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Sustainability perceptions and consumer brand preferences: Evidence from the milk and dairy products market in Azerbaijan

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Abstract

This study examines the relationship between sustainability perceptions and consumer brand preferences in Azerbaijan's milk and dairy products market. A cross-sectional online questionnaire survey in Baku produced 545 valid responses from consumers with dairy purchasing experience, recruited through convenience sampling. Sustainability perceptions were examined across four dimensions: environmental responsibility, ethical and animal welfare practices, health and food safety assurance, and social responsibility and transparency. The analysis combined exploratory factor analysis, internal consistency assessment, regression analysis and structural equation modeling. The reported results indicate positive associations between each sustainability dimension and consumer brand preference. Health and food safety assurance had the largest reported standardized coefficient, followed by ethical and animal welfare practices; environmental responsibility and social responsibility and transparency had smaller positive coefficients. The findings suggest that consumers' evaluations of responsible production are connected with their preferences for dairy brands and provide a basis for further research on sustainability-related brand evaluation in an emerging market. For dairy producers and brand managers, the study highlights the potential relevance of credible health, safety and ethical communication. The cross-sectional design and convenience sample limit causal interpretation and population generalizability.

JEL classification: D12; M31; Q13

1 Introduction

Sustainability is an influential concept in consumer decision-making within food and agricultural markets. Environmental, ethical and food-related considerations can extend consumer evaluations beyond price and availability to the conditions of production and corporate conduct (Grunert 2011). Sustainability perceptions may consequently contribute to consumers' trust and brand-related judgments.

Within consumer behavior and branding literature, sustainability is increasingly conceptualized as a multidimensional perceptual construct. Consumers do not assess sustainability in a uniform manner; instead, they form perceptions based on a combination of environmental responsibility, ethical and animal welfare practices, health and food safety assurances, and broader social responsibility and transparency (Grunert 2011; Maignan 2001). These dimensions function as intangible signals that reduce perceived risk and shape how consumers evaluate and compare brands, particularly in product categories closely linked to daily consumption and personal well-being.

Brand preference represents a central outcome of these evaluative processes. Prior research suggests that positive sustainability perceptions can enhance brand trust, strengthen perceived quality, and increase consumers' willingness to favor certain brands over competing alternatives (Aaker 1991; Keller 2013). However, the strength and relevance of sustainability-driven brand preferences vary across product categories and market contexts. In food markets, and especially in dairy products, consumers

tend to be more sensitive to sustainability-related cues due to concerns associated with health, safety, and production conditions.

Milk and dairy products offer a relevant setting for examining sustainability perceptions because they connect regular food consumption with agricultural and animal-based production. Dairy sustainability involves environmental, animal-health and wider socioeconomic considerations (Food and Agriculture Organization of the United Nations (FAO) and Global Dairy Platform (GDP) 2019). The present study examines consumers' interpretations of these issues alongside perceived health, food safety and transparency.

Research has examined dairy sustainability perceptions, carbon-footprint labels and consumer priorities for production practices (Aizaki and Takeshita 2023; Canavari and Coderoni 2020; Schiano et al. 2020). These studies provide a basis for examining how perceived responsibilities relate to brand preference, beyond general green marketing claims (Peattie and Crane 2005). The present study builds on this literature by examining four sustainability perception dimensions together in Azerbaijan's dairy market. Its contribution concerns the associations with brand preference in this setting, rather than assuming that sustainability-related attributes have a uniform importance across markets.

Azerbaijan provides the empirical setting for this study. Local food branding research has examined demographic variation in consumer behavior (Guliyev 2024). More recently, a survey of 475 fast-food consumers found differences in sustainability perceptions across demographic groups (Guliyev et al. 2026). That study concerned group differences in a different food sector; the present survey examines dairy brand preference among 545 consumers. The two studies therefore offer related contextual evidence without treating their samples or outcomes as equivalent.

The study investigates the association between sustainability perceptions and consumer brand preferences in the milk and dairy products market. Sustainability perceptions are operationalized through environmental responsibility, ethical and animal welfare practices, health and food safety assurance, and social responsibility and transparency. Survey data from 545 consumers in Azerbaijan are used to examine the relationships between these dimensions and consumer brand preference.

Accordingly, this study addresses the following research questions:

- RQ1. How are overall sustainability perceptions associated with consumer brand preferences in the milk and dairy products market?
- RQ2. How do the associations with consumer brand preference differ across environmental responsibility, ethical and animal welfare practices, health and food safety assurance, and social responsibility and transparency?
- RQ3. What implications do these associations have for understanding dairy brand preference in the surveyed Azerbaijani context?

2 Literature review

2.1 Sustainability in consumer behavior

Sustainability in consumer behavior includes consumers' evaluations of environmental consequences and corporate responsibility (Peattie and Crane 2005). Such evaluations interact with the circumstances of consumption. White et al. (2019) organize the psychological drivers of sustainable behavior around social influence, habits, the individual self, feelings and cognition, and tangibility. This framework helps explain why awareness of responsibility may contribute to favorable brand evaluations while daily routines and practical constraints continue to influence choices.

Prior research emphasizes that sustainability-related perceptions influence attitudes, trust, and decision-making, particularly in food markets where consumption is frequent and closely linked to health and well-being. Consumers often rely on sustainability cues as heuristics to reduce uncertainty and perceived risk, especially when direct assessment of production processes is difficult (Grunert 2011). As a result, sustainability perceptions play an increasingly important role in shaping brand evaluations and preferences.

Labels provide one route through which production-related information enters food choice. Potter et al. (2021) find that environmental labels were generally associated with selection and purchase of more sustainable foods in the studies reviewed, although many studies had unclear or high risk of bias. Tiboni-Oschilewski et al. (2024) emphasize that label effects are heterogeneous and depend on design and policy context. These reviews support examining consumers' interpretations of claims without assuming that a label guarantees behavioral change.

In the Azerbaijani sample, the relevance of sustainability perceptions is examined alongside the practical concerns that characterize dairy purchasing. Broader claims about changes in national sustainability awareness would require longitudinal or representative evidence.

2.2 Dimensions of sustainability perceptions

The present study operationalizes sustainability perceptions through four dimensions: environmental responsibility, ethical and animal welfare practices, health and food safety assurance, and social responsibility and transparency. These dimensions draw on sustainability, food-consumption and corporate-responsibility literature (Grunert 2011; Maignan 2001). Schiano et al. (2020) identify overlap in consumers' interpretations of sustainable, healthy, natural, ethical and trustworthy dairy products. Health and food safety are therefore examined as perceived aspects of responsible production, while their conceptual distinction from environmental sustainability is retained.

Environmental responsibility reflects consumers' perceptions of a brand's efforts to reduce environmental harm through production, resource use and packaging (Grunert 2011). Evidence from Italian dairy consumers links stated willingness to pay for lower-carbon products with climate-related beliefs, while showing that price sensitivity can limit that willingness (Canavari and Coderoni 2020).

Environmental cues may thus contribute to product evaluations without displacing consumers' other purchasing considerations.

Ethical and animal welfare practices capture consumers' evaluations of animal treatment and responsible conduct in the supply chain. Ethical-consumption research links such evaluations to moral concerns and favorable consumer responses (Carrington et al. 2010). A Swiss choice experiment found that animal welfare improvements were valued highly relative to the other dairy attributes examined, including greenhouse gas reductions (Richter et al. 2025). This supports examining welfare perceptions separately from environmental responsibility.

Health and food safety assurance concerns perceptions of responsible production, hygiene and the suitability of dairy products for consumption (Grunert 2011). Consumers in five European countries rated safety, nutrition and animal welfare information as especially useful on meat and dairy labels (Ammann et al. 2024). These evaluations justify examining safety-related perceptions alongside wider sustainability concerns; they do not establish the actual health or environmental performance of a product.

Social responsibility and transparency refer to consumers' perceptions of a company's accountability, social contribution and openness about its practices (Maignan 2001). Communication is relevant to how these practices are understood. Fischer et al. (2021) identify several purposes of sustainable consumption communication, extending beyond one-way promotion to consumer empowerment and wider changes in consumption systems. Transparency is consequently treated here as part of perceived responsible conduct, rather than the mere frequency of sustainability advertising.

Together, these four dimensions form the perceptual foundation through which consumers interpret sustainability and evaluate brands in food markets.

2.3 Sustainability perceptions and consumer brand preferences

Consumer brand preference reflects a consumer's tendency to favor one brand over competing alternatives based on accumulated evaluations and experiences. Branding literature emphasizes that brand preferences are shaped not only by functional product attributes but also by intangible cues such as trust, credibility, and perceived corporate values (Aaker 1991; Keller 2013).

Sustainability perceptions may be linked to brand preference through consumers' trust, perceived quality and brand credibility. Brands perceived as environmentally responsible, ethical and socially accountable may be evaluated more favorably. These mechanisms provide a theoretical interpretation; trust and perceived quality were not separately modeled as mediators in the reported analysis.

Sustainability-related perceptions may contribute to perceived quality and credibility, but exaggerated claims can generate skepticism (Nyilasy et al. 2014). A review of greenwashing in food identifies transparency, information, knowledge, trust and labeling as recurring issues (Nugraha et al. 2024). This

suggests that the credibility of the evidence behind a sustainability claim should be considered when interpreting favorable consumer evaluations.

Price and willingness to pay introduce an additional distinction between favorable perceptions and purchasing decisions. A meta-analysis of sustainable food studies finds that estimated premiums vary by region, food category, sustainability attribute and elicitation method, with hypothetical estimates tending to exceed non-hypothetical estimates (Li and Kallas 2021). A dairy-focused review likewise documents variation in the valuation of organic production, welfare, quality, safety and other attributes (Madududu et al. 2024). The present survey measures brand preference and does not estimate willingness to pay or verify purchases.

2.4 Sustainability perceptions in the milk and dairy products market

Milk and dairy products represent a distinct category within fast-moving consumer goods (FMCG) due to their close association with health, nutrition, and daily consumption. Unlike many non-food FMCG products, dairy items are directly linked to agricultural practices, animal welfare, and food safety regulations, making sustainability perceptions particularly salient (FAO and GDP 2019).

Dairy consumers evaluate production conditions alongside familiar product attributes. Schiano et al. (2020) show that animal treatment, ingredients, packaging and environmental concerns enter sustainability perceptions. In a German milk choice experiment, husbandry practices were particularly important, and packaging preferences did not necessarily reflect the packaging's environmental performance (Meyerding and Seidemann 2024). Perceived sustainability should therefore be distinguished from measured impacts, while remaining relevant to consumer evaluations.

Cross-country evidence further cautions against a universal ranking of dairy sustainability concerns. Aizaki and Takeshita (2023) compare eleven production-related activities across five countries and identify differences in priorities, including differences associated with age and gender. Their multidimensional approach supports examining distinct responsibilities while allowing their importance to vary with the market and consumer group.

The Azerbaijani survey offers a setting in which to examine how brand reputation, perceived quality and production-related evaluations are associated with dairy brand preferences. The development of local certification and labeling practices is not measured by the survey and should not be inferred from its results.

2.5 Hypothesis development

The reviewed evidence connects sustainability perceptions with evaluations of dairy production attributes and with stated willingness to pay (Aizaki and Takeshita 2023; Madududu et al. 2024). These outcomes are related to, but distinct from, consumer brand preference. Together with branding theory on intangible evaluations (Aaker 1991; Keller 2013), this literature provides a basis for testing whether

favorable overall sustainability perceptions are positively associated with dairy brand preference in the surveyed context.

H1: Overall sustainability perceptions are positively associated with consumer brand preferences for milk and dairy products.

The overall hypothesis is complemented by four dimension-specific hypotheses. These distinguish environmental, ethical and welfare, health and safety, and social and transparency evaluations rather than assuming that all dimensions represent the same consumer concern.

Environmental information can influence dairy evaluations, while price sensitivity may constrain consumers' willingness to reward lower-impact production (Canavari and Coderoni 2020). This provides a basis for testing the proposed environmental association:

H2: Environmental responsibility perceptions are positively associated with consumer brand preferences.

Choice evidence indicates that welfare improvements can carry substantial value for dairy consumers (Richter et al. 2025). The next hypothesis examines whether favorable ethical and animal welfare perceptions are associated with brand preference:

H3: Ethical and animal welfare perceptions are positively associated with consumer brand preferences.

The importance assigned to safety and nutrition information on dairy labels provides a basis for examining these concerns within responsible brand evaluations (Ammann et al. 2024):

H4: Health and food safety perceptions are positively associated with consumer brand preferences.

Corporate-responsibility research links perceived responsible conduct with consumer responses (Maignan 2001; Sen and Bhattacharya 2001). Concerns about transparency and credibility in food greenwashing research further motivate the proposed social responsibility and transparency association (Nugraha et al. 2024):

H5: Social responsibility and transparency perceptions are positively associated with consumer brand preferences.

3 Methodology

3.1 Research design

This study uses a quantitative, cross-sectional survey design to examine associations between sustainability perceptions and consumer brand preferences in the milk and dairy products market. Questionnaire measures allow perceptual constructs and hypothesized relationships to be examined using multivariate statistical techniques (Hair et al. 2019). The observational design does not establish causal effects.

3.2 Sample and data collection

The target population of the study consists of consumers of milk and dairy products. Data were collected using a structured questionnaire administered to individuals who regularly purchase and consume dairy products. To ensure the relevance and accuracy of responses, only participants with direct purchasing experience in the dairy category were included.

Data were collected in Baku, Azerbaijan, from 3 to 28 January 2026 through an online questionnaire administered using Google Forms. Participants received information about the study and its objectives before the survey questions and provided explicit electronic consent to participate.

The analysis included 545 valid questionnaires obtained through convenience sampling. The authors report no missing data in the analyzed responses. The sample size permits the reported multivariate analyses, although adequacy also depends on model complexity, distributional assumptions and effect sizes (Hair et al. 2019). Convenience sampling limits population representativeness.

3.3 Measurement instruments

The questionnaire consisted of three sections: sustainability perceptions, consumer brand preferences and demographic characteristics. Multi-item measures were adapted from literature on sustainability, ethical consumption, food safety and branding. Wording was adjusted to the milk and dairy products context.

Sustainability perceptions were operationalized as a multidimensional construct comprising four dimensions:

Environmental responsibility, adapted from green consumption and green brand perception scales (Chen 2010; Laroche et al. 2001)

Ethical and animal welfare practices, adapted from ethical consumption and corporate responsibility measures (Carrington et al. 2010; De Pelsmacker et al. 2005)

Health and food safety assurance, adapted from food quality, safety, and risk perception scales (Grunert 2011; Verbeke and Viaene 1999)

Social responsibility and transparency, adapted from consumer-based corporate social responsibility scales (Maignan 2001; Sen and Bhattacharya 2001)

Based on the Likert (1932) approach, each dimension was measured using multiple items assessed on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Likert-type scales are widely accepted in consumer research due to their reliability and suitability for measuring attitudes and perceptions.

Consumer brand preference, the dependent variable, was measured using eight items adapted from established brand equity, brand choice, and repurchase intention scales (Aaker 1991; Hellier et al. 2003; Keller 2013). These items capture consumers' tendency to favor a particular brand, intention to repurchase, and likelihood of recommending the brand to others.

3.4 Data analysis techniques

IBM SPSS Statistics, version 29, was used for the factor, reliability and regression analyses. Exploratory factor analysis (EFA) examined the dimensionality of the sustainability perception measures. The authors report that the data were normally distributed, but the original normality diagnostics are no longer available for independent assessment.

Second, reliability analysis was performed using Cronbach's alpha coefficients to evaluate the internal consistency of each measurement scale. Values exceeding commonly accepted thresholds indicate satisfactory reliability (Nunnally and Bernstein 1994).

Four separate bivariate regressions examined the relationships between each sustainability dimension and consumer brand preference. An aggregate sustainability index and a multiple-predictor regression were also reported. Structural equation modeling (SEM) was used to examine the proposed paths between constructs. The SEM software, estimator and complete model specification have not been confirmed in the available documentation.

3.5 Assistance with manuscript preparation

ChatGPT (OpenAI) was used during manuscript revision to assist with language editing, manuscript organization, reference checking and editorial suggestions. The authors remain responsible for verifying the sources, reported analyses and final text. This assistance did not generate survey observations or replace the original statistical analysis.

4 Data analysis and hypothesis testing

4.1 Respondent profile and reliability assessment

The respondent profile is summarized in Table 1. Male respondents accounted for 48.1% of the sample and female respondents for 51.9%. This distribution describes the sample and does not establish an absence of selection bias.

The largest age group was 25–34 years (34.9%), followed by 35–44 years (25.5%) and 18–24 years (20.6%). Together, these groups accounted for approximately 81% of respondents.

A bachelor's degree was reported by 53.6% of respondents and a master's degree or higher by 30.6%. The reported household-income categories comprised 29.0% low income, 52.7% middle income and 18.3% high income. These percentages describe the convenience sample rather than Azerbaijan's income distribution.

Dairy products were purchased daily by 37.2% of respondents and two or three times per week by 42.4%. The sample therefore includes consumers with frequent dairy purchasing experience.

Table 1
Respondent profile (N = 545)

Variable	Category	n	%
Gender	Male	262	48.1
Gender	Female	283	51.9
Age	18–24	112	20.6
Age	25–34	190	34.9
Age	35–44	139	25.5
Age	45–54	75	13.8
Age	55+	29	5.3
Education	Secondary	86	15.8
Education	Bachelor	292	53.6
Education	Master+	167	30.6
Monthly household income	Low	158	29.0
Monthly household income	Middle	287	52.7
Monthly household income	High	100	18.3
Purchase frequency (dairy)	Daily	203	37.2
Purchase frequency (dairy)	2–3 times/week	231	42.4
Purchase frequency (dairy)	Weekly or less	111	20.4

Percentages are rounded and may not sum to 100. The income-category thresholds require author confirmation.

Internal consistency was assessed using Cronbach's alpha, a widely accepted measure of scale reliability in quantitative research. Alpha values above 0.70 indicate acceptable reliability, while values above 0.80 reflect good internal consistency (Hair et al. 2019; Nunnally and Bernstein 1994).

All reported Cronbach's alpha coefficients exceed 0.70. Environmental responsibility (α = 0.86) and ethical and animal welfare practices (α = 0.88) show reported internal consistency above 0.80. Health and food safety assurance has the highest reported alpha (α = 0.91). These values concern internal consistency rather than the distinctness or substantive validity of the constructs.

The reported alpha values are 0.83 for social responsibility and transparency and 0.90 for consumer brand preference. The latter scale contains eight items covering preference, repurchase and recommendation intentions. High internal consistency does not establish that these intentions form a construct distinct from loyalty or word of mouth.

The reported reliability coefficients are consistent with acceptable internal consistency. Evaluation of the measurement structure also requires the original questionnaire, item-level results and factor analysis documentation.

4.2 Exploratory factor analysis

Prior to conducting exploratory factor analysis, the suitability of the dataset was evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. These tests are commonly applied to assess whether the correlation structure among variables is appropriate for factor analysis.

The results in Table 2 indicate a Kaiser–Meyer–Olkin value of 0.92, supporting the factorability of the reported item correlation matrix (Kaiser 1974). This diagnostic does not, by itself, establish distinct factors or discriminant validity.

Bartlett's test of sphericity is statistically significant ($\chi^2(276) = 6{,}012.4$, $p < 0.001$), rejecting the null hypothesis that the correlation matrix is an identity matrix. This confirms the presence of meaningful correlations among the variables and further supports the appropriateness of applying exploratory factor analysis (Hair et al. 2019).

Table 2
Kaiser–Meyer–Olkin measure and Bartlett's test of sphericity

Test	Value
Kaiser–Meyer–Olkin (KMO) Measure	0.92
Bartlett's Test of Sphericity – χ^2	6,012.4
Degrees of Freedom	276
Significance (p-value)	< 0.001

KMO = Kaiser–Meyer–Olkin measure. The reported Bartlett degrees of freedom imply a correlation matrix with 24 variables; the exact analyzed item set requires confirmation.

The original analysis used principal axis factoring with varimax rotation to examine the sustainability perception items. Varimax is an orthogonal rotation that simplifies interpretation of factor loadings. Its use does not establish that the underlying sustainability perceptions are substantively independent.

Four factors were reported, corresponding to environmental responsibility, ethical and animal welfare practices, health and food safety assurance, and social responsibility and transparency. The item-level loading matrix, cross-loadings and factor-retention criteria are unavailable, so the factor structure cannot be independently evaluated from the reported summaries alone.

The four sustainability perception factors collectively explained 69.1% of the total variance, exceeding commonly accepted benchmarks in behavioral and marketing research. Among these dimensions, Health and Food Safety Assurance accounted for the largest share of explained variance (18.9%), followed by Environmental Responsibility (17.4%), Ethical and Animal Welfare Practices (16.8%), and Social Responsibility and Transparency (16.0%).

The original analysis reports a single factor for the consumer brand preference items, explaining 61.7% of their total variance. The missing item-level output prevents independent assessment of this reported unidimensional solution.

The reported exploratory factor results are consistent with the proposed dimensions. Item-level loadings, cross-loadings and the factor-retention criteria are needed to evaluate the measurement structure fully.

4.3 Bivariate regression analysis

Four separate simple linear regressions examined the bivariate associations between individual sustainability dimensions and consumer brand preference (CBP). Each model included one sustainability dimension as its predictor. These models describe unadjusted associations and do not isolate causal effects.

As reported in Table 3, all sustainability perception dimensions exhibit positive and statistically significant relationships with consumer brand preference.

Environmental responsibility was positively associated with CBP ($\beta = 0.42$, $p < 0.001$; $R^2 = 0.18$). Ethical and animal welfare practices had a larger reported coefficient ($\beta = 0.49$, $p < 0.001$; $R^2 = 0.24$).

Health and food safety assurance had the largest reported bivariate coefficient ($\beta = 0.56$, $p < 0.001$; $R^2 = 0.31$). Social responsibility and transparency were also positively associated with CBP ($\beta = 0.39$, $p < 0.001$; $R^2 = 0.15$).

The reported bivariate coefficients are positive for H2–H5. Their magnitude and inferential statistics require verification against the original regression outputs.

Table 3
Bivariate regression results for sustainability dimensions

Hyp.	Predictor	β (Std.)	t	p-value	R^2
H2	ENV → CBP	0.42	11.9	< 0.001	0.18
H3	ETH → CBP	0.49	14.2	< 0.001	0.24
H4	HFS → CBP	0.56	17.3	< 0.001	0.31
H5	SOC → CBP	0.39	10.8	< 0.001	0.15

CBP = consumer brand preference. ENV = environmental responsibility; ETH = ethical and animal welfare practices; HFS = health and food safety assurance; SOC = social responsibility and transparency. β denotes a standardized coefficient. Numerical values are retained from the original manuscript and require verification.

4.4 Aggregate sustainability regression

An aggregate index combining the four sustainability dimensions was used to examine H1. Consumer brand preference was regressed on this overall sustainability-perception index. The original scoring and weighting procedure has not been established from the available study records.

Table 4 reports a positive standardized coefficient for overall sustainability perceptions ($\beta = 0.64$, $p < 0.001$). The reported model R^2 is 0.41.

These reported estimates are consistent with H1. They indicate an aggregate association rather than an established causal effect.

Table 4
Regression results for overall sustainability perceptions

Hyp.	Predictor	β (Std.)	t	p-value	R^2
H1	Sustainability Perceptions → CBP	0.64	19.6	< 0.001	0.41

CBP = consumer brand preference. β denotes a standardized coefficient. The construction and weighting of the overall index require author confirmation.

The reported coefficients indicate positive associations at both the dimensional and aggregate levels. Health and food safety assurance had the largest coefficient among the separate dimensional models. Comparisons across these coefficients are descriptive; no formal test of differences between coefficients is reported.

4.5 Multiple linear regression analysis

The multiple linear regression analysis examines the extent to which sustainability perception dimensions explain Consumer Brand Preference (CBP). The regression model includes Environmental

Responsibility (ENV), Ethical and Animal Welfare Practices (ETH), Health and Food Safety Assurance (HFS), and Social Responsibility and Transparency (SOC) as explanatory variables.

The estimated standardized regression model is expressed as:

$$\mathrm{CBP} = 0.15\,(\mathrm{ENV}) + 0.21\,(\mathrm{ETH}) + 0.31\,(\mathrm{HFS}) + 0.12\,(\mathrm{SOC}) + \varvec{\epsilon}$$

Table 5 reports positive standardized coefficients for all four dimensions. Health and food safety assurance had the largest coefficient (β = 0.31, p < 0.001), followed by ethical and animal welfare practices (β = 0.21, p < 0.001), environmental responsibility (β = 0.15, p < 0.001), and social responsibility and transparency (β = 0.12; the narrative reports p = 0.001). The table's p-value category for the final coefficient requires verification against the unrounded output.

The original analysis reports $R^2 = 0.55$, adjusted $R^2 = 0.54$ and $F(4, 540) = 165.4$ ($p < 0.001$). These model-summary statistics and the coefficients require reconciliation against the original output. Reported variance inflation factors (VIFs) range from 1.63 to 2.10.

Table 5
Multiple linear regression results

Predictor	β (Std.)	t	p-value	VIF
Environmental Responsibility (ENV)	0.15	4.1	< 0.001	1.78
Ethical and Animal Welfare Practices (ETH)	0.21	5.5	< 0.001	1.95
Health and Food Safety Assurance (HFS)	0.31	8.0	< 0.001	2.10
Social Responsibility and Transparency (SOC)	0.12	3.3	< 0.001	1.63

β denotes a standardized coefficient; VIF = variance inflation factor. The reported model summary and the social-responsibility p-value require verification.

Reported model summary: $R^2 = 0.55$; adjusted $R^2 = 0.54$; $F(4, 540) = 165.4$; $p < 0.001$.

These values are retained pending verification against the original analysis output.

The reported multiple-regression coefficients follow the same descriptive ordering as the bivariate results. Interpretation of their magnitude depends on resolution of the numerical discrepancies noted above.

4.6 Structural equation modeling

The original analysis also reports a structural equation model linking the four sustainability perception dimensions to consumer brand preference. Tables 6 and 7 present the reported measurement summaries and structural paths. Full evaluation requires the model specification, estimator and item-level outputs.

Composite reliability (CR) and average variance extracted (AVE) were reported for the measurement model (Table 6). All reported CR values exceed 0.70 and all reported AVE values exceed 0.50. These summary statistics address internal consistency and convergent validity; they do not establish discriminant validity on their own.

Health and food safety assurance has the highest reported CR (0.92) and AVE (0.72). The other constructs also exceed the stated CR and AVE thresholds. These summaries are consistent with internal consistency and convergent validity, but they do not establish the overall adequacy of the measurement model or discriminant validity.

Table 6
Composite reliability and average variance extracted

Construct	CR	AVE
Environmental Responsibility (ENV)	0.88	0.65
Ethical and Animal Welfare (ETH)	0.90	0.68
Health and Food Safety (HFS)	0.92	0.72
Social Responsibility and Transparency (SOC)	0.85	0.60
Consumer Brand Preference (CBP)	0.91	0.63

CR = composite reliability; AVE = average variance extracted. These indices alone do not establish discriminant validity.

Table 7 presents the standardized structural path coefficients and reported hypothesis outcomes. Their interpretation remains conditional on the unavailable measurement and structural model documentation.

Table 7 reports positive structural path coefficients for all four dimensions. Health and food safety assurance had the largest coefficient ($\beta = 0.33$, $p < 0.001$), followed by ethical and animal welfare practices ($\beta = 0.22$, $p < 0.001$), environmental responsibility ($\beta = 0.16$, $p < 0.001$), and social responsibility and transparency ($\beta = 0.13$, $p = 0.002$). The reported estimates are consistent with H2–H5.

The reported structural-model R^2 for consumer brand preference is 0.57.

Table 7
Structural path estimates for consumer brand preference

Hyp.	Path	Standardized estimate	p-value	Result
H2	ENV → CBP	0.16	< 0.001	Supported
H3	ETH → CBP	0.22	< 0.001	Supported
H4	HFS → CBP	0.33	< 0.001	Supported
H5	SOC → CBP	0.13	0.002	Supported

CBP = consumer brand preference. Estimates and p-values are those reported in the original manuscript.

Reported structural-model fit statistics were $\chi^2/df = 2.41$, comparative fit index (CFI) = 0.95, Tucker–Lewis index (TLI) = 0.94, root mean square error of approximation (RMSEA) = 0.051, and standardized root mean square residual (SRMR) = 0.043. These values are consistent with acceptable fit under commonly used criteria (Hair et al. 2019), although fit assessment also requires the model specification, estimator and assumptions.

Figure 1 summarizes the four reported structural paths to consumer brand preference. The arrows represent the hypothesized directions in the estimated model and do not establish causality. The figure omits measurement indicators, residuals and predictor covariances for readability.

Figure 1 Simplified structural paths from sustainability dimensions to consumer brand preference with reported standardized coefficients (ENV environmental responsibility; ETH ethical and animal welfare practices; HFS health and food safety assurance; SOC social responsibility and transparency; CBP consumer brand preference)

The figure shows the largest reported standardized path for health and food safety assurance ($\beta = 0.33$), followed by ethical and animal welfare practices ($\beta = 0.22$). Environmental responsibility ($\beta = 0.16$) and social responsibility and transparency ($\beta = 0.13$) had smaller positive paths.

The ordering of these paths is descriptive. Formal comparisons would be needed to conclude that their magnitudes differ statistically. The reported R^2 of 0.57 should be evaluated alongside the complete structural-model output.

4.7 Summary of hypothesis testing

Table 8 summarizes the hypothesis outcomes reported in the original analysis. These are retained as reported outcomes because the lost statistical outputs prevent verification.

The aggregate regression is reported to support H1. The four positive dimensional coefficients in the regression and structural models are reported to support H2–H5.

Across the reported analyses, health and food safety assurance had the largest dimensional coefficient, followed by ethical and animal welfare practices. The findings concern associations within the surveyed sample.

Table 8
Reported hypothesis outcomes

Hyp.	Statement	Result
H1	Overall sustainability perceptions are positively associated with consumer brand preferences for milk and dairy products.	Supported
H2	Environmental responsibility perceptions are positively associated with consumer brand preferences.	Supported
H3	Ethical and animal welfare perceptions are positively associated with consumer brand preferences.	Supported
H4	Health and food safety perceptions are positively associated with consumer brand preferences.	Supported
H5	Social responsibility and transparency perceptions are positively associated with consumer brand preferences.	Supported

“Supported” records the interpretation in the original manuscript; confirmation requires the original statistical outputs.

The reported hypothesis outcomes provide a basis for assessing the proposed framework once the numerical checks and measurement reporting are completed.

5 Discussion and conclusion

5.1 Discussion of findings

This study examined the association between sustainability perceptions and consumer brand preferences in the milk and dairy products market. The reported coefficients suggest positive relationships at both the aggregate and dimensional levels. Interpretation remains conditional on the verification of the original analysis outputs.

The reported aggregate association is consistent with H1 and with branding literature emphasizing intangible evaluations in brand preference (Aaker 1991; Keller 2013). The comparatively large health and food safety coefficient suggests that practical concerns may be prominent in respondents’ evaluations. This is compatible with the importance assigned to safety and nutrition information in European meat and dairy research (Ammann et al. 2024). Differences in measures and samples prevent treating that comparison as replication, and the present association does not establish a causal effect.

The positive reported association for ethical and animal welfare perceptions is consistent with ethical-consumption research (Carrington et al. 2010; De Pelsmacker et al. 2005). Dairy choice evidence also

indicates that consumers may value welfare improvements highly (Richter et al. 2025). However, favorable ethical attitudes need not translate into actual buying behavior. The present self-report survey concerns brand evaluations and intentions rather than verified purchases.

Environmental responsibility also has a positive reported association with brand preference, with a smaller coefficient than health and food safety or ethical and animal welfare practices. This is compatible with literature on environmental considerations in food purchasing (Chen 2010; Peattie and Crane 2005). Italian dairy evidence suggests that price sensitivity may condition responses to lower-carbon products (Canavari and Coderoni 2020), although that mechanism was not tested here. The coefficient ordering remains descriptive and does not establish statistically significant differences between dimensions.

Social responsibility and transparency also had a positive reported path to brand preference, consistent with corporate-responsibility research (Maignan 2001; Sen and Bhattacharya 2001). The food greenwashing literature makes credibility and access to reliable information relevant considerations (Nugraha et al. 2024). A possible trust mechanism remains an interpretation because trust was not separately measured and tested as a mediator.

The study adds dairy-specific associations to local food branding research (Guliyev 2024) and complements the demographic perspective reported for Azerbaijan's fast-food consumers (Guliyev et al. 2026). International dairy comparisons indicate that consumer priorities can differ by country, age and gender (Aizaki and Takeshita 2023). The present results should therefore be interpreted within the surveyed context. They neither establish national changes in sustainability awareness nor assess the development of local labels or certifications.

5.2 Managerial and practical implications

Subject to verification of the reported results, dairy producers and brand managers may consider health and food safety assurance in their brand communication. Any claims should reflect documented production practices and quality controls. The survey does not quantify the commercial return on such investments.

Dairy managers may consider specific welfare practices and documented production conditions in brand communication, while testing which messages their customers understand and value. German milk research identifies differences in consumer preferences for husbandry, packaging and other attributes (Meyerding and Seidemann 2024). The broader behavioral framework also suggests considering habits and the tangibility of messages (White et al. 2019). These findings support examining consumer differences rather than assuming that a single sustainability message will appeal equally to all dairy buyers.

Credible labeling and consumer education may help people assess sustainability claims, but their effectiveness should be evaluated in the local market. Evidence reviews identify both benefits and limitations of food eco-labeling (Potter et al. 2021; Tiboni-Oschilewski et al. 2024). Communication

should explain the practices underlying claims and enable questions and feedback, consistent with the wider purposes of sustainable consumption communication (Fischer et al. 2021). The present survey does not measure the effects of any specific labeling policy.

5.3 Theoretical contributions

The study offers context-specific evidence on a four-dimensional operationalization of sustainability perceptions in dairy brand evaluation. It also identifies questions about the boundary between sustainability, health and food safety that warrant further measurement research. The use of regression and structural equation modeling on the same survey provides complementary analyses, rather than independent replication or proof of generalizability.

5.4 Limitations and future research

The cross-sectional design limits causal inference, and convenience sampling limits population generalizability. All constructs were collected through a single self-report questionnaire, so shared method variance, response tendencies and social desirability may affect the associations. The brand preference measure also includes repurchase and recommendation intentions, which require attention when assessing its distinction from loyalty and word of mouth. The underlying data are unavailable and the original statistical outputs have been lost, preventing reanalysis and full verification of the reported estimates. The regression inconsistencies identified in this manuscript remain unresolved.

Future research could use longitudinal or experimental designs, representative samples and observed purchasing behavior. Cross-country comparisons could assess contextual differences. Additional analyses could examine price sensitivity, consumer involvement and the distinction between sustainability perceptions and perceived food quality, as well as test trust or perceived quality as potential mediators.

5.5 Conclusion

The reported findings indicate positive associations between sustainability perceptions and dairy brand preferences in the Azerbaijani sample. Health and food safety assurance had the largest reported dimensional coefficient, followed by ethical and animal welfare practices, with smaller positive coefficients for environmental responsibility and social responsibility and transparency.

The study offers a basis for further investigation of how consumers interpret responsible dairy production. Its substantive conclusions should be considered alongside the cross-sectional design, convenience sample, measurement limitations and the need to verify the reported analysis outputs.

Declarations

Funding

No funding was received for this research or the preparation of this article.

Competing interests

The authors declare that they have no competing interests relevant to this article.

Ethics approval

The authors report that ethics approval or a documented exemption was obtained for this survey. The reviewing body, decision reference and date have not yet been specified.

Consent to participate

Participants received information about the study and its objectives on the opening page of the Google Forms questionnaire. Explicit electronic consent to participate was obtained before participants proceeded to the survey questions.

Consent for publication

Not applicable. The article reports aggregate survey results and contains no information identifying individual participants.

Data availability

The underlying data are unavailable, and the original statistical output files can be provided if requested.

Materials and code availability

The questionnaire and other retained study materials are available from the corresponding author upon reasonable request.

Author contributions

Seymur M. Guliyev analysed the data and wrote the conclusion. Rasim Abutalibov wrote the introduction and formulated the hypotheses, research questions and methodology. Both authors read and approved the manuscript.

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Figures

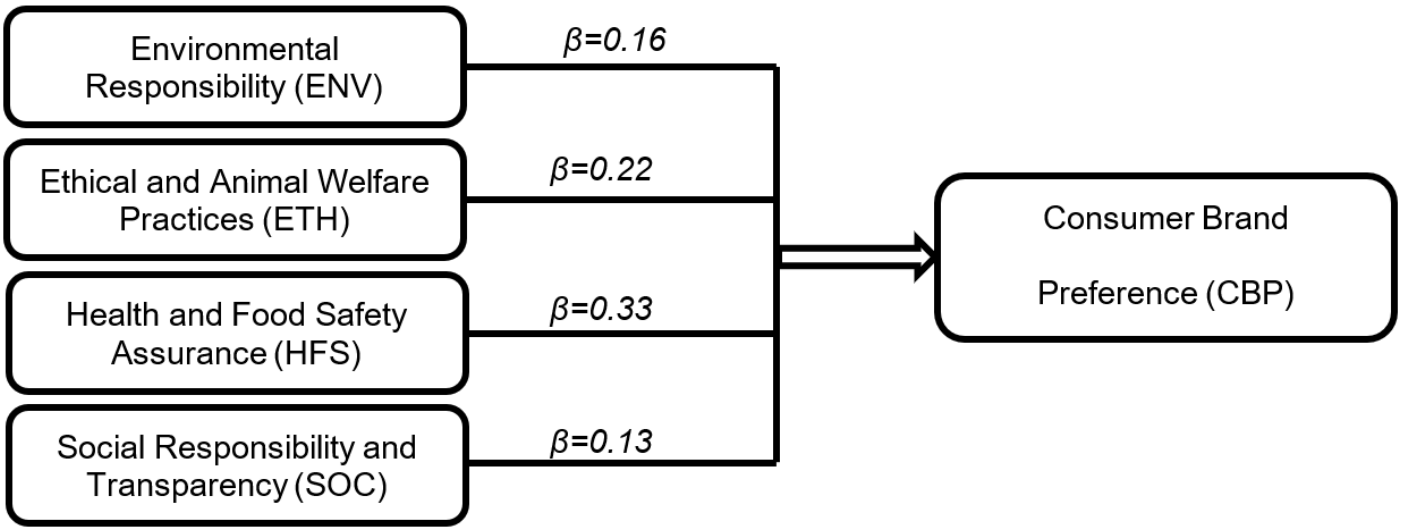


Figure 1

Simplified structural paths from sustainability dimensions to consumer brand preference with reported standardized coefficients (ENV environmental responsibility; ETH ethical and animal welfare practices; HFS health and food safety assurance; SOC social responsibility and transparency; CBP consumer brand preference)