Social Sciences & Humanities Open 13 (2026) 102422

Contents lists available at ScienceDirect

Social Sciences & Humanities Open

journal homepage: www.sciencedirect.com/journal/social-sciences-and-humanities-open

Regular Article

Assessing the effectiveness of eco-labels on consumer purchase intentions in the food and beverage industry: A PLS-SEM approach

Md. Sohel Rana [a,*], Shadia Sharmin [a,g], Mohammad Bin Amin [b,c,h,**], Nur-A-Alam Mishad [a], Judit Oláh [d,e,f]

[a] Department of Business Administration, University of Scholars, 40, Kemal Ataturk Avenue, Banani, Dhaka, 1213, Bangladesh
[b] Doctoral School of Management and Business, Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, Debrecen, 4032, Hungary
[c] Department of Business Administration, Faculty of Business Studies, Bangladesh Army University of Science and Technology, Saidpur, 5310, Nilphamari, Bangladesh
[d] Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, Debrecen, 4032, Hungary
[e] Doctoral School of Management and Business Administration, John von Neumann University, 6000, Kecskemét, Hungary
[f] College of Business and Economics, University of Johannesburg, Johannesburg, 2006, South Africa
[g] Centre for Higher Studies and Research, Bangladesh University of Professionals, Mirpur Cantonment, Dhaka, 1216, Bangladesh
[h] Department of Business Studies, State University of Bangladesh, 696 Kendua, Kanchan, Rupganj, Narayanganj, 1461, Dhaka, Bangladesh

ARTICLE INFO

Keywords:
Eco-labels
Consumer purchase intention
Food and beverage industry
PLS-SEM
Moderation effects

ABSTRACT

The study investigates the impacts of eco-labels in influencing consumer purchase intentions in the food and beverage industry through the Partial Least Squares Structural Equation Modeling (PLS-SEM) framework. Based on the Theory of Planned Behavior (TPB), the Stimulus-Organism-Response (S-O-R) model, and the Value-Attitude-Behavior (VAB) model, the study focused on the role of eco-label awareness, eco-label credibility, environmental concern, and perceived product value in consumer behavior and the moderating role of attitudes toward eco-labeled products. The structural model shows empirical findings that eco-label awareness, eco-label credibility, environmental concern, and perceived product value have a significant positive influence on purchase intentions. The theoretical implications of the findings confirmed that emotional and attitudinal constructs improve the predictive validity of earlier classical theories of behavior, such as TPB, and justify the use of interaction terms in studies of sustainable behavior. In practice, this study highlights the paramount need for transparency, trust, and educating consumers to maximize the efficiency of eco-labels. This helps both in the knowledge base and viable marketing plans, stressing the revolutionary powers of the credible eco-labels in the concept of environmentally conscious consumption.

1. Introduction

With an increased global awareness of environmental sustainability, eco-labels have become an important communication tool that connects consumers with the environmentally friendly attributes of products. Eco-labels serve as information signals that guide ecologically conscious consumers to products with lower environmental impacts in the organic product industries, particularly in food and beverage sectors associated with environmental concerns such as agricultural emissions, resource consumption, and packaging waste (Potter et al., 2021; Quoc et al., 2025). Eco-labels are designed to influence consumer purchasing toward sustainable consumption patterns by signaling environmental responsibility and product integrity.

There has been a growing demand for transparency and sustainability from consumers, which the food and beverage industry has been responding to by incorporating eco-labels. Previous research has demonstrated that eco-labels have a direct impact on consumer perception and purchasing intention, with the perceived credibility of a label being crucial, as well as an understanding of them (Galati et al., 2022; Liang et al., 2020). However, other studies show discrepancies between consumers' intentions and their actual buying behaviors due to a lack of knowledge or mistrust in eco-labeling credibility (Gonzalez,

* Corresponding author.
** Corresponding author. Doctoral School of Management and Business, Faculty of Economics and Business, University of Debrecen, Böszörményi street 138, Debrecen 4032, Hungary.
E-mail addresses: drsohelmr@gmail.com, sohel@ius.edu.bd (Md.S. Rana), shadia.sharmin@ius.edu.bd (S. Sharmin), binamindu@gmail.com (M.B. Amin), mishad.alam@ius.edu.bd (N.-A.-A. Mishad), olah.judit@econ.unideb.hu (J. Oláh).

https://doi.org/10.1016/j.ssaho.2025.102422
Received 4 September 2025; Received in revised form 23 December 2025; Accepted 24 December 2025
Available online 6 January 2026

2020; Araya et al., 2022). Such mixed results indicate that the impact of eco-labels is not straightforward, and possibly context-specific aspects or consumer-related mechanisms, such as cognitive or attitudinal factors, are missing in existing research.

Beyond the food and beverage industry, eco-labeling has also been widely investigated in other areas, including fashion and electronics, which demonstrate distinct characteristics concerning sustainability. In the fashion industry, environmental labels mainly signal ethical production methods, resource-saving, and waste avoidance, impacting consumer behavior through brand responsibility and material authenticity (Choi & Cheng, 2015; Garcia-Torres et al., 2022; Ray & Nayak, 2023). In electronics, eco-labels attach importance to aspects such as energy consumption benefits, recyclability potential, and durability of products, but consumer knowledge is likely limited due to the highly technical content provided (Bu et al., 2022; Imperiale et al., 2023). These cross-industry findings indicate that the impact of eco-labels depends strongly on context, which highlights the need to study labelling effects directly within food and beverage, since emotional, ethical dimensions of consumption are likely to be more salient.

Although eco-labels are supposed to promote sustainable consumerism, their actual effects are conceptually and empirically ambiguous. The vast majority of studies available to date are somewhat superficial (on the surface) and do not delve below the psychological or perceptual 'surface' that can help explain, for example, how trust or environmental concern mediates use value in the context of purchasing (Darnall et al., 2018; Testa et al., 2015; Thøgersen et al., 2010). Furthermore, the absence of methodological strictness in dealing with latent constructs, mediating variables, and moderating effects is common in previous empirical models (Hossain et al., 2022). Modern analytical tools such as PLS-SEM enable these limitations to be overcome, where researchers can incorporate multi-dimensional and non-linear relationships in their models of analysis (Hair et al., 2021).

Another notable gap is the geographic and subject matter coverage of previous studies. The literature is focused on Western markets or specific types of eco-labels like carbon, energy labels, and there is less research in relation to the emerging economies and other categories of eco-label (Donato, 2025; Zhan et al., 2025). Likewise, there is still scarce yet any empirical evidence about how eco-label awareness, perceived credibility, environmental concern, and perceived value interactive influence purchase intentions in the context of a diverse and dynamic food and beverage category (Ghouse et al., 2025; Mahesha & Rekha, 2024).

This study attempts to bridge these theoretical and empirical gaps by proposing and later establishing a more complete PLS-SEM model that combines cognitive, affective, and context determinants of eco-label effectiveness. In particular, it seeks to understand the collective impacts of eco-label awareness, credibility, environmental concern, and perceived value on consumer purchasing intention in the food and beverage industry. Theoretically, this research provides a comprehensive model to illuminate the intricate moderating processes of eco-label effectiveness. Practically, it incorporates evidence-based implications relevant to marketers, policy makers, and certification bodies on the development and communication of eco-labeling systems that promote consumer trust, understanding, and sustainable purchasing.

2. Literature review and hypothesis development

2.1. Eco-labels in the food and beverage sector

The use of eco-labels has become an important instrument of sustainable consumption because they keep consumers informed about the environmental performance of commodities. In the case of the food and beverage industry, with its related concerns of the environment and day-to-day consumption, eco-labels become a nudge system that alters the purchasing behaviour by decreasing information asymmetry (Grunert et al., 2014).

Eco-labels like USDA Organic, Fair Trade, and Carbon Trust Certified are meant to close the so-called green gap, that is, the mismatch between what people claim to care about and what they buy (Hossain et al., 2022). Therefore, to evaluate their effectiveness, one must consider not only their awareness and levels of trust but also the translation of such attitudes to purchase intentions.

2.2. Theoretical underpinning

Ajzen (1991) proposes a valuable theory of planned behavior (TPB) in the analysis of consumer intentions. TPB provides that behavioral intentions are determined by attitude, subjective norms, and perceived behavioral control. A relative regard for eco-labels:

- *Attitudes* are influenced by beliefs surrounding the credibility and usefulness of eco-labels.
- *Subjective norms* depend on peer and societal demands of sustainable behaviour.
- *Perceived behavioral control* could indicate the availability of eco-labeled products or price considerations.

Complementing TPB, the Stimulus-Organism-Response (S-O-R) framework (Mehrabian & Russell, 1974) is an emotional and behavioral responses model based upon the environmental cues. In the eco-label context:

- Stimulus: An eco-label is an external environmental reference.
- Organism: Signifies the state of the consumer in his/her inside (e.g., trust, perceived credibility, environmental concern).
- Response: The consequent behavior, e.g. purchase intention or avoidance.

The framework is especially useful in explaining affective responses (e.g., pride, guilt, trust) between the exposure to the label and behavioral intention, filling the cognitive bias of TPB with emotional and experiential variables (Walsh et al., 2011).

Furthermore, the Value-Attitude-Behavior (VAB) model (Homer & Kahle, 1988) provides an even more solid theoretical grounding as it connects personal values to attitudes and subsequent behavioural intention. For eco-labels, they are perceived as environmentally or ethically oriented; accordingly, for such consumers holding high environmental or ethical concerns will lead to more positive attitudes toward eco-labeled products and thus green purchasing conduct. The VAB model highlights the motivating force of personal values (e.g., altruism, biospheric concern, moral norm) on environmentally friendly attitudes and intentions. The VAB framework, in combination with TPB and S-O-R, offers a powerful theoretical perspective that captures the interconnectedness among cognitive, affective, and value-related mechanisms of sustainable consumer behavior. Collectively, these models provide a strong conceptual base for understanding how awareness and credibility of eco-labels, as well as environmental concern, are invoked to explain purchase intentions in the food and beverage sector.

2.3. Hypothesis development

2.3.1. Eco-label awareness and purchase intention

Eco-label awareness means the level to which consumers recognize, understand, and remember eco-labels displayed on product packages. It can be regarded as a basic antecedent of green consumer behavior, especially in environmentally conscious market segments. Consciousness of eco-labels is paramount in enhancing the cognitive assessment of a product on its environmental authenticity by consumers, thus determining their purchase intention (Hossain et al., 2022; Nguyen-Viet, 2022). In a study conducted by Darnall et al. (2018), a greater level of eco-label awareness positively correlated with a more pronounced preference toward environmentally certified products because these

consumers were more likely to distinguish between genuine green products and conventional ones. Similarly, Prakash and Pathak (2017) revealed that label awareness was an important factor in predicting the intention to purchase eco-label food products mediated by product trust and perceived environmental benefit. Given that there is a strong relationship between awareness and intention, the food and beverage industry has been a significant example with eco-labels that provide confidence in organic sources, good production, and sustainability certifications. The findings of Taufique et al. (2016) emphasized that consumers with the ability to recognize eco-labels were more likely to show trust and liking to eco-friendly food products, which reaffirmed that there should be an appropriate promotion and education of the labels.

H1. Eco-label awareness positively influences the purchase intention of eco-labeled food and beverage products.

2.3.2. Eco-label credibility and purchase intention

Consumer trust and consumer purchase behavior highly depend on the credibility of eco-labels. When the eco-labels are seen as reliable, the consumers will tend to believe the environmental claims they make and engage in sustainable purchases. Testa et al. (2015) provided empirical evidence showing that reliable eco-labels improve consumer trust, which raises the purchase intention of eco-friendly products. Furthermore, the research by Caliskan et al. (2021) established the fact that eco-label credibility is a psychological signal that enhances purchase intention through decreasing information asymmetry. The credibility of the eco-label is central in influencing consumer purchase intentions, especially in food and beverage products. Eco-labels have become more and more trustworthy signals to consumers when it comes to environmental responsibility. According to Donato (2025), credible eco-labels have been identified to play a significant role in influencing consumer buy intention of a product as they are seen as reliable cues to the environmental friendliness of the product. The research stresses the role of consumer awareness and perception of the legitimacy in enhancing the purchasing intention of eco-labeled food products.

H2. Eco-label credibility positively influences the purchase intention of eco-labeled food and beverage products.

2.3.3. Environmental concern and purchase intention

Eco-friendly consumer behavior is a very essential indicator of environmental concern. Customers who are well-informed about the environment tend to buy sustainable products. Biswas and Roy (2015), noted that environmentally conscious consumers pay attention to eco-labels and are more prone to being affected by it when making their purchase. And Paul et al. (2016) identified the direct positive correlation between the level of environmental concern of consumers and their likelihood to purchase green products. The connection between environmental concern and the intent to buy eco-labeled food and beverage products is strong and persistent according to empirical studies. The results of the study conducted by Yahya et al. (2022) showed that environmental concern positively and significantly influenced the intention to buy eco-labeled products in the case of the Malaysian youth. It was also revealed by Donato (2025) that eco-labels with a combination of high environmental concern and knowledge of consumers positively contributed to a strong increase in purchase intentions toward green food products in Finland. Calderon-Monge et al. (2021) emphasized that individuals with a strong sense of environmental responsibility are more prone to being influenced by eco-labels as they buy food and beverages.

H3. Environmental concern positively influences the purchase intention of eco-labeled food and beverage products.

2.3.4. Perceived product value and purchase intention

The willingness of consumers to pay the price of the eco-labeled product is largely determined by the perception of value by consumers in terms of the trade-off between quality, cost, and environmental benefit. Chen and Chang (2012) also endorse the positive effects of perceived value on the purchase intention of green products by enhancing the satisfaction of the customers. Subsequently, Zhang et al. (2018) identified that higher perceptions of value of green products (e.g., durability or health safety) led to a higher probability of consumers buying such products. Potential to indicate perceived product value with a strong positive effect on the purchase intention of eco-labeled food and beverage products is evidenced. Consumers tend to purchase products that are environmentally friendly when they think about it as a high-quality, health-promoting, and ethical or environmentally friendly product. According to Nguyen-Viet et al. (2022), the perception of product quality contributes to the increment of green brand equity, which, further, positively influences the purchase intention regarding eco-labeled products tremendously. Bakri et al. (2023) empirically confirmed that environmental knowledge and lifestyle, which is a contributor of perceived value, exert direct influence on the purchase intention of beverage products with an eco-label. According to Calderon-Monge et al. (2021), perceived behavioral control and attitudes, which are determined by perceived product value, were very crucial in predicting the purchase intention of food products with eco-labels.

H4. Perceived product value positively influences the purchase intention of eco-labeled food and beverage products.

2.3.5. Attitude toward eco-labeled products as a moderator

Attitude serves as a window through which information on the eco-label is perceived. The intended eco-label awareness effect on purchase intention can be enhanced by a positive attitude towards eco-labeled products. Huang and Rust (2014) contend that attitudes serve as a mental sieve; positive-minded consumers toward eco-labels will tend to make their awareness count, and buy accordingly. Moreover, SEM analysis by Rafiq and Xinru (2025) showed that the moderating role of attitude is substantial, and this approach supports the significance of the consumer orientation in the models of eco-friendly behavior. In the study by Ihle and Ihle (2023), they indicated that, in addition to awareness, the emotional alignment with environmental values contributes to the choice of eco-labeled products, highlighting the moderating role of attitude. In a study conducted by Che Musa and Kadir (2025), the conceptual analysis of the attitude towards the sustainable label as the key moderating variable of purchase intention is used. They suggest that positive attitudes can increase the beneficial influence of eco-label awareness on the willingness to pay a premium on eco-labeled food products.

H5. Attitude toward eco-labeled products moderates the relationship between eco-label awareness and purchase intention.

H6. Attitude toward eco-labeled products moderates the relationship between eco-label credibility and purchase intention.

H7. Attitude toward eco-labeled products moderates the relationship between environmental concern and purchase intention.

H8. Attitude toward eco-labeled products moderates the relationship between perceived product value and purchase intention.

2.4. Proposed Research Model

Based on a synthesis of relevant theories and prior empirical findings, the conceptual framework (Fig. I) illustrates the hypothesized relationships among the key variables.

3. Methodology

3.1. Ethics statement

The study received approval from the Research Committee of the

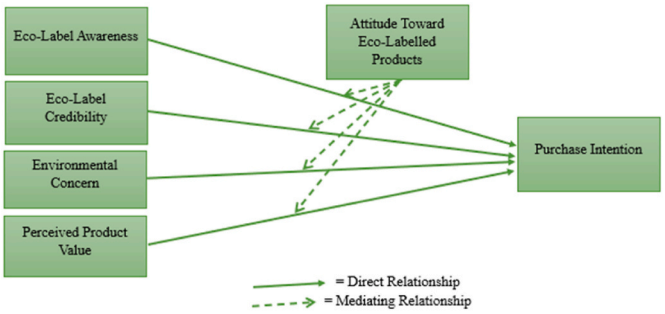

Fig. 1. Proposed research model.
Source: Authors

University of Scholars (Approval No. IUS/Regi. Office/Letter/2024/241 on February 04, 2025) as it involves human participants. Informed consent was obtained (February 05, 2025 to May 04, 2025) in person by the researchers, where participants were informed that each question was optional and no personally identifying information would be collected, ensuring strict anonymity.

3.2. Measurement instrument

The instrument was, at first, validated by educationalists, and this was followed by pilot testing, which further validated the questionnaire. The research tool was constructed on a five-point Likert scale varying between strongly disagree (1) and strongly agree (5). The items for Eco-Label Awareness (ELA), Eco-Label Credibility (ELC), Environmental Concern (EC), Perceived Product Value (PPV), Attitude Toward Eco-Labeled Products (ATELP), and Purchase Intention (PI) were adapted from Prakash et al. (2024), Nguyen-Viet (2022), Galati et al. (2022), Nuttavuthisit and Thøgersen (2017), and Shah et al. (2023) (see Appendix I). Moreover, data were collected along with the sample attributes such as gender, age, education level, income level, occupation, and purchase frequency through a non-probability sampling technique. The authors used convenience sampling because they collected the data from food and beverage customers who were available at that time, and it was easy for them to access them. According to researchers (Comrey & Lee, 2013; MacCallum et al., 1999; Mundfrom et al., 2005), a sample of 50 is considered to be poor, while a sample of 300 and 500 is considered good and excellent, respectively, in factor analysis. Hence, 400 respondents were targeted initially, but after the removal of missing responses, the data were reduced to 384 respondents. The instrument also fulfils the criteria of containing no fewer than 25 items (Hair, 2011). Table 1below summarises the definitions and sources of the constructs used in this study to develop the conceptual framework.

Table 1
Root constructs, definition, and sources.

Construct	Definition	Sources
Eco-Label Awareness (ELA)	The extent to which consumers are familiar with and understand eco-labels.	Darnall et al. (2018); Thøgersen et al. (2012)
Eco-Label Credibility (ELC)	The perceived trustworthiness and authenticity of eco-label claims.	Testa et al. (2015); Galati et al. (2022)
Environmental Concern (EC)	The degree of personal concern consumers have about environmental issues.	Dunlap (2008); Nguyen et al. (2016)
Perceived Product Value (PPV)	The perceived balance of cost and benefits (quality, health, sustainability) of eco-labeled food items.	Liang and Lim (2021); Mahesha and Rekha (2024)
Attitude Toward Eco-Labeled Products (ATELP)	The overall positive or negative evaluation of eco-labeled food products.	Ajzen (1991); Galati et al. (2022)
Purchase Intention (PI)	The likelihood of a consumer intending to buy a food product with an eco-label.	Cai et al. (2017); Panopoulos et al. (2022)

3.3. Common method bias

To assess common method bias (CMB), the authors conducted a full collinearity test using SmartPLS version 4. The Variance Inflation Factors (VIFs) for all constructs were below 3.3, indicating that CMB is not a major concern (Kock, 2015; Kock & Lynn, 2012).

3.4. Demographics

The characteristics of the sample are represented in Table 2, in which the total number of respondents, with the exclusion of outliers, is 384.

3.5. Justification for using PLS-SEM

The PLS-SEM technique was used as the main data analysis tool for this research since it is appropriate for complex models, predictive types of objectives, and the non-normal nature of the data distribution. Contrary to the covariance-based SEM methods LISREL or AMOS, which are confirmatory in nature, structured on large sample sizes, and multivariate normality spoken about in accurate ways (Hair, 2014), PLS-SEM is a variance-based method that emphasizes maximizing explained variance in dependent constructs, making it ideal for exploratory and predictive research contexts (Sarstedt et al., 2021). For the assessment of interaction and moderation effects among latent variables, PLS-SEM was preferred because of its strength to cope with more complex models, and being ability to reliably estimate relationships even in the case of relatively small sample sizes (Hair et al., 2021). Moreover, PLS-SEM permits reflective and formative measures in the same model, which means that it offers more flexibility in modelling multidimensional concepts as eco-label credibility and purchase intention. Furthermore, the method allows one to test for indirect and moderating effects using bootstrapping, which improves result confidence and statistical validity (Henseler et al., 2016). So, PLS-SEM was selected from LISREL and AMOS to fit with the research's predictive nature, with proprietary data sample and model complexity dissolved.

Table 2
Profile of respondents.

Characteristics		Frequency	Percent
Gender	Male	269	70.05 %
	Female	115	29.95 %
Age	Below 20 Years	27	7.03 %
	21–30	108	28.12 %
	31–40	154	40.10 %
	41–50	79	20.57 %
	Above 50	21	5.47 %
Education level	Secondary	39	10.16 %
	Higher Secondary	57	14.84 %
	Graduate	196	51.04 %
	Post-graduate	92	23.96 %
Income level	Below 15, 000 Taka	38	9.90 %
	15,001 to 30,000 Taka	109	28.39 %
	30,001 to 50,000 Taka	211	54.95 %
	Above 50,000 Taka	26	6.77 %
Occupation	Student	122	31.77 %
	Business	82	21.35 %
	Govt. Employee	79	20.57 %
	Private Job	101	26.30 %
Purchase frequency	Daily	234	60.94 %
	2–3 times a week	108	28.12 %
	Once a week	42	10.94 %

Source: Customized SPSS output

4. Data analysis and results

4.1. Control of potential confounding variables

Potential confounding variables that could affect consumer purchase intentions were identified, and the individual model estimates were statistically controlled to maintain the validity of the model estimates. Following previous studies on consumer behavior and sustainability, demographic indicators (gender, age, education level, income level, and occupation) and purchase frequency were considered as control variables. To separate the effect of these variables from the main predictors (eco-label awareness, credibility, environmental concern, and perceived value), we specified these variables as exogenous constructs with direct paths towards the dependent variable-purchase intention. The variance inflation factor (VIF) for all constructs fell below the cut-off of 3, confirming no multicollinearity concern. Incorporating these controls did not quantitatively change the significance or magnitude of the direct path coefficients, thereby increasing confidence in our findings and ensuring that we were capturing true effects of eco-label related constructs as opposed to demographic or experiential confounds.

4.2. Measurement model analysis

The researchers conducted a thorough analysis of the measurement model, as shown in Table 3, in order to assess the construct validity and reliability. According to Hair et al. (2021), the results showed strong evidence of internal consistency and reliability, with Cronbach's alpha coefficients above the suggested cutoff of 0.80. This demonstrates the consistency and dependability of the constructions. By strictly following the recommendations made by Hair et al. (2021), Shmueli et al. (2019), and Sarstedt et al. (2021), the study demonstrated methodological rigour. Composite reliability (CR), in addition to Cronbach's alpha, was used to evaluate the measuring scales' internal consistency. These results highlight the robustness and dependability of the constructs and are consistent with the suggestions made by Hair et al. (2021) and Shmueli et al. (2019).

The significance of Average Variance Extracted (AVE) in assessing convergent validity was also underlined in the study. AVE measures the variance explained by a construct in relation to the variance assigned to measurement error, as explained by Saunders et al. (2019) and corroborated by Sarstedt et al. (2014). A minimum AVE of 0.50 is essential to provide strong convergent validity, as suggested by Hair et al. (2021), Shmueli et al. (2019), and Rahman et al. (2023). An AVE below 0.50 would suggest that measurement errors outweigh the variance explained by the construct, underscoring the need to meet this threshold for validity. In this study, all constructs exceeded the minimum AVE requirement of 0.50. This compliance demonstrates the rigorous validation process undertaken, ensuring the constructs' reliability and validity. By adhering to the methodological recommendations of Hair et al. (2021), Shmueli et al. (2019), Sarstedt et al. (2021), and Rahman et al. (2023), the research showcases a robust framework for evaluating construct validity and reliability.

A crucial component of PLS-SEM path analysis is discriminant validity, which guarantees the statistical separation of latent variables that represent distinct theoretical notions, as stressed by Shmueli et al. (2019). By meeting the exacting requirements of the Heterotrait-Monotrait Ratio (HTMT), the results shown in Table 4 validate the attainment of discriminant validity. The HTMT measure is a valid method for determining how similar two latent variables are, according to Shmueli et al. (2019) and Hair et al. (2021). For discriminant validity to be established, HTMT values must fall below the threshold of 1. The findings in this study not only align with this requirement but also demonstrate compliance with the methodological standards, providing robust evidence of discriminant validity.

4.3. Goodness of fit

The Coefficient of Determination (R^2), the Standardised Root Mean Squared Residual (SRMR), and the Normed Fit Index (NFI) were used to assess the model's fit and efficacy. R^2 values of 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak (Hair et al., 2019). The present study's R^2 value of 0.798 demonstrates a highly significant relationship between variables, as shown in Table 5. Hair et al. (2021) and Shmueli et al. (2019) suggest that a model is well-fitted if the NFI value approaches 1 and the SRMR is below 0.08. The study's findings include an NFI value of 0.887, which is close to the ideal of 1, and an SRMR value of 0.060, comfortably below the 0.08 threshold. These metrics, as outlined in Table 5, indicate that the model demonstrates an acceptable and reliable fit.

4.4. Hypotheses testing

The assessment of the measurement model allowed moving to test the hypothesized linkages between constructs and variables from the proposed conceptual framework. As per the model, the structural model illustrated the relationships between measured constructs and variables

Table 3
Convergent validity.

Constructs	Items	Loadings	α	CR	AVE
Eco-Label Awareness	ELA1	0.761	0.758	0.730	0.632
	ELA2	0.842			
	ELA 3	0.870			
	ELA 4	0.803			
Eco-Label Credibility	ELC1	0.785	0.731	0.753	0.558
	ELC2	0.798			
	ELC3	0.720			
	ELC4	0.864			
Environmental Concern	EC1	0.904	0.725	0.797	0.580
	EC2	0.830			
	EC3	0.814			
	EC4	0.739			
	EC5	0.804			
Perceived Product Value	PPV1	0.816	0.812	0.868	0.626
	PPV2	0.795			
	PPV3	0.895			
	PPV4	0.831			
Attitude Toward Eco-Labeled Products	ATELP1	0.750	0.750	0.857	0.579
	ATELP2	0.884			
	ATELP3	0.830			
	ATELP4	0.917			
Purchase Intention	PI1	0.970	0.849	0.767	0.521
	PI2	0.775			
	PI3	0.851			
	PI4	0.845			
	PI5	0.917			

Abbreviations: α = Cronbach's alpha, CR=Composite Reliability, AVE = Average Variance Extracted.
Source: Customized output of Smart-PLS

Table 4
Discriminant validity (HTMT ratio).

	ATELP	EC	ELA	ELC	PI	PPV
ATELP						
EC	0.621					
ELA	0.550	0.673				
ELC	0.705	0.562	0.579			
PI	0.598	0.574	0.486	0.523		
PPV	0.656	0.581	0.556	0.617	0.540	

Abbreviations: ELA = Eco-Label Awareness, ELC = Eco-Label Credibility, EC = Environmental Concern, PPV=Perceived Product Value, ATELP=Attitude Toward Eco-Labeled Products and PI=Purchase Intention.
Source: Smart-PLS output

Table 5
Model fitness.

Name of Criteria	Value
R^2	0.798
SRMR	0.060
NFI	0.887

Source: Smart-PLS output

(Hair et al., 2012). The results of the hypotheses testing are summarized in Table 6, indicating that all the proposed hypotheses are supported, confirming the strength and significance of the relationships among the study constructs. To further contextualize these findings, the following section provides an in-depth interpretation of the results and their practical implications for sustainability-oriented marketing strategies.

4.5. In-depth analysis and practical interpretation of results

The findings provide significant practical insights regarding the eco-label-related impacts on consumer purchase intentions in the food and beverage industry. Environmental concern was found to be the most influential predictor of purchase intention ($\beta = 0.594$, $p = 0.000$), indicating that consumers' intrinsic environmental values serve as important antecedents to eco-friendly product purchasing decisions. This means that marketing measures should focus on emotional and normative appeals in harmony with the consumers' ecological values, strengthening the ethical dimension of green consumption. Eco-label awareness ($\beta = 0.384$, $p = 0.001$) likewise had a significant positive influence, which means that enlightening consumers about the meaning of eco-labels would be an effective way to fill the knowledge gap regarding sustainable purchases. As such, educating the consumers and being open about the meaning of eco-labels as well as certification processes, and environmental contributions is essential to foster consumer involvement.

Furthermore, eco-label credibility ($\beta = 0.333$, $p = 0.003$) was found to have a strong and significant effect, verifying that trust and perceived authenticity are crucial for translating attitudes into intentions. Thus, companies must make sure eco-labels rest on independent verifications and continued environmental spreadsheet performance since claims are coming under more scrutiny from a consumer point of view for potential "greenwashing". Perceived product value ($\beta = 0.143$, $p = 0.033$), on the other hand, although significant too, has a lower impact, suggesting that functional or pragmatic forces are subordinated to green purchasing behavior. This aligns with prior studies, which indicate that emotional-ethical value dimensions tend to dominate cost-benefit considerations in sustainable consumer behavior (Ates, 2021; Quoc et al., 2025).

Table 6
Structural model.

No.	Path	*Mean*	*STDEV*	*T statistics*	*p*-values	Decision
H1	ELA - > PI	0.384	0.059	6.541	0.001	Supported
H2	ELC - > PI	0.333	0.118	3.016	0.003	Supported
H3	EC - > PI	0.594	0.082	7.117	0.000	Supported
H4	PPV - > PI	0.143	0.116	2.136	0.033	Supported
H5	ELA x ATELP - > PI	0.102	0.043	2.416	0.001	Supported
H6	ELC x ATELP - > PI	0.232	0.040	5.756	0.001	Supported
H7	EC x ATELP - > PI	0.608	0.044	14.273	0.000	Supported
H8	PPV x ATELP - > PI	0.198	0.051	3.728	0.001	Supported

Abbreviations: ELA = Eco-Label Awareness, ELC = Eco-Label Credibility, EC = Environmental Concern, PPV=Perceived Product Value, ATELP=Attitude Toward Eco-Labeled Products and PI=Purchase Intention.
Source: Smart-PLS output

Practically, this finding suggests that firms should focus on promoting the ethical and environmental merits rather than merely relying on price or quality to promote the adoption of eco-labeled products. Collectively, the findings underscore the need to incorporate consumer education, credibility development, and value matching into green purchasing strategies aimed at generating authentic green purchase intentions for food and beverage products.

5. Discussion

5.1. Theoretical implications and validation of behavioral models

The results of the study confirm several theories underlying the study of sustainable consumer behavior, especially the Theory of Planned Behavior (TPB). Eco-label awareness, eco-label credibility, and environmental concern found significant direct effects on purchase intention, supporting the TPB hypothesis that attitude and perceived control are important determinants of behavioral intention (Ajzen, 1991). The highly significant positive effect of environmental concern also correlates with the findings of Ates (2021), who indicates that the more environmentally conscious consumers are, the more they indicate intention to conduct green consumption behaviors, especially when an eco-label is used.

Conceptually, the findings validate the statement that eco-label awareness and credibility act as an important precondition of eco-friendly buying behaviour. These constructs assist in solving the controversy that lends credibility to information asymmetry in sustainability marketing. According to Horne (2009) and Pathak et al. (2024), a consumer might be reluctant to follow green intentions because they do not know enough or simply do not believe environmental claims. These studies provide empirical evidence that the trust in eco-labels, a condition that is augmented with consumer knowledge (Eco-label awareness and eco-label credibility), has a significant implication on purchase behavior, confirming the principles of signaling theory. In addition, the significant moderation effect of ELC × ATELP indicates that credibility is not only an independent driver of attitude, but it also increases the linkage between consumer attitude and intentions, indicating the strength of perceived legitimacy on the sustainability claims.

5.2. Effects of eco-label awareness, credibility, and environmental concern

Theoretically, the interaction terms analyzed in this study have a significant contribution to the literature since they demonstrate how the interaction between the three variables, namely, environmental concern, product value, and eco-attitudes, influences consumer behavior. The path EC × ATELP → PI testifies to a strong synergistic functioning, which upholds the model of Value-Attitude-Behavior (VAB) (Homer & Kahle, 1988). This implies that, besides, values and attitudes work independently; when synchronized, they form a powerhouse towards prompting consumer action. These findings give context to the previous research, which has commonly focused on predictors of green behavior independent of one another and, therefore, expand the theoretical foundation by recommending modeling with interactions in mind.

Interestingly, the study found a rather weak effect of the perceived product value on purchase intention. This finding is in line with the recent discussions, which point out that the functional or economic value is not adequate to serve as a pro-environmental behavior in the case of food and beverage commodities, despite being still statistically significant. In their study on green packaging and branding, Quoc et al. (2025) also state a similar finding in regards to the necessity of emotional and ethical resonance to make a significant impact on behavior. These observations argue against the models of classical economic utility and advocate a paradigm change towards morally oriented consumerism or consumers who become more inclined to

ethical conformance rather than plain cost-to-benefit ratio.

5.3. Methodological and analytical contributions

The corroborated interaction patterns, including ELA x ATELP and PPV x ATELP, further authenticate that attitude formation is very critical in moderating the effects of antecedents. This gives credence to moderated mediation models in PLS-SEM, which is a largely understudied area in eco-label studies. The large values of T-statistics and low p-values of all interaction effects are good empirical reasons to include complex interaction terms in future models of sustainability studies. The findings provide methodological contributions to the research that show how PLS-SEM can be used to effectively capture the multidimensionality of sustainable consumption behavior.

5.4. Practical implications for the food and beverage industry

A key strength of this study lies in its interdisciplinary, integrative approach to analysis. The authors combine PLS-SEM with three different theoretical perspectives-the TPB, S-O-R, and VAB models. This multidimensional approach offers a more comprehensive understanding of the psychological and cognitive processes that give rise to consumer purchase intention towards eco-labeled products. While TPB explains the role of attitudes and perceived behavioral control, the S-O-R model helps to locate eco-labeling awareness and credibility as substantive forces exerting influences on internal cognition and affect, ultimately leading to behavior. Including the VAB framework emphasizes how individual values interact with attitudes to produce environmentally conscious acts. Furthermore, with the inclusion of attitudes towards eco-labeled products (ATELP) as a moderator, the model contributes to theoretical dialogue by demonstrating how consumer attitudes are predictors directly as well as have an enhancing or mitigating effect on other relationships proposed in the model. This synthesis enhances the internal validity of the study's analytical framework and adds to a theoretical understanding of sustainable consumer behavior.

The context of the study, which is the food and beverage industry, presents industry-specific information that will be quite beneficial given the goal of sustainability. Earlier literature observed that consumers in this industry are particularly susceptible to the risks of ethical labeling and greenwashing (Sun & Shi, 2022). The strong level of explanatory power in this model shows the fact that eco-labels may prove to be a critical factor when supported by transparency, credibility, and consumer awareness. Such findings are not only relevant to scholarly discussions but also establish asymmetrical conclusions that are practical to regulators and marketers willing to enhance eco-label quality, establish education campaigns, and develop more genuine green value propositions.

5.5. Cultural factors and directions for future cross-cultural research

Cultural context has strong effects on consumers' perceptions and trust toward eco-labels, which subsequently leads to more or less translation of environmental information into buying intentions. Building on Hofstede's (2001) cultural dimensions, collectivist and long-term-oriented societies, like several East Asian countries, are more likely to report a kind of sustainable marketing behaviour given by communal responsibility and intergenerational ethic drivers (Chwialkowska et al., 2020; Tam, 2024), whereas individualistic cultures interpret most eco-labels through the prism of self-benefit or product differentiation (Laroche et al., 2001). Empirical evidence also corroborates this premise; consumers living in emerging economies trust eco-labels more if backed by local or governmental entities, as opposed to Western consumers who place a high value on independent certifications (Biswas & Roy, 2015), and Bhatti and Alawad (2023) found that eco-labels focusing on social harmony and stewardship are better received in collectivist cultures. These results suggest that there is a pressing need for cross-cultural studies using multi-group PLS-SEM or multi-level modeling to examine the moderating influence of cultural value on interrelationships in TPB, S-O-R, and VAB frameworks. Accordingly, researchers in the future need to merge variables like cultural orientation, environmental worldview, and social norms into research on eco-labels to increase the generalizability of eco-label research and assist marketers in developing culturally consistent sustainability communication that drives green consumption.

6. Theoretical implications

The current research has valuable theoretical implications in that the Theory of Planned Behavior (TPB) is collated with the Stimulus-Organism-Response (S-O-R) model and Value-Attitude-Behavior (VAB) framework to describe how consumers make purchase decisions driven by eco-labels within the food and beverage industry. The role of environmental concern, eco-label awareness, and credibility is strong in influencing the purchase intention, thus validating the core principles of TPB, i.e., the attitude, subjective norms, and perceived behavioral control as the key predictors of pro-environmental intentions (Ajzen, 1991). Strong interaction effect of the environmental concern and attitude toward eco-labeled products strengthens TPB by focusing on the synergetic relationship between value-attitude alignment, which is in line with Homer and Kahle's (1988) Value-Attitude-Behavior model. Simultaneously, the S-O-R model would be confirmed because eco-label cues (stimuli), including awareness, credibility, and perceived value, trigger internal cognitive-affective responses (organism) attitude, and which subsequently influence behavioral intentions (response), echoing the mechanisms suggested by Mehrabian and Russell (1974). The important interaction paths, i.e., ELC x ATELP and PPV x ATELP, highlight the mediating role of internal states through which the external sustainability signal produces an effect, supporting the emotional and motivational roles of eco-labels. The results promote hybrid theoretical models mixing cognitive (TPB) and affective (S-O-R) approaches to further theoretical development in gaining a fuller picture of green consumer behaviour, which has been advocated in more sustainable literature in the last decade (Prakash et al., 2024). Moreover, methodologically, the research adds to PLS-SEM studies by showing the usefulness of the moderated mediation modeling to reflect the complexity of sustainability decision-making mechanisms.

7. Practical implications

The results of the current study have significant practical considerations to offer to marketers, policy-makers, and sustainability activists working in the food and beverage sector. Originally, the high effect of the eco-label awareness and credibility on purchase intention indicates that clear, visible, and credible eco-labels play a crucial role in influencing purchase decisions so that consumers will make sustainable choices. To fill this gap in knowledge and distrust more typical of green marketing, organizations ought to invest in educational campaigns to improve the level of public knowledge about the meaning of eco-labels and their credibility thresholds. This strong moderation role, which includes the influence of the eco-label credibility to enhance the association between the consumer attitude and intention, opens up the necessity of regulatory organizations to adopt stricter certification and monitoring measures to eliminate greenwashing. Also, the findings place particular significance on incorporating environmental messages with emotional and attitudinal appeals in product message mix since consumer attitudes mediate and multiply the impact of informational cues such as eco-labels. When eco-labels are positioned to be played into a broader environmental context by a brand instead of simply being a compliance tick, then consumers' ethical considerations can be triggered and result in more positive purchase behaviour. Finally, companies must realize that perceived product value is not enough to encourage green behavior; they must ensure that the value propositions

are emotional and ethical to the sustainability expectations of the consumers. Such insights can be used to develop more successful green branding, packaging design, and labeling to build long-term eco-conscious consumer loyalty.

8. Limitations and future research directions

Though it provides useful theoretical and practical implications, this study has some limitations to be noted. The utilization of the cross-sectional research design hinders our ability to establish causality among eco-label related constructs and consumer purchase intentions since the obtained relationships reflect association at one point in time, instead of through any dynamic behavioral process. The purposive sampling strategy, which targets food and beverage consumers only, has the potential to introduce sample selection bias and limit generalization not only across sectors (e.g., fashion, electronics, products for household use), where eco-label effectiveness may depend on differences in product involvement or ethical salience, but also across countries. Furthermore, although the study successfully incorporates the TPB, the S-O-R model, and the VAB framework into its theoretical framework, it focuses on bodily-related approaches above emotional or identity-related constructs (i.e., psychological dimensions such as moral norms, eco-guilt, or environmental self-identity), regarded as a highly relevant extension that would also contribute to an enhanced comprehension of sustainable consumption. Although the study was able to take advantage of PLS-SEM's capability for modelling complex relationships into model analysis, it nevertheless did not employ hybrid methodologies, which may significantly increase predictive accuracy or detect nonlinear effects. Additionally, this study's sample was drawn from organizations operating within a single developing country context. Consequently, the findings may not be fully generalizable to firms in developed markets, where institutional, economic, and cultural conditions differ. For future research, longitudinal or experimental research designs are suggested to be applied with larger and more cross-sectional sampling, emotional and identity-based variable notation. Studies could also explore other industries to evaluate the effectiveness of ecolabels across different product categories, and hybrid modeling further, like a combination of PLS-SEM and machine learning for analyzing the model in both internationalization and domestic perspectives. Additionally, comparative or cross-cultural studies are encouraged to examine how cultural values or different environmental norms impact consumer perception about eco-labels in other regions.

9. Conclusion

This study examined the effect of eco-labels on consumers' intentions to purchase in relation to food and beverage, contextualized within the TPB, S-O-R, and VAB theoretical perspectives using PLS-SEM. The results give strong empirical evidence to support the positive and direct influences of eco-label awareness, eco-label credibility, environmental concern, and perceived product value on customers' green purchase intentions. Among these, environmental concern exerted the highest loading ($\beta = 0.594$), suggesting that people with higher environmental values are more likely to perform green purchasing behaviors. This result aligns with previous studies, indicating that moral and ethical consciousness is the most significant determinant of sustainable consumption (Ates, 2021; Nguyen et al., 2016). The awareness of eco-label ($\beta = 0.384$) was another significant enabler in the model, implying that consumers who are knowledgeable about labeling information and certificates have more capability to purchase environmentally friendly products. This underscores the importance of transparent communication and public education by both policymakers and firms to improve understanding of labels.

Likewise, eco-label credibility ($\beta = 0.333$) also had a significant effect on purchase intention, indicating that consumer trust in the genuine and lawful nature of these labels is a crucial predictor of green purchasing behavior. Practical examples from EU Ecolabel and USDA Organic certification, for instance, demonstrate that trust in environmental claims increases with the application of credible third-party verification, leading to a higher propensity to buy, particularly in cases where independent standards underpin such environmental claims (European Commission, 2023). An interesting finding is that perceived product value ($\beta = 0.143$) has a relatively weak but significant influence on purchase intentions-so while there is some evidence here to back up consumer obsession with functional and economic factors, decisions are increasingly being fuelled by emotional, ethical, or environmental motivations in the marketplace. This phenomenon can be seen in brands like Patagonia and Ben & Jerry's, which successfully combined ethical narratives into products. While all hypotheses were supported, the relatively weaker effect of perceived product value ($\beta = 0.143$) suggests functional attributes may be secondary to ethical or emotional drivers in this context.

From a theoretical standpoint, the present study extends the TPB as it incorporates moderated interactions and reveals how attitudes and values converge for the construction of behavioral intentions. It also supports the S-O-R mechanism, with eco-label awareness and credibility being placed as triggers that drive cognitive and affective reactions consistent with pro-environmental purchasing. And the VAB framework demonstrates how deeply held environmental values translate into attitudes that drive behavior. Practically, the findings highlight that transparent, credible, and effectively communicated eco-labels may play a substantial role in supporting sustainable choices. Hence, for the eco-label to have an impact on purchase intent, businesses and regulators need to work towards increasing transparency of the eco-label, ensuring third-party verification, and stimulating consumer education to reinforce the link between awareness, trust, and purchasing behaviour. Further research may build upon these findings by comparing across sectors, cultures, and longitudinally to see if the influence of ecolabels is time-dependent and market-specific.

CRediT authorship contribution statement

Md. Sohel Rana: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Shadia Sharmin:** Writing – original draft, Software, Investigation. **Mohammad Bin Amin:** Writing – review & editing, Resources, Project administration. **Nur-A-Alam Mishad:** Resources, Investigation, Conceptualization. **Judit Oláh:** Writing – review & editing, Validation, Supervision, Funding acquisition.

Consent to participate

We have informed and collected both oral and written "consent letter" from each of the study respondents. Moreover, we have collected approval from each organization where the respondents worked during the period of data collection.

Ethical statement

In this research, ethical standards were maintained following Helsinki declarations. To attain the ethical approval, before starting the data collection, the researchers of this study applied attaching the questionnaire, sampling details, and all other ethical requirements to the "Research Committee of the University of Scholars". which is an academic authority for the ethical clearance. After assessing all ethical concerns and guidelines, the committee approved and provided the certificate (ref no: IUS/Regi. Office/Letter/2024/241) for further survey process.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

Acknowledgment

This research was supported by the University of Debrecen Program for Scientific Publication.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssaho.2025.102422.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-t

Araya, S., Elberg, A., Noton, C., & Schwartz, D. (2022). Identifying food labeling effects on consumer behavior. *Marketing Science, 41*(5), 982–1003.

Ates, H. (2021). Understanding students' and science educators' eco-labeled food purchase behaviors: Extension of theory of planned behavior with self-identity, personal norm, willingness to pay, and eco-label knowledge. *Ecology of Food and Nutrition, 60*(4), 454–472.

Bakri, A. A., Masbullah, M., Ekowati, D., Ridhwan, M., & Winarno, B. (2023). The influence of environmental knowledge and lifestyle on purchase intention of eco-labeled beverage products. *Community Development Journal: Jurnal Pengabdian Masyarakat, 4*(4), 7914–7920.

Bhatti, M. A., & Alawad, W. A. (2023). Cultural roots of sustainable choices: Navigating environmental attitudes and eco-label influence in marketing strategies. *Cultura: International Journal of Philosophy of Culture and Axiology, 20*(3).

Biswas, A., & Roy, M. (2015). Green products: An exploratory study on the consumer behaviour in emerging economies of the East. *Journal of Cleaner Production, 87*, 463–468.

Bu, C., Zhang, K., Shi, D., & Wang, S. (2022). Does environmental information disclosure improve energy efficiency? *Energy Policy, 164*, Article 112919.

Cai, Z., Xie, Y., & Aguilar, F. X. (2017). Eco-label credibility and retailer effects on green product purchasing intentions. *Forest Policy and Economics, 80*, 200–208.

Calderon-Monge, E., Redondo-Rodriguez, R. G., & Ramírez-Hurtado, J. M. (2021). Narrowing the gap between consumer purchasing intention and behaviour through ecolabelling: A challenge for eco-entrepreneurism. *British Food Journal, 123*(10), 3293–3308.

Caliskan, A., Celebi, D., & Pirnar, I. (2021). Determinants of organic wine consumption behavior from the perspective of the theory of planned behavior. *International Journal of Wine Business Research, 33*(3), 360–376.

Che Musa, N., & Kadir, B. (2025). A conceptual analysis of the antecedents of willingness to pay a premium for packaged food products with sustainable labels among working adults in Malaysia. *International Journal of Academic Research in Business and Social Sciences, 15*(2). https://doi.org/10.6007/ijarbss/v15-i2/24682

Chen, Y. S., & Chang, C. H. (2012). Enhance green purchase intentions: The roles of green perceived value, green perceived risk, and green trust. *Management Decision, 50*(3), 502–520.

Choi, T. M., & Cheng, T. E. (2015). *Sustainable fashion supply chain management*. Switzerland: Springer.

Chwialkowska, A., Bhatti, W. A., & Glowik, M. (2020). The influence of cultural values on pro-environmental behavior. *Journal of Cleaner Production, 268*, Article 122305.

Comrey, A. L., & Lee, H. B. (2013). *A first course in factor analysis*. Psychology press.

Darnall, N., Ji, H., & Vázquez-Brust, D. A. (2018). Third-party certification, sponsorship, and consumers' ecolabel use. *Journal of Business Ethics, 150*, 953–969. https://doi.org/10.1007/s10551-016-3138-2

Donato, C. (2025). Eco-label as a sustainable communication tool. In *Eco-label visual design and sustainability: The impact on consumer perceptions and market trends* (pp. 5–38). Cham: Springer Nature Switzerland.

Dunlap, R. E. (2008). The new environmental paradigm scale: From marginality to worldwide use. *The Journal of Environmental Education, 40*(1), 3–18.

European Commission. (2023). Setting EU-wide standards of environmental excellence. https://environment.ec.europa.eu/topics/circular-economy/eu-ecolabel/about-eu-ecolabel_en.

Galati, A., Miret-Pastor, L., Siggia, D., Crescimanno, M., & Fiore, M. (2022). Determinants affecting consumers' attention to fish eco-labels in purchase decisions: A cross-country study. *British Food Journal, 124*(10), 2993–3013. https://doi.org/10.1108/bfj-05-2021-0498

Garcia-Torres, S., Rey-Garcia, M., Sáenz, J., & Seuring, S. (2022). Traceability and transparency for sustainable fashion-apparel supply chains. *Journal of Fashion Marketing and Management: International Journal, 26*(2), 344–364.

Ghouse, S. M., Shekhar, R., Ali Sulaiman, M. A. B., & Azam, A. (2025). Green purchase behaviour of Arab millennials towards eco-friendly products: The moderating role of eco-labelling. *The Bottom Line, 38*(3), 286–308.

González, D. H. (2020). Influence of variables to reduce the intention and behaviour purchase gaps in eco-label food products. *Multidisciplinary Business Review, 13*(1), 71–81.

Grunert, K. G., 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

Hair, J. F. (2011). Multivariate data analysis: An overview. *International Encyclopedia Of Statistical Science*, 904–907.

Hair, J. F. (2014). *A primer on partial least squares structural equation modeling (PLS-SEM)*. sage.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *An Introduction to Structural Equation Modeling. Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R, 1–29*. https://doi.org/10.1007/978-3-030-80519-7_1

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2–24.

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The use of partial least squares structural equation modeling in strategic management research: A review of past practices and recommendations for future applications. *Long Range Planning, 45*(5–6), 320–340.

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems, 116*(1), 2–20.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. Sage publications.

Homer, P. M., & Kahle, L. R. (1988). A structural equation test of the value-attitude-behavior hierarchy. *Journal of Personality and Social Psychology, 54*(4), 638.

Horne, R. E. (2009). Limits to labels: The role of eco-labels in the assessment of product sustainability and routes to sustainable consumption. *International Journal of Consumer Studies, 33*(2), 175–182.

Hossain, I., Fekete-Farkas, M., & Nekmahmud, M. (2022). Purchase behavior of energy-efficient appliances contribute to sustainable energy consumption in developing country: Moral norms extension of the theory of planned behavior. *Energies, 15*(13), 4600.

Huang, M. H., & Rust, R. T. (2014). Should your business be less productive? *MIT Sloan Management Review, 55*(3), 68–77.

Ihle, M., & Ihle, T. (2023). *From labels to actions: Unraveling the nexus of eco-labels in driving environmentally purchasing behavior (Master's thesis, Handelshøyskolen BI)*.

Imperiale, F., Pizzi, S., & Lippolis, S. (2023). Sustainability reporting and ESG performance in the utilities sector. *Utilities Policy, 80*, Article 101468.

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration, 11*(4), 1–10.

Kock, N., & Lynn, G. S. (2012). Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations. *Journal of the Association for Information Systems, 13*(7), 2.

Laroche, M., Bergeron, J., & Barbaro-Forleo, G. (2001). Targeting consumers who are willing to pay more for environmentally friendly products. *Journal of Consumer Marketing, 18*(6), 503–520.

Liang, A. R. D., & Lim, W. M. (2021). Why do consumers buy organic food? Results from an S–O–R model. *Asia Pacific Journal of Marketing and Logistics, 33*(2), 394–415.

Liang, T. C., Situmorang, R. O. P., Liao, M. C., & Chang, S. C. (2020). The relationship of perceived consumer effectiveness, subjective knowledge, and purchase intention on carbon label products—A case study of carbon-labeled packaged tea products in Taiwan. *Sustainability, 12*(19), 7892. https://doi.org/10.3390/su12197892

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods, 4*(1), 84.

Mahesha, V., & Rekha, K. M. (2024). Green influence: Exploring the impact of eco-labels on consumer decision-making. *Journal of Management and Entrepreneurship Research, 18*(2), 1.

Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. the MIT Press.

Mundfrom, D. J., Shaw, D. G., & Ke, T. L. (2005). Minimum sample size recommendations for conducting factor analyses. *International Journal of Testing, 5*(2), 159–168.

Nguyen, T. N., Lobo, A., & Greenland, S. (2016). Pro-environmental purchase behaviour: The role of consumers' biospheric values. *Journal of Retailing and Consumer Services, 33*, 98–108.

Nguyen-Viet, B. (2022). Understanding the influence of eco-label, and green advertising on green purchase intention: The mediating role of green brand equity. *Journal of Food Products Marketing, 28*(2), 87–103. https://doi.org/10.1080/10454446.2022.2043212

Nuttavuthisit, K., & Thøgersen, J. (2017). The importance of consumer trust for the emergence of a market for green products: The case of organic food. *Journal of Business Ethics, 140*, 323–337.

Panopoulos, A., Poulis, A., Theodoridis, P., & Kalampakas, A. (2022). Influencing green purchase intention through eco labels and user-generated content. *Sustainability, 15*(1), 764.

Pathak, K., Prakash, G., Jain, M., Agarwal, R., & Attri, R. (2024). Do eco labels matter for green business strategy and sustainable consumption? A mixed method investigation on green products. *Business Strategy and the Environment, 33*(5), 4271–4291.

Paul, J., Modi, A., & Patel, J. (2016). Predicting green product consumption using theory of planned behavior and reasoned action. *Journal of Retailing and Consumer Services, 29*, 123–134.

Potter, C., Bastounis, A., Hartmann-Boyce, J., Stewart, C., Frie, K., Tudor, K., Bianchi, F., Cartwright, E., Cook, B., Rayner, M., & Jebb, S. A. (2021). The effects of environmental sustainability labels on selection, purchase, and consumption of food and drink products: A systematic review. *Environment and Behavior, 53*(8), 891–925. https://doi.org/10.1177/0013916521995473

Prakash, G., & Pathak, P. (2017). Intention to buy eco-friendly packaged products among young consumers of India: A study on developing nation. *Journal of Cleaner Production, 141*, 385–393. https://doi.org/10.1016/j.jclepro.2016.09.116

Prakash, G., Sharma, S., Kumar, A., & Luthra, S. (2024). Does the purchase intention of green consumers align with their zero-waste buying behaviour? An empirical study

on a proactive approach towards embracing waste-free consumption. *Heliyon, 10*(3), Article e25022.

Quoc, T. N., Phuc, N. N., & Duong, N. H. (2025). Examining green packaging, branding, and eco-labeling strategies: The case of young consumers' perceptions and responses in F&B industry. *Cleaner and Responsible Consumption, 16*, Article 100258. https://doi.org/10.1016/j.clrc.2025.100258

Rafiq, M., & Xinru, L. (2025). The mediating role of green advertising in linking personal values and ethical self-identity to green purchase intention. *Vision*, Article 09722629251326758.

Rahman, M. S., Hasan, M. J., Khan, M. S. H., & Jahan, I. (2023). Antecedents and effect of creative accounting practices on organizational outcomes: Evidence from Bangladesh. *Heliyon, 9*(2), Article e13759. https://doi.org/10.1016/j.heliyon.2023.e13759

Ray, S., & Nayak, L. (2023). Marketing sustainable fashion: Trends and future directions. *Sustainability, 15*(7), 6202.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 587–632). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-05542-8_15-2.

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair Jr, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy, 5*(1), 105–115. https://doi.org/10.1016/j.jfbs.2014.01.002

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students*. Pearson education.

Shah, R., Modi, A., Muduli, A., & Patel, J. D. (2023). Purchase intention for energy-efficient equipment appliances: Extending TPB with eco-labels, green trust, and environmental concern. *Energy Efficiency, 16*(4), 31.

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J. H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *European Journal of Marketing, 53*(11), 2322–2347. https://doi.org/10.1108/EJM-02-2019-0189

Sun, Y., & Shi, B. (2022). Impact of greenwashing perception on consumers' green purchasing intentions: A moderated mediation model. *Sustainability, 14*(19), Article 12119.

Tam, K. P. (2024). Culture and pro-environmental behavior. *Current Opinion in Psychology*, Article 101986.

Taufique, K. M. R., Vocino, A., & Polonsky, M. J. (2016). The influence of eco-label knowledge and trust on pro-environmental consumer behaviour in an emerging market. *Journal of Strategic Marketing, 25*(7), 511–529. https://doi.org/10.1080/0965254x.2016.1240219

Testa, F., Iraldo, F., Vaccari, A., & Ferrari, E. (2015). Why eco-labels can be effective marketing tools: Evidence from a study on Italian consumers. *Business Strategy and the Environment, 24*(4), 252–265. https://doi.org/10.1002/bse.1821

Thøgersen, J., Haugaard, P., & Olesen, A. (2010). Consumer responses to ecolabels. *European Journal of Marketing, 44*(11/12), 1787–1810. https://doi.org/10.1108/03090561011079882

Thøgersen, J., Jørgensen, A. K., & Sandager, S. (2012). Consumer decision making regarding a "green" everyday product. *Psychology and Marketing, 29*(4), 187–197.

Walsh, G., Shiu, E., Hassan, L. M., Michaelidou, N., & Beatty, S. E. (2011). Emotions, store-environmental cues, store-choice criteria, and marketing outcomes. *Journal of Business Research, 64*(7), 737–744.

Yahya, W. K., Braun-Scheeff, A. S., & Hashim, N. H. (2022). Young consumers purchase intention of eco-labelled products: Evidence from Malaysia. *International Journal of Academic Research in Business and Social Sciences, 12*(1), 1824–1840.

Zhan, Y., Ren, Y., & Xu, J. (2025). Willingness to pay a premium for eco-label products in China: A mediation model based on quality value. *Scientific Reports, 15*(1), 1783.

Zhang, B., Fu, Z., Huang, J., Wang, J., Xu, S., & Zhang, L. (2018). Consumers' perceptions, purchase intention, and willingness to pay a premium price for safe vegetables: A case study of beijing, China. *Journal of Cleaner Production, 197*, 1498–1507.