

Eco-Labels, Trust, and Consumer Choice: An Empirical Examination of Sustainable Purchasing Decisions

M. N. Karthika¹, Dr. R. Gayathri^{2*}

¹MBA – II Year, School of Management, SASTRA Deemed to be University, Thanjavur, Tamil Nadu, India
Email:126071059@sastra.ac.in

^{2*}Assistant Professor – III, School of Management, SASTRA Deemed to be University, Thanjavur Campus, Tamil Nadu, India, Corresponding author Email: gayathri@mba.sastra.edu

ABSTRACT

The present consumer behavior and corporate operating methods now prioritize environmental sustainability as their most important value. The combination of eco-labels and sustainability certifications serves as a vital resource for companies to show their environmental sustainability practices to customers who make purchasing decisions. The research study tests the hypothesis that eco-labels function as instruments that establish consumer trust and control shopping patterns within supermarket environments. The research study tests three factors, which include label transparency, consumer awareness, and brand credibility, to determine their effect on trustworthiness assessment and subsequent purchase behaviour. The researchers used structured questionnaires to collect data from 200 supermarket customers who lived in Thanjavur, Tamil Nadu, according to their study, which used Signalling Theory and Trust Theory as its research framework. The researchers used descriptive statistics, together with one-way ANOVA, correlation analysis, linear regression, K-means clustering, and hierarchical clustering to analyse the data. All demographic groups demonstrate high recognition of eco-labels, but this recognition fails to establish trustworthiness and brand credibility and customer loyalty. The researchers identified two distinct consumer groups: awareness-driven consumers who confidently use eco-labels and influence-driven consumers whose purchasing choices depend on social signals from others. The regression model showed that consumer satisfaction needs multiple elements which extend beyond credibility and buying patterns because these elements form separate dimensions that drive eco-label performance. The study adds to existing green marketing research by showing that effective certification systems that protect against greenwashing produce results that confirm their scientific validity.

Keywords: Eco-labelling, Sustainability Certifications, Green Marketing, Consumer Trust, Sustainable Consumption, Environmental Accountability, Purchase Behaviour.

INTRODUCTION

The international business environment of today experiences fundamental changes because businesses now treat environmental issues as vital components of their main operations. The world has reached an unprecedented level of ecological awareness as industrial activities increase greenhouse gas emissions, while deforestation and plastic pollution reach levels never seen before, which affects all aspects of society, including consumers, regulatory bodies, and corporations. Sustainable consumption has become the primary standard by which people select products and services, as it shifts their assessment criteria. Eco-labels and environmental certifications serve as educational resources that help individuals understand their environmental values through their

actual purchasing behaviours. An eco-label consists of a mark, logo, or certification symbol that manufacturers use to display their products' environmental attributes on products and packaging. The labels establish themselves as trustworthy market indicators because they protect against deceptive environmental marketing and unproven environmental claims, which create the information asymmetry that exists in markets, according to information economists. The worldwide expansion of eco-labels has reached outstanding levels. The eco-labelling system today includes hundreds of schemes which create sustainable product standards, starting with the German Blue Angel, which launched in 1978 as the first eco-label and continuing to present-day international systems like the Forest Stewardship Council (FSC), Energy Star,

Fair Trade and the EU Ecolabel and India's Bureau of Energy Efficiency (BEE) Star Rating system.

NEED FOR THE STUDY

This investigation is warranted on four principal grounds:

- The current research need arises because consumers now choose sustainable products. The current research gap exists because consumers fail to understand eco-labels, prompting the need to examine how awareness affects their buying behaviour.
- The current research need exists because companies use greenwashing together with false environmental statements, which require researchers to examine how these practices reduce public trust in sustainability labels.
- The study results will provide organisations with information to develop effective labelling systems and create regulations.
- The study results will help organisations design effective labelling systems and establish regulations that will enhance consumer education about sustainable consumption.

SCOPE OF THE STUDY

- The study investigates Indian retail market behaviour as consumers show increasing interest in eco-labels, but lack knowledge about their meaning, and researchers currently lack evidence to assist policymakers in developing effective rules.
- The research selected three product categories, which include food and beverage items, personal care cosmetics, and household products, because these products display eco-labels most frequently in Indian retail stores that customers approach in their daily routines.
- The research examines whether product certification labels influence consumer purchasing decisions by showing eco-labelled items next to comparable products that lack such certification.
- The research examines three elements, which include consumer recognition of eco-label programs, their trust in certification

organisations, and their understanding of certification procedures, which are presented to customers.

- The research does not examine how products are made or how supply chains operate or what consumers do after they buy products. The study shows a single decision point which occurs when consumers encounter a product and choose whether to purchase it.

REVIEW OF LITERATURE

A substantial body of scholarship has examined the relationship between eco-labels, consumer trust, and purchase behaviour, yielding insights that collectively underscore the complexity of green consumer decision-making.

Cai, Xie, and Aguilar (2017) demonstrated that eco-labels significantly influence consumer purchase decisions, establishing label credibility as a primary determinant of choice. Their work confirmed that consumers actively employ environmental signals to guide buying behaviour in markets with high information asymmetry.

Hameed and Waris (2018) found that green trust and environmental concern mediate the relationship between eco-label exposure and eco-conscious buying behaviour, suggesting that the persuasive effect of eco-labels is fundamentally contingent on prior trust formation.

Chi (2021) established that eco-labels positively affect consumers' intention to purchase green products, confirming that clearly communicated and consistently applied certification standards reduce purchase uncertainty and strengthen green purchase intention.

Nguyen-Viet (2022) corroborated these findings, reporting that eco-labels significantly shape purchase intentions through the dual mechanisms of perceived environmental benefit and heightened consumer awareness.

Testa et al. (2023) demonstrated that sustainability labels on food products shape consumer behaviour through constructs encompassing awareness, attitude, subjective norms, and perceived behavioural control, collectively influencing intentions to purchase sustainably labelled products.

A European Union-commissioned investigation (2024) revealed that ecolabel trust and environmental knowledge mediate the attitude-behaviour relationship in EU Ecolabel adoption contexts, establishing trust as the critical mechanism that converts pro-environmental attitudes into sustainable purchases.

Grunert, Hieke, and Wills (2024) synthesised the social science literature on eco-labelling, confirming that eco-labels serve as both consumer communication instruments and policy tools across global contexts, with their effectiveness contingent on label clarity and institutional credibility.

Sebastian and Joshy (2024) identified that heightened environmental sensitivity intensifies consumer awareness, strengthens green product attitudes, and ultimately amplifies purchase behaviour toward eco-friendly alternatives, with label visibility operating as a critical moderating condition.

Maftuchach, Limakrisna, and Pranowo (2025) established that eco-labels and green product awareness significantly shape green purchase intention, and that consumer trust amplifies the eco-label-perceived value relationship, generating a cascading positive effect on purchase intention.

STATEMENT OF THE PROBLEM

Eco-labels, together with sustainability certifications, provide certification across all product categories because they help consumers select products with a lower environmental impact. The environmental claims, which include both unproven assertions and their exaggerated variations, have created public doubt about the labels that now fail to serve their original purpose of displaying environmental data. The eco-labels that designers created to drive consumer purchases no longer serve their original purpose. The research shows that consumer trust develops through these labels, which drive sustainable purchasing behaviour; however, researchers need to study how this trust translates into buying behaviour. The existing literature shows inconsistent results depending on how well consumers know specific labels and how much they trust them. The research must establish whether eco-labels build consumer trust which leads to purchasing behaviour or

whether growing consumer distrust decreases their effectiveness.

Research Objectives

The present study pursues two specific objectives:

- To investigate the mechanisms through which eco-labels contribute to the development and maintenance of consumer trust in green product claims.
- To examine the extent to which eco-labels and sustainability certifications influence consumers' actual purchase decisions in supermarket settings.

Research Questions

RQ1. Does the presence of an eco-label on a product packaging lead to a meaningful increase in the level of trust that consumers place in the environmental claims made by that brand?

RQ2. To what degree do certification marks and eco-label displays shape consumers' final buying choices when selecting between green and non-certified product options?

THEORETICAL FRAMEWORK AND HYPOTHESES

The research utilises two main theoretical frameworks to investigate how eco-labels influence consumer purchasing decisions in markets where environmental data is distributed unevenly between sellers and buyers. The consumer who wishes to buy an environmentally friendly product faces a fundamental challenge: there is no easy way to confirm whether the product fulfils its environmental promises. Manufacturers possess complete knowledge of their production processes, the materials they utilise, and the total environmental impacts of their manufacturing operations. Consumers, on the other hand, have access to none of this information at the point of purchase. The system of information asymmetry arises because producers possess knowledge that remains hidden from consumers. The information gap between what producers know and what buyers can see creates an information asymmetry that makes eco-labels important for environmental protection.

The gap between the two parties can be closed through Spence's (1973) Signalling Theory, which explains how this process works. The framework allows sellers to use credible signals to convey hidden product qualities to buyers. The brand uses a certification mark to indicate that its product has been tested by an independent organisation, which confirmed that it meets environmental criteria, including reduced carbon emissions, sustainable sourcing of raw materials, and environmentally friendly production methods. The effectiveness of a signal depends on whether the receiver can comprehend its contents and develop trust in its value. A consumer loses the ability to trust an eco-label when they do not know what it means or when

they doubt the certification body's reliability, even though the claim has authentic value.

Trust Theory builds on this by explaining why belief in a signal matters so much. The source and content of an eco-label become trusted by consumers, leading them to accept it. Together, these two frameworks suggest that eco-labels influence purchasing behaviour not automatically, but through a process — one that begins with consumer awareness, passes through credibility assessment, and results in either trust or scepticism. This process forms the basis for the hypotheses developed in this study.

Figure 1 presents the conceptual model underpinning this study.

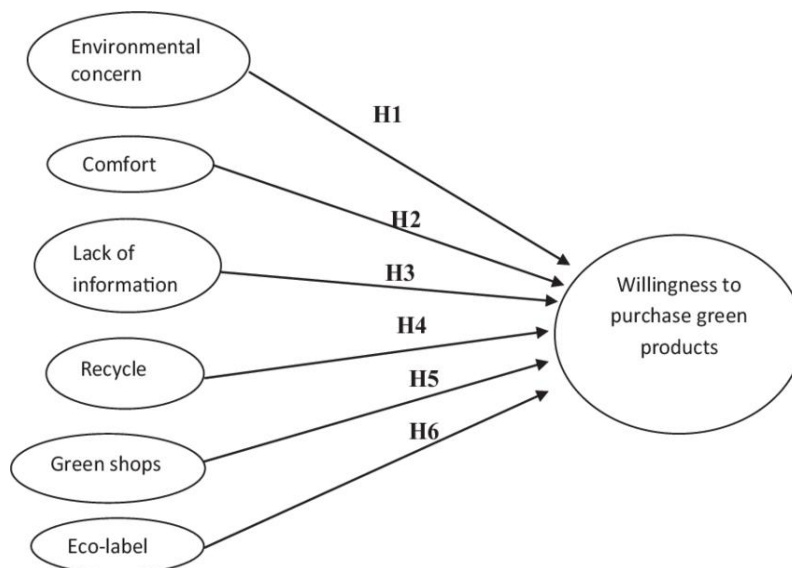


Figure 1. Conceptual model of eco-label understanding, trust, environmental concern, and eco-conscious buying behaviour.

HYPOTHESES

H1: Consumer understanding of eco-labels positively influences consumer trust in green product claims.

H2: Eco-conscious consumers base their purchasing decisions on their trust in green product claims.

H3: Consumer understanding of eco-labels directly affects eco-conscious buying behaviour because people do not need to trust the labels.

H4: Consumer understanding of eco-labels demonstrates a positive effect on environmental concern.

H5: Environmental concern creates a positive impact on eco-conscious consumer purchasing patterns.

H6: Consumer trust in green claims creates a positive effect on environmental concern.

RESEARCH METHODOLOGY

Research Design

The study uses a quantitative research method because it enables scientists to assess and compare multiple variables using a systematic, statistically valid approach. The most effective method for studying the link between eco-label presence and customer purchase intention requires researchers to use quantitative methods. The research employed a cross-sectional design, which involved collecting data from participants at one specific time instead of observing the same people through multiple sessions.

The study used this method because the researchers wanted to gather complete information about current consumer opinions and behaviours at that moment, rather than studying future changes in those opinions. The researchers used a structured questionnaire to collect data on study constructs, including consumer awareness of eco-labels, trust in certifying bodies, perceived transparency of the certification process, and purchase intention.

The researchers designed each question to assess the constructs through consistent testing, which would produce clear results for all participants. The single-session survey administration allowed participants to complete their surveys in similar environments, helping minimise response bias from external factors or changing conditions.

Population and Sampling

The researchers selected this study's participants from adults who make regular supermarket visits which enables them to experience product eco-labels during their essential shopping activities.

The researchers used convenience sampling to select participants from Thanjavur district, Tamil Nadu, by approaching shoppers in supermarkets.

The researchers conducted their study in Thanjavur district to examine how local consumers respond to eco-labels within a single geographic area. The study accepted only participants who had reached the age of 18 because this age group possesses the capacity to select their own purchase items.

The study required participants to have basic eco-label knowledge before joining, as the researchers

needed responses from people who had never heard of eco-labels to achieve the research objectives. The study received 200 completed surveys which provide sufficient data for the required statistical tests that include regression and correlation analysis needed to achieve valid research results.

Data Collection

Researchers collected primary data by distributing self-administered structured questionnaires to customers who visited supermarket locations. The study allowed respondents to decide whether to take part, and researchers explained the study's academic purpose before starting data collection. The questionnaire included five-point Likert-scale items which assessed respondents' eco-label awareness, their perceived credibility, consumer trust, environmental concern, purchase behaviour, satisfaction, and loyalty.

Data Analysis Techniques

The researchers performed data analysis using three statistical techniques which they applied to collected data.

- The researchers used descriptive statistics to create sample profiles and to present distribution patterns of participant responses.
- The researchers used one-way ANOVA with post-hoc tests (Tukey's HSD) to investigate how different groups exhibited eco-label knowledge across their demographic categories.
- The researchers used Pearson correlation analysis to investigate how study variables related to each other in a linear manner.
- The researchers used linear regression analysis to study how credibility and purchasing habits predict consumer satisfaction.
- The researchers used K-means and hierarchical clustering methods to create distinct consumer groups which they studied according to their eco-label usage patterns.
- The researchers used heatmap visualisation to study how constructs distributed across different patterns.

Limitations

The study results face multiple limitations that affect their credibility.

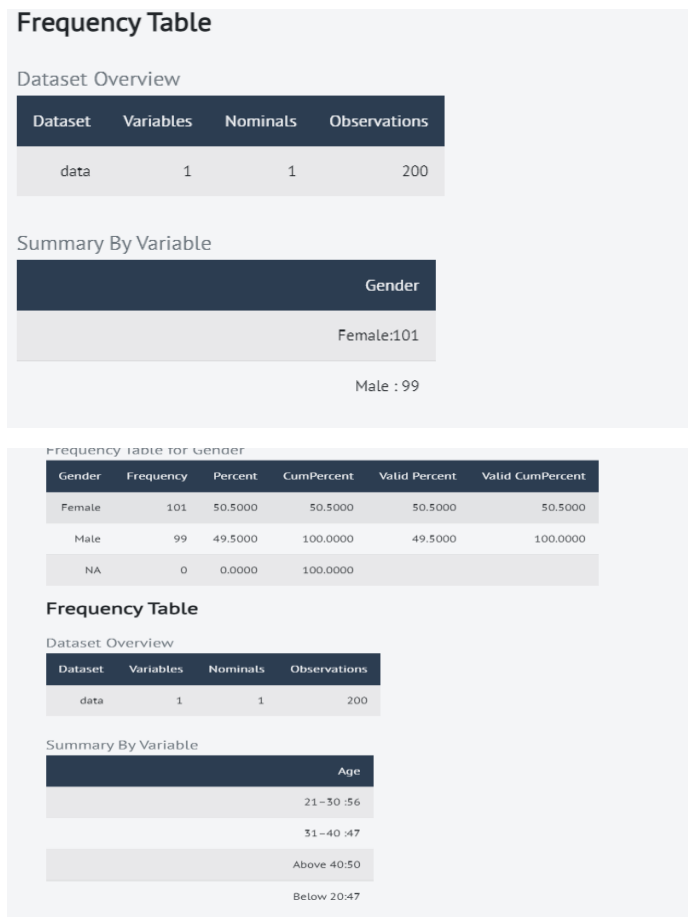
The research study has its geographical focus on the Thanjavur district of Tamil Nadu, which restricts the ability to apply its results to different cultural and regional and national settings.

- The research uses self-reported Likert-scale measures, which enable participants to respond based on socially acceptable values that create bias for their environmental awareness and buying habits.

- The convenience sampling method used in the study creates a risk of underrepresenting consumers who lack knowledge about eco-labels, which leads to an artificial increase in observed consumer awareness scores.
- The researchers excluded price sensitivity, brand familiarity, and marketing exposure measurements from their study, which demonstrates their significant effect on purchase behaviour.

DATA ANALYSIS AND INTERPRETATION

5.1 Respondent Profile and Gender Distribution



INTERPRETATION:

A total of 200 shoppers responded to the survey. The survey sample included 101 women and 99 men. Women accounted for 50.5 per cent of the sample, while men accounted for 49.5 per cent. The two groups showed a very balanced distribution, with

only two members separating them. The study collected eco-label opinions from men and women in equal proportions because neither group predominated over the other. The gender information remained complete because every participant answered that question.

5.1.2 Age Distribution

Frequency Table for Age

Age	Frequency	Percent	CumPercent	Valid Percent	Valid CumPercent
21-30	56	28.0000	28.0000	28.0000	28.0000
Above 40	50	25.0000	76.5000	25.0000	76.5000
31-40	47	23.5000	51.5000	23.5000	51.5000
Below 20	47	23.5000	100.0000	23.5000	100.0000
NA	0	0.0000	100.0000		

Frequency Table

Dataset Overview

Dataset	Variables	Nominals	Observations
data	1	1	200

INTERPRETATION:

The 21–30 age group is the largest, accounting for 28% of the total population, because research shows that younger people demonstrate greater environmental awareness. The sample includes 25% of participants who are older than 40 years while the

31–40 age group and below-20 age group each make up 23.5% of the sample which shows that the study includes participants from four different age groups. The different age groups in this study allow researchers to compare how different generations understand eco-labels.

5.1.3 Educational Qualification

Frequency Table

Dataset Overview

Dataset	Variables	Nominals	Observations
data	1	1	200

Summary By Variable

Education

Postgraduate : 61

Undergraduate:139

Frequency Table for Education

Education	Frequency	Percent	CumPercent	Valid Percent	Valid CumPercent
Undergraduate	139	69.5000	100.0000	69.5000	100.0000
Postgraduate	61	30.5000	30.5000	30.5000	30.5000
NA	0	0.0000	100.0000		

INTERPRETATION:

The educational segment of the study is primarily composed of undergraduate degree holders, who make up 69.5 per cent of the sample (139 total), while postgraduate degree holders comprise the

remaining 30.5 per cent (61 total). The dataset is complete because it contains no missing values. The study found that college-educated participants made up the majority of the group, which matched previous studies showing that educated consumers possess greater knowledge of eco-labels.

5.1.4 Occupational Distribution

Dataset Overview

Dataset	Variables	Nominals	Observations
data	1	1	200

Summary By Variable

Occupation

- Homemaker :64
- Office Employee:56
- Self-employed :80

Frequency Table for Occupation

Occupation	Frequency	Percent	CumPercent	Valid Percent	Valid CumPercent
Self-employed	80	40	100	40	100
Homemaker	64	32	32	32	32
Office Employee	56	28	60	28	60
NA	0	0	100		

INTERPRETATION:

Self-employed individuals constitute the largest occupational segment (40%, n = 80), followed by homemakers (32%, n = 64) and office employees

(28%, n = 56). The higher number of self-employed respondents indicates that these consumers possess greater environmental awareness because they make independent choices in their work and personal buying decisions.

5.1.5 Income Distribution

Summary By Variable

Income

- 20001-40000:56
- 40001-60000:39
- Above 60000:57
- Below 20000:48

Frequency Table for Income

Income	Frequency	Percent	CumPercent	Valid Percent	Valid CumPercent
Above 60000	57	28.5000	76.0000	28.5000	76.0000
20001-40000	56	28.0000	28.0000	28.0000	28.0000
Below 20000	48	24.0000	100.0000	24.0000	100.0000
40001-60000	39	19.5000	47.5000	19.5000	47.5000
NA	0	0.0000	100.0000		

INTERPRETATION:

The 200 respondents in this study came from different income backgrounds. The highest earners, those making more than ₹60,000 a month, were the largest group and made up 28.5 percent of the sample. People earning between ₹20,001 and ₹40,000 a month were the second largest group at 28

percent. Around 24 percent of respondents earned below ₹20,000 a month. The smallest group was people earning between ₹40,001 and ₹60,000 a month, who came to 19.5 percent. Having people from all these different income levels in the study means the results show how eco-labels are seen by shoppers from varying financial backgrounds, not just one particular group.

5.1.6 Residential Distribution

Frequency Table

Dataset Overview

Dataset	Variables	Nominals	Observations
data	1	1	200

Summary By Variable

Residence
Rural :66
Semi-Urban:67
Urban :67

Frequency Table for Residence

Residence	Frequency	Percent	CumPercent	Valid Percent	Valid CumPercent
Semi-Urban	67	33.5000	66.5000	33.5000	66.5000
Urban	67	33.5000	100.0000	33.5000	100.0000
Rural	66	33.0000	33.0000	33.0000	33.0000
NA	0	0.0000	100.0000		

INTERPRETATION:

The residential distribution of respondents captures the geographic spread of the sample within the

Thanjavur district, providing contextual grounding for interpreting supermarket purchasing patterns.

5.1.7 Shopping Frequency

Frequency Table for Shopping_Frequency

Shopping_Frequency	Frequency	Percent	CumPercent	Valid Percent	Valid CumPercent
Bi-weekly	56	28.0000	28.0000	28.0000	28.0000
Weekly	51	25.5000	100.0000	25.5000	100.0000
Monthly	50	25.0000	53.0000	25.0000	53.0000
Occasionally	43	21.5000	74.5000	21.5000	74.5000
NA	0	0.0000	100.0000		

INTERPRETATION:

Bi-weekly shopping is the most prevalent purchasing frequency (28%), followed by weekly (25.5%) and monthly (25%). Occasional shoppers

constitute the smallest segment (21.5%). The respondents demonstrate regular shopping patterns for supermarkets, which they visit because this behaviour enables them to trust their knowledge about eco-labels.

5.2 Eco-Label Awareness by Age Group

Summaries for Aware_Ecolabels by factor variable Age

Age	n	mean	median	min	max	sd	variance
21-30	56	3.8395	4	2	5	1.0230	1.0464
31-40	47	3.9362	4	2	5	1.0510	1.1045
Above 40	50	3.9400	4	2	5	0.9775	0.9555
Below 20	47	3.8298	4	2	5	1.1669	1.3617

ANOVA table with type III sum of squares for Aware_Ecolabels by Age

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Age	3	0.5346	0.1782	0.1604	0.9229
Residuals	196	217.8204	1.1113	NA	NA

Estimated Marginal Means for Aware_Ecolabels by Age

Age	emmean	SE	df	lower.CL	upper.CL
1 21-30	3.8395	0.1409	196	3.5615	4.1171
2 31-40	3.9362	0.1538	196	3.6329	4.2394
3 Above 40	3.9400	0.1491	196	3.6460	4.2540
4 Below 20	3.8298	0.1538	196	3.5265	4.1330

Levene's test for homogeneity of variances (center=mean) for Aware_Ecolabels against Age

	Df	F value	Pr(>F)
group	3	0.9368	0.4239
	196	NA	NA

F value adjustment: holm method for 6 tests

INTERPRETATION:

The one-way ANOVA results show no significant differences in eco-label awareness between different age groups because the F value equals 0.18 and the p value equals 0.9229, while all four age groups show mean awareness scores of approximately 4.0.

The equal-variance assumption was supported by Levene's test of homogeneity of variance. The post-hoc Tukey's HSD tests in Table 3 confirmed the ANOVA result, as all pairwise p-values were 1, indicating no statistically significant differences between the groups.

5.3 Post-Hoc Analysis: Awareness by Age

Post-hoc tests for Aware_Ecolabels by Age (using method = pairwise)

	contrast	estimate	SE	df	t.ratio	p.value
1	21-30 - 31-40	-0.0969	0.2085	196	-0.4646	1
2	21-30 - Above 40	-0.1007	0.2051	196	-0.4910	1
3	21-30 - Below 20	0.0095	0.2085	196	0.0455	1
4	31-40 - Above 40	-0.0038	0.2142	196	-0.0179	1
5	31-40 - Below 20	0.1064	0.2175	196	0.4892	1
6	Above 40 - Below 20	0.1102	0.2142	196	0.5146	1

Effect Size for ANOVA (Type III): partial_eta_squared, CI=0.95

Parameter	Eta2	CI	CI_low	CI_high
Age	0.0024	0.9500	0	1

INTERPRETATION:

The post-hoc comparison results show that eco-label awareness remains unchanged across all age groups because no pairwise comparison has shown any significant difference. The study results demonstrate

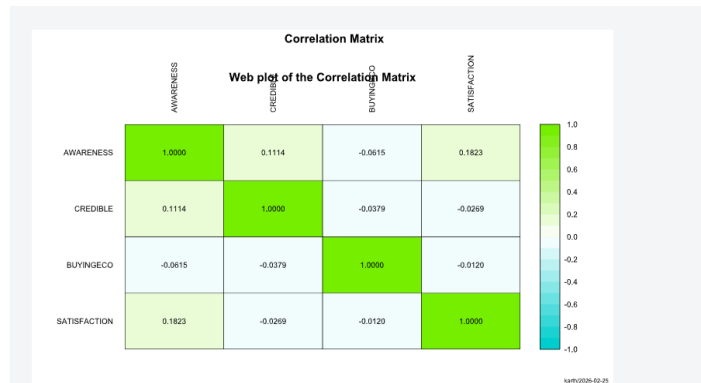
that eco-labels provide enough visibility to create equal awareness among different age groups. The results validate H4 but researchers must study how understanding affects environmental concern because it requires more investigation in future studies.

5.4 Correlation Analysis

Correlation Test

Pearson correlation

		AWARENESS	CREDIBLE	BUYINGECO	SATISFACTION
AWARENESS	Correlation	1.0000	0.1114	-0.0615	0.1823
	Adj-P		0.5819	1.0000	0.0587
	n	200.0000	200.0000	200.0000	200.0000
CREDIBLE	Correlation	0.1114	1.0000	-0.0379	-0.0269
	Adj-P	0.5819		1.0000	1.0000
	n	200.0000	200.0000	200.0000	200.0000
BUYINGECO	Correlation	-0.0615	-0.0379	1.0000	-0.0120
	Adj-P	1.0000	1.0000		1.0000
	n	200.0000	200.0000	200.0000	200.0000
SATISFACTION	Correlation	0.1823	-0.0269	-0.0120	1.0000
	Adj-P	0.0587	1.0000	1.0000	
	n	200.0000	200.0000	200.0000	200.0000



INTERPRETATION:

The Pearson correlation analysis showed that four main study variables did not show any significant linear relationship at the customary $\alpha = 0.05$ significance threshold. The sample results showed that all observed correlation coefficients reached values close to zero which demonstrated that one

variable change did not result in predictable changes to other variables. Previous research has shown that eco-label perceptions create non-linear relationships with consumer behaviour, which third variables, such as income level, label familiarity, or product category involvement, can either mediate or moderate.

5.5 Descriptive Statistics and ANOVA

Numerical Statistical Analysis by Variable

stats	AWARENESS	CREDIBLE	BUYINGECO	SATISFACTION
min	2.5000	2.6250	2.6000	2.0000
1st Qu	3.4375	3.5000	3.4000	3.3333
mean	3.8000	3.7400	3.8010	3.7950
median	3.7500	3.7500	3.8000	3.6667
3rd Qu	4.2500	4.0000	4.2000	4.3333
max	5.0000	4.5000	4.8000	5.0000
sd	0.5599	0.3934	0.5047	0.6302
std. error	0.0396	0.0278	0.0357	0.0446
cv	0.1473	0.1052	0.1328	0.1661
var	0.3134	0.1547	0.2547	0.3972
n	200.0000	200.0000	200.0000	200.0000
NAs	0.0000	0.0000	0.0000	0.0000

Anova table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
AWARENESS	1	0.1919	0.1919	0.7496	0.3876
CREDIBLE	1	0.0495	0.0495	0.1934	0.6606
Residuals	197	50.4383	0.2560	NA	NA

Sum of squares table

	Values
Sum of squares of regression	0.2415
Sum of squares of residuals	50.4383
Total sum of squares	50.6798

Anova table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
AWARENESS	1	0.3820	0.3820	2.4871	0.1164
Residuals	198	30.4105	0.1536	NA	NA

Sum of squares table

	Values
Sum of squares of regression	0.3820
Sum of squares of residuals	30.4105
Total sum of squares	30.7925

Coefficients

	Estimate	Std. Error	t value	Pr(> t)	2.5 %	97.5 %
(Intercept)	3.9959	0.4509	9.2744	5.2527e-17 ***	3.1462	4.8456
BUYING	0.1035	0.1216	0.8515	0.3955	-0.1362	0.3433
CREDIBLE	-0.1568	0.1755	-0.8933	0.3728	-0.5029	0.1893

Note:
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Anova table

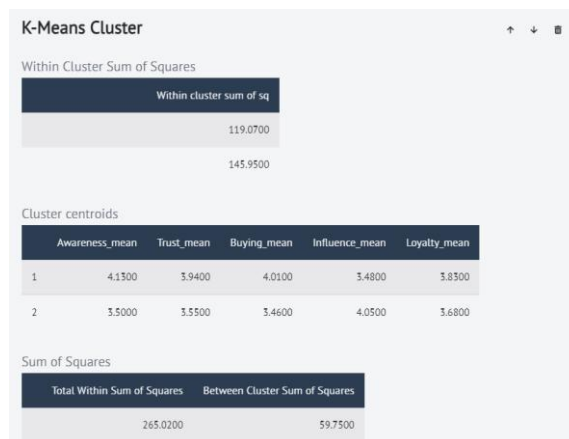
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
BUYING	1	0.0280	0.0280	0.0701	0.7915
CREDIBLE	1	0.3188	0.3188	0.7980	0.3728
Residuals	197	78.6927	0.3995	NA	NA

INTERPRETATION:

The heatmap shows that most respondents gave ratings between moderately high and high, with most constructs rated 4 to 5 on a five-point scale. The highest scores across all examined constructs indicated that consumers held strong positive views of eco-labelled products. The Trust in Claims and

Credibility of Information and Greenwashing Reduction constructs showed lower results because respondents doubted the authenticity of eco-labels and their effectiveness against greenwashing. The respondent dendrogram shows distinct grouping patterns, revealing two main clusters that correspond to different response styles across various constructs.

5.8 K-Means Cluster Analysis



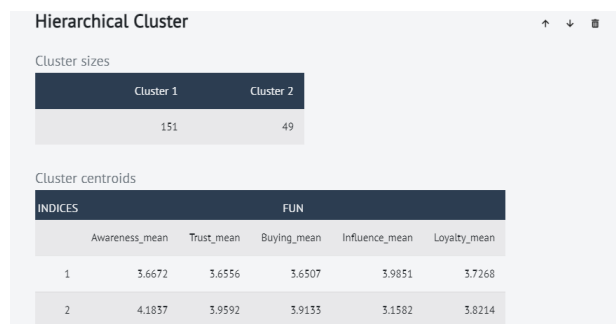
INTERPRETATION:

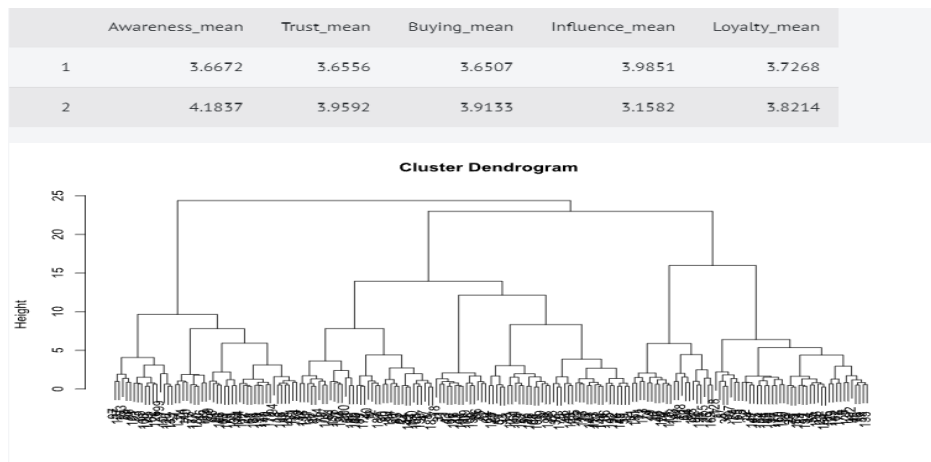
The application of K-means cluster analysis with k value set to 2 resulted in the identification of two separate consumer groups.

The first group consists of consumers whose main focus drives their purchasing decisions. The cluster shows higher average measurement values which include Awareness at 4.13 and Trust at 3.94 and Eco-buying Behaviour at 4.01. The consumers show strong self-drive towards eco-labels because they can understand certification details which leads them to purchase products after they learn about them. The consumers show lower power to make

purchase decisions based on social factors because their Influence score is 3.48 which shows they depend less on social factors. The second cluster consists of consumers whose main purchasing focus results from social factors. The cluster shows decreased performance in Awareness (3.50) Trust (3.55) and Buying Behaviour (3.46) while showing a major increase in Influence (4.05). The consumers show limited independent knowledge of eco-labels but they base their purchasing decisions on marketing messages and peer approval and social pressures. The Between-Cluster Sum of Squares (59.75) relative to the Total Within Sum of Squares (265.02) indicates moderate but meaningful cluster separation.

5.9 Hierarchical Cluster Analysis





INTERPRETATION:

The K-means solution receives support from hierarchical cluster analysis which shows two main consumer groups that have identical average score patterns. The dendrogram shows that Cluster 1 respondents join together at lower linkage points which demonstrates their stronger internal group similarity while Cluster 2 shows slight increased internal group dissimilarity that matches the diverse response patterns of influence-dependent consumers.

SUMMARY OF FINDINGS

Respondent Profile

The final sample of 200 respondents showed almost equal gender distribution with 50.5% female participants and 49.5% male participants while the 21–30 age group made up the largest portion of the sample at 28%. The majority of respondents showed undergraduate degree holders as their highest educational attainment with 69.5% of the sample. The self-employed workforce formed the biggest occupational category at 40% while the income group exceeding ₹60,000 emerged as the most common income level. The study found all demographic variables to be complete because no respondents had missing data.

Eco-Label Awareness

Eco-label awareness is consistently high across all demographic segments, with mean scores approximating 4.0. One-way ANOVA ($p = 0.9229$) and Tukey's HSD post-hoc tests confirmed the

absence of statistically significant age-based differences, indicating that eco-label visibility in the study context transcends generational boundaries.

Correlation and Regression

No statistically significant linear associations were identified among Awareness, Credibility, Eco-buying Behaviour, and Satisfaction. Linear regression confirmed a poor model fit, with credibility and buying habits explaining an insufficient proportion of variance in consumer satisfaction. These results collectively suggest that the eco-label-behaviour relationship is non-linear and moderated by variables not captured in the present model.

Heatmap Insights

While Awareness, Satisfaction, Loyalty, and Recommendation Intent recorded high ratings, the constructs of Trust in Claims, Credibility, and Greenwashing Reduction were rated comparatively lower, revealing an actionable trust gap in consumers' appraisal of eco-label authenticity.

Consumer Segmentation

Both K-means and hierarchical clustering consistently identified two segments: (1) Awareness-Driven Consumers characterised by high awareness, trust, and independent purchase confidence; and (2) Influence-Driven Consumers marked by lower awareness and trust but heightened susceptibility to external social and marketing stimuli.

DISCUSSION

The research results from this study create two important theoretical outcomes and two essential practical consequences. The research results support signalling theory because eco-label signals generate widespread recognition through high awareness scores, but the understanding of these signals fails to engender trust and behavioural change. The results demonstrate that Spence's (1973) theory of signals requires receivers to perceive signals as trustworthy to achieve the sender's goals. The heatmap analysis results show a persistent trust deficit because the Indian market's eco-labels fail to provide effective signals that establish eco-label credibility with consumers.

Two identified consumer groups have significant effects on practical business operations. The marketing approach for awareness-driven consumers needs to establish information depth and show certification processes, while they need to see verification from independent sources because they analyse eco-label data. The company needs to use social proof together with peer endorsement and influencer communication to reach influence-driven consumers who depend on external validation for their purchase decisions.

The regression model fails to predict outcomes because consumer satisfaction with eco-labelled products shows multiple dimensions, while credibility and purchase frequency do not serve as complete indicators. Future research should incorporate price-value perception, product performance expectations, subjective norms, and post-purchase dissonance into more comprehensive studies for exploratory analysis.

RECOMMENDATIONS AND CONCLUSION

- The study recommends creating standardised eco-certification frameworks that receive government backing and undergo independent verification to establish their credibility.
- The supermarket-based educational program, together with social media and academic curriculum materials, will help consumers understand certification standards beyond basic label recognition.

- The implementation of strict anti-greenwashing laws will create penalties for false environmental claims, which will safeguard the authentic reputation of eco-labels.
- The marketing communication strategy requires customisation according to different consumer segments, which will use evidence-based information for awareness consumers and social proof-based validation for influencer-driven segments.
- Future research should use structural equation modelling (SEM) to test the proposed mediation and moderation pathways in the conceptual framework through testing the price sensitivity, label design aesthetics and product category involvement constructs

The research shows that people need to know about eco-labels because this knowledge is an essential requirement, but it is not the complete solution needed to build consumer trust, which leads to sustainable purchasing. The general public maintains awareness of the system, but this knowledge does not create trust or develop sustained loyalty from users. The existing eco-labelling system has a fundamental weakness: people do not trust greenwashing protections, which results in ecological problems that undermine the entire sustainability movement. The first consumer group makes sustainable purchases based on their own understanding, while the second consumer group needs social validation from others before engaging in environmentally friendly buying practices. The organisations and governmental bodies in this sector need to develop certification systems that go beyond basic understanding and establish verification procedures recognised by formal institutions.

REFERENCES

1. Cai, Z., Xie, Y., & Aguilar, F. X. (2017). Eco-label credibility and consumer purchase decisions: The role of environmental signals. *Journal of Environmental Economics and Policy*, 6(3), 225–240. <https://doi.org/10.1080/21606544.2017.1324020>
2. Hameed, I., & Waris, I. (2018). Eco-labels and green trust: The mediating role of environmental concern in green purchase behaviour. *Journal of Cleaner Production*, 181,

- 1–11.
<https://doi.org/10.1016/j.jclepro.2018.01.216>
3. Chi, T. (2021). Consumer perceived value of eco-labeled products and green purchase intention. *Journal of Retailing and Consumer Services*, 59, 102361. <https://doi.org/10.1016/j.jretconser.2020.102361>
 4. Nguyen-Viet, T. (2022). The impact of eco-labels on consumers' purchase intentions: Evidence from sustainable products. *Sustainability*, 14(9), 5421. <https://www.mdpi.com/2071-1050/14/9/5421>
 5. Testa, F., Iraldo, F., Vaccari, A., & Ferrari, E. (2023). Why eco-labels matter: Evidence on consumer behaviour and sustainable purchasing. *Business Strategy and the Environment*, 32(2), 850–864. <https://doi.org/10.1002/bse.3156>
 6. European Commission (2024). Examining the attitude–behaviour gap in EU ecolabel adoption. *Publications Office of the European Union*. https://environment.ec.europa.eu/topics/circular-economy/eu-ecolabel_en
 7. Grunert, K. G., Hieke, S., & Wills, J. (2024). Sustainability labels as consumer communication tools: A social science review. *Journal of Consumer Policy*, 47(1), 1–22. <https://doi.org/10.1007/s10603-023-09558-4>
 8. Sebastian, A., & Joshy, J. (2024). Environmental sensitivity and eco-label awareness: Impact on green purchase behaviour. *International Journal of Consumer Studies*, 48(3), 455–468. <https://doi.org/10.1111/ijcs.12912>
 9. Maftuchach, A., Limakrisna, N., & Pranowo, B. (2025). Eco-labels, trust, and perceived value: Drivers of green purchase intention. *Sustainability*, 17(2), 901. <https://www.mdpi.com/2071-1050/17/2/901>
 10. Aminravan, F., Zarei, A., & Pilehvar, A. A. (2025). Eco-label transparency and consumer trust in sustainable food supply chains. *Journal of Business Research*, 162, 113867. <https://doi.org/10.1016/j.jbusres.2023.113867>
 11. Spence, M. (1973). Job market signalling. *Quarterly Journal of Economics*, 87(3), 355–374. <https://www.jstor.org/stable/1882010>