/10.3389/fnhum.2018.00417.

Jolibert AJ, Baumgartner G. 1981. Toward a definition of the consumerist segment in France. J Consum Res. 8(1):114–117. https://doi.org/10.1086/208847.

Jones AD, Hoey L, Blesh J, Miller L, Green A, Shapiro LF. 2016. A systematic review of the measurement of sustainable diets. Adv Nutr. 7(4):641–664. https://doi.org/10.3945/an.115.011015.

Jungbluth N, Olaf T, Scholz RW. 2000. Food purchases: Impacts from the consumers' point of view investigated with a modular LCA. Int J Life Cycle Assess. 5:134–142. https://doi.org/10.1007/BF02978609.

Kaczorowska J, Rejman K, Halicka E, Szczebyło A, Górska-Warsewicz H. 2019. Impact of food sustainability labels on the perceived product value and price expectations of urban consumers. Sustainability. 11(24):7240. https://doi.org/10.3390/su11247240.

Krystallis A, Chryssohoidis G. 2005. Consumers' willingness to pay for organic food: Factors that affect it and variation per organic product type. Br Food J. 107(5):320–343. https://doi.org/10.1108/00070700510596901.

Lang M, Stanto J, Qu Y. 2014. Consumers' evolving definition and expectations for local foods. Br Food J. 116(11):1808–1820. https://doi.org/10.1108/BFJ-03-2014-0117.

Larranaga A, Valor C. 2022. Consumers' categorization of eco-friendly consumer goods: An integrative review and research agenda. Sustainable Prod Consum. 34:518–527. https://doi.org/10.1016/j.spc.2022.10.005.

Lazzarini GA, Visschers VH, Siegrist M. 2018. How to improve consumers' environmental sustainability judgments of foods. J Clean Prod. 198:564–574. https://doi.org/10.1016/j.jclepro.2018.07.033.

Lin W, Nayga RM. 2022. Green identity labeling, environmental information, and pro-environmental food choices. Food Policy. 106:102187. https://doi.org/10.1016/j.foodpol.2021.102187.

Luchs MG, Mooradian TA. 2012. Sex, drugs, and organic rolls: How food culture and product scarcity lead to a new consumer morality. J Consum Res. 39(3):579–597. https://doi.org/10.1007/s10603-011-9179-0.

Marques MR, Torres AP, Behe BK, Langenhoven P, Boas LHDBV. 2021. Exploring consumers' preferred purchase location for fresh fruits. HortTechnology. 31(5):595–606.

Meyer A. 2015. Does education increase pro-environmental behavior? Evidence from Europe. Ecol Econ. 116:108–121. https://doi.org/10.1016/j.ecolecon.2015.04.018.

Mooi E, Sarstedt M, Mooi-Reci I. 2018. Market research: The process, data, and methods using Stata. Springer New York, NY, USA.

Nygaard A, Silkoset R. 2023. Sustainable development and greenwashing: How blockchain technology information can empower green consumers. Bus Strategy Environ. 32(6):3801–3813. https://doi.org/10.1002/bse.3338.

Pearce H, Green M, Noble E, Sonnino R, Morgan K, SCR, Soil Association. 2005. Double dividend: Promoting good nutrition and sustainable consumption through healthy school meals. Sustain Dev Comm Rep. http://hdl.handle.net/10023/2253. [accessed 27 Jul 2023].

Popa M, Mitelut A, Niculita P, Geicu M, Ghidurus M, Turtoi M. 2011. Biodegradable materials for food packaging applications. J Environ Prot Ecol. 12(4):1825–1834. https://www.researchgate.net/publication/270285096_Biodegradable_Materials_for_Food_Packaging_Applications. [accessed 23 Sep 2023].

Ragaert P, Verbeke W, Devlieghere F, Debevere J. 2004. Consumer perception and choice of minimally processed vegetables and packaged fruits.

Food Qual Prefer. 15(3):259–270. https://doi.org/10.1016/S0950-3293(03)00066-1.
Rahman SME, Mele MA, Lee YT, Islam MZ. 2021. Consumer preference, quality, and safety of organic and conventional fresh fruits, vegetables, and cereals. Foods. 10(1):105. https://doi.org/10.3390/foods10010105.
Rani A, Bhardwaj N, Arora B. 2019. Carbon and water footprint for eco-friendly agriculture practices. Clim Smart Agric Food Secur. 9:141-158. https://www.researchgate.net/publication/373389272_Climate-Smart_Agriculture_and_Food_Security_9_Carbon_and_Water_Footprint_for_Eco-Friendly_Agriculture_Practices/link/64e8bb5e40289f7a0fb7434d/download. [accessed 2 Nov 2023].
Reynolds AP, Richards G, de la Iglesia B, Rayward-Smith VJ. 2006. Clustering Rules: A comparison of partitioning and hierarchical clustering algorithms. J Math Model Algorithms. 5:475–504. https://doi.org/10.1007/s10852-005-9022-1.
Sebastian RS, Wilkinson Enns C, Goldman JD, Hoy K, Moshfegh AJ. 2018. Salad consumption in the U.S.: What we eat in America, NHANES 2011-2014. FSRG Dietary Data Briefs. https://www.ncbi.nlm.nih.gov/books/NBK589291/. [accessed 14 Dec 2023].
Rihn AL, Yue C. 2016. Visual attention's influence on consumers' willingness-to-pay for processed food products. Agribusiness. 32(3):314–328. https://doi.org/10.1002/agr.21452.
Riskos K, Dekoulou P, Mylonas N, Tsourvakas G. 2021. Ecolabels and the attitude-behavior relationship towards green product purchase: A multiple mediation model. Sustainability. 13(12):6867. https://doi.org/10.3390/su13126867.
Rondoni A, Grasso S. 2021. Consumers behavior towards carbon footprint labels on food: A review of the literature and discussion of industry implications. J Clean Prod. 301:127031. https://doi.org/10.1016/j.jclepro.2021.127031.
Saarinen M, Kurppa S, Virtanen Y, Usva K, Mäkelä J, Nissinen A. 2012. Life cycle assessment approach to the impact of home-made, ready-to-eat, and school lunches on climate and eutrophication. J Clean Prod. 28:177–186. https://doi.org/10.1016/j.jclepro.2011.11.038.
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. Front Nutr. 10. https://doi.org/10.3389/fnut.2023.1140636.
Shaikh S, Yaqoob M, Aggarwal P. 2021. An overview of biodegradable packaging in food industry. Curr Res Food Sci. 4:503–520. https://doi.org/10.1016/j.crfs.2021.07.005.
Siegrist M, Visschers VH, Hartmann C. 2015. Factors influencing changes in sustainability perception of various food behaviors: Results of a longitudinal study. Food Qual Prefer. 46:33–39. https://doi.org/10.1016/j.foodqual.2015.07.006.
Smith ML, Sunil TS, Salazar CI, Rafique S, Ory MG. 2013. Disparities of food availability and affordability within convenience stores in Bexar County, Texas. J Environ Public Health. 2013. https://doi.org/10.1155/2013/782756.
Smith MR, Mueller ND, Springmann M, Sulser TB, Garibaldi LA, Gerber J, Myers SS. 2022. Pollinator deficits, food consumption, and consequences for human health: A modeling study. Environ Health Perspect. 130(12):127003. https://doi.org/10.1289/EHP10947.
Song JH, Murphy RJ, Narayan R, Davies GBH. 2009. Biodegradable and compostable alternatives to conventional plastics. Philos Trans R Soc Lond B Biol Sci. 364(1526):2127–2139. https://doi.org/10.1098/rstb.2008.0289.
Sörqvist P, Colding J, Marsh JE. 2020. Psychological obstacles to the efficacy of environmental footprint tools. Environ Res Lett. 15(9):091001. https://doi.org/10.1088/1748-9326/ab9968.
Tan BC, Lau TC. 2010. Attitude towards the environment and green products: Consumers' perspective. Manag Sci Eng. 4(2):27–39. https://doi.org/10.3968/j.mse.1913035X20100402.002.
Thakur KS, Gupta Ms. 2012. Exploration of green shift: Shift from trendy marketing to environmental friendly green marketing. Int J Arts Commerce. 1:122–133. https://www.ijac.org.uk/images/frontImages/gallery/Vol1no7december2012/11.pdf. [accessed 15 Dec 2023].
Thomas M, Jensen K, Velandia M, Clark C, English B, Lambert D, Walker F. 2020. Outdoor home gardener preferences for environmental attributes in gardening supplies and use of ecofriendly gardening practices. HortTechnology. 30(5):552–563. https://doi.org/10.21273/HORTTECH04672-20.
Torres AP. 2020. For young consumers farm-to-fork is not organic: A cluster analysis of university students. HortScience. 55(9):1475–1481. https://doi.org/10.21273/HORTSCI15228-20.
US Census Bureau. 2023. Census Bureau regions and divisions with state FIPS codes. https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf. [accessed 16 Dec 2023].
US Census Bureau. 2020. American Community Survey 2019. Retrieved from https://www.census.gov/data/tables/2023/dec/2020-census-demographic-profile. [accessed 17 Jul 2023].
US Department of Agriculture and US Department of Health and Human Services. 2020. Dietary Guidelines for Americans, 2020-2025. https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf. [accessed 16 Dec 2023].
Verain M, Bartels J, Dagevos H, Sijtsema SJ, Onwezen MC, Antonides G. 2012. Segments of sustainable food consumers: A literature review. Int J Consum Stud. 36:123–132. https://doi.org/10.1111/j.1470-6431.2011.01082.x.
Verain M, Dagevos H, Antonides G. 2015. Sustainable food consumption. Product choice or curtailment? Appetite. 91:375–384. https://doi.org/10.1016/j.appet.2015.04.055.
Vermeulen SJ, Campbell BM, Ingram JSI. 2012. Climate change and food systems. Annu Rev Environ Resour. 37:195–222. https://doi.org/10.1146/annurev-environ-020411-130608.
Virtanen Y, Kurppa S, Saarinen M, Katajajuuri JM, Usva K, Mäenpää I, Mäkelä J, Grönroos J, Nissinen A. 2011. Carbon footprint of food – approaches from national input–output statistics and an LCA of a food portion. J Clean Prod. 19(16):1849–1856. https://doi.org/10.1016%2Fj.jclepro.2011.07.001.
Ward J. 1963. Hierarchical grouping to optimize an objective function. J Am Stat Assoc. 58(301):236–244. https://doi.org/10.1080/01621459.1963.10500845.
Yadav J, Sharma M. 2013. A review of k-mean algorithm. Int J Eng Trends Technol. 4(7):2972–2976. https://api.semanticscholar.org/CorpusID:61532973. [accessed 26 Sep 2023].
Zhan L, Bulgari R, Pignata G, Casale M, Nicola S. 2022. The mixing ratio and filling-amount affect the tissue browning and antioxidant properties of fresh-cut baby leaf lettuce (*Lactuca sativa* L.) and rocket (*Eruca sativa* Mill.) grown in floating growing systems. Foods. 11(21):3515. https://doi.org/10.3390/foods11213515.
Zhllima E, Imami D, Canavari M. 2015. Consumer perceptions of food safety risk: Evidence from a segmentation study in Albania. J Integr Agric. 14(6):1142–1152. https://doi.org/10.1016/S2095-3119(14)60997-7.