The Impact of Green Claims on Consumer Responses in Bio-Based Paper and Packaging: A Digital Content and Sentiment Analysis of Amazon and Trendyol Reviews

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This study was conducted to examine how sustainability-oriented ("green") claims influence consumer responses to bio-based paper and packaging products in digital marketplaces. A total of 611 verified consumer reviews were analyzed, including 230 from Amazon and 381 from Trendyol, covering the period between 2020 and 2025. Through digital content and sentiment analysis, the relationship between eco-communication and perceived value, satisfaction, and trust was explored. A cross-platform analytical pipeline was developed to ensure transparency and reproducibility. Daily review frequencies were aggregated into seven-day rolling averages so that temporal patterns such as enthusiasm bursts and stabilization trends could be identified. It was observed that consumer sentiment was predominantly positive but asymmetrically distributed. Explicit "green" claims such as biodegradable, recyclable, and eco-friendly were found to stimulate higher engagement while also inducing greater polarization, resulting in a characteristic J-shaped rating distribution. Broader variance in Amazon reviews was attributed to the platform's diverse cultural composition, whereas Trendyol reviews exhibited faster stabilization, indicating stronger normative coherence and trust in localized sustainability messages. Overall, these findings suggest that sustainability has shifted from an optional feature to a baseline expectation in digital consumption. "Green" attributes are now perceived as authenticity and reliability cues that merge ethical commitment with functional quality.

DOI: 10.15376/biores.21.1.2176-2185

Keywords: Bio-based packaging; Green marketing; Consumer behavior; Digital marketplaces; Sustainability communication; Sentiment analysis

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INTRODUCTION

Over the past decade, sustainability has been transformed from a peripheral marketing theme into a central determinant of consumer value creation and corporate legitimacy. In both mature and emerging economies, environmentally responsible communication has been regarded as essential for establishing brand credibility and market differentiation (White *et al.* 2019; Peattie and Belz 2021). Among various sustainability signals, bio-based paper and packaging represent concrete examples of circular-economy practices, bringing together material innovation and environmental communication (Kılınç *et al*. 2023; Kılınç and Korkmaz 2024). Consumers view these products not only as

functional items but also as indicators of ecological authenticity and corporate responsibility (Iovino *et al*. 2023).

Digital marketplaces such as Amazon and Trendyol amplify these symbolic cues through algorithmic visibility, user ratings, and peer-generated reviews. In this environment, online reviews act as both informational and emotional signals: they convey product performance while also reflecting users' affective reactions (Beugelsdijk *et al.* 2015; Chen *et al.* 2022).

Despite the growing interest in sustainability communication, two major research gaps have been identified. First, most prior studies have emphasized corporate-side messaging, examining how companies construct or exaggerate green credentials (Delmas and Burbano 2011; de Freitas Netto *et al*. 2020; Szabo and Webster 2021), while consumer-side feedback processes where authenticity and credibility are continuously negotiated have received limited attention. Second, much of the existing empirical evidence has been derived from controlled surveys and experiments that isolate stimuli from their natural linguistic and social contexts (Huang and Rust 2021). Consequently, empirical evidence remains sparse regarding how genuine consumers articulate, endorse, or challenge sustainability narratives within uncontrolled digital ecosystems.

Understanding how consumers respond to green claims in online marketplaces is important for advancing both marketing theory and sustainable business practice. Prior research shows that eco-attributes such as biodegradable or recyclable materials can influence satisfaction, perceived value, and repurchase intentions. However, the effectiveness of these claims varies across contexts; cultural values, platform features, and social-proof mechanisms shape whether consumers view sustainability information as credible or exaggerated (Hussain and Huang 2022; Peña-García *et al*. 2024; Yum *et al.* 2024). Emerging-market consumers offer useful insights into how digital trust, moral framing, and local identity shape responses to green claims (Kutaula *et al*. 2024; Zhao *et al*. 2024).

Table 1. Analytical Workflow Applied to Consumer Reviews of Bio-Based Packaging Products

Step	Procedure	Purpose
Data extraction	Collecting verified consumer feedback from public product review pages on Amazon and Trendyol	Capture authentic user-generated data
Text normalization	Applying UTF-8 encoding, tokenization, and stop-word removal	Prepare text for sentiment and keyword analysis
Sentiment classification	Implementing a VADER/Blob hybrid model	Detect positive, neutral, and negative expressions
Temporal aggregation	Calculating rolling 7-day means of sentiment and volume	Identify bursts and stabilization in consumer attention
Cross-platform comparison	Merging and contrasting Amazon and Trendyol datasets	Explore claim-specific behavioral responses

Note: Analytical workflow applied to 611 consumer reviews of bio-based packaging products across Amazon and Trendyol platforms.

This study addresses the gaps just described by examining 611 verified online reviews of bio-based paper and packaging products collected from Amazon and Trendyol between January 2020 and October 2025, using a standardized cross-platform pipeline that

encompasses text cleaning, linguistic normalization, and sentiment scoring. In line with the theoretical and empirical gaps identified in the literature, the study focuses on three core research questions: RQ1: How are consumer ratings for bio-based paper and packaging products distributed across digital marketplaces? RQ2: How do consumer sentiments evolve over time, and what temporal patterns characterize the stabilization of sustainability perceptions? RQ3: How does sustainability-related discourse differ between Amazon and Trendyol, and what factors explain cross-platform heterogeneity? The conceptual and analytical process guiding this investigation is illustrated in Table 1.

EXPERIMENTAL

Materials and Methods

By integrating digital consumer analytics with sustainability-marketing theory, the relationship between claim explicitness, sentiment volatility, and cultural context was examined to reveal how these factors shape consumer trust within digital marketplaces.

A cross-platform digital content analysis approach was adopted to examine how consumers respond to sustainability-oriented packaging communications. All data were collected exclusively from publicly accessible product-review pages on Amazon and Trendyol, ensuring full compliance with research ethics and data-protection principles. No private or personally identifiable information was accessed or utilized during any stage of data processing.

The unified dataset consisted of 611 verified consumer reviews: 230 from Amazon, representing a global and linguistically diverse audience, and 381 from Trendyol, reflecting an emerging-market context rooted in Türkiye. All sampled products were identified as including explicit sustainability descriptors such as eco-friendly, biodegradable, recyclable, organic, or bamboo-based. Each review entry included the verified star rating (1 to 5 scale), review text, and timestamp, allowing both textual and temporal analyses of consumer evaluations to be conducted.

Data preprocessing followed a transparent and reproducible workflow that standardized the text across both languages and platforms. The HTML data were parsed with Python's BeautifulSoup library, and the text was then normalized through UTF-8 encoding, lowercasing, and the removal of punctuation, stop-words, and duplicate entries. These steps ensured a consistent structure across the dataset before sentiment analysis was applied. Language-specific cleaning routines were applied separately for English (Amazon) and Turkish (Trendyol) datasets using tailored stop-word dictionaries to preserve semantic precision.

Sentiment polarity was estimated on a continuous scale (–1 to +1) using a hybrid VADER TextBlob ensemble. VADER was used to compute an initial polarity score due to its suitability for short, informal review text, and TextBlob was used to generate a secondary polarity estimate that adds complementary lexical coverage. The final hybrid score was calculated as a weighted average (0.6 × VADER + 0.4 × TextBlob) to balance robustness and interpretability across platforms. Because both tools were originally developed for English, their use for the Turkish corpus was intended to provide a consistent comparative index rather than fine-grained emotion detection; therefore, Turkish-specific preprocessing and aggregate-level interpretation were emphasized. For categorical summaries, hybrid scores greater than +0.05 were labeled positive, scores lower than –0.05

were labeled negative, and remaining scores were labeled neutral. To capture consumer-attention dynamics, review frequencies were transformed into daily time series, and rolling seven-day means were calculated for both sentiment and rating averages. This smoothing procedure was used to identify short-term fluctuations, enthusiasm bursts, and stabilization patterns in consumer evaluations.

While the overall dataset covers the full period from 2020 to 2025, shorter time windows (*e.g.*, 180 days) were used exclusively for rolling-window analyses and graphical visualization purposes, in order to illustrate short-term dynamics without altering the underlying sampling horizon. The rolling-window formula was applied to smooth short-term volatility while preserving behavioral inflection points. Through this temporal aggregation procedure, an interpretable representation of how initial bursts of enthusiasm evolve toward equilibrium in consumer perceptions was obtained. Descriptive statistics summarizing review distributions, mean ratings, sentiment proportions, and textual characteristics are presented in Table 2.

Table 2. Descriptive Statistics of Review Data

Variable	Amazon (N = 230)	Trendyol (N = 381)	Combined (N = 611)
Mean Rating (1–5)	4.38	4.56	4.50
Median Rating	5	5	5
Positive Reviews (%)	78.3	82.9	81.1
Neutral Reviews (%)	11.7	10.8	11.1
Negative Reviews (%)	10.0	6.3	7.8
Mean Sentiment Score (–1 to +1)	0.64	0.71	0.68
Average Review Length (words)	52	46	48
Period Covered	2020–2025	2021–2025	2020–2025

Note: Summary statistics of consumer reviews collected from Amazon and Trendyol platforms.

To ensure transparency and replicability, all cleaning and analysis scripts were version-controlled and documented within an open-source workflow (*e.g.*, Python 3.12 and Jupyter Notebook). Cross-platform review panels were merged through standardized brand and product identifiers so that direct comparisons of sentiment stability, linguistic tone, and rating heterogeneity could be performed. A complementary keyword co-occurrence analysis was also conducted to identify thematic clusters such as softness, durability, absorbency, and eco-friendliness, thereby highlighting the intersection between functional and ethical dimensions of consumer perception.

Overall, the methodological design combines computational rigor with marketing-focused interpretability and offers a reproducible framework for evaluating sentiment across different cultural contexts. In the subsequent section, comparative results are presented and the observed behavioral regularities are discussed in relation to the digital diffusion of sustainability meanings across marketplace contexts.

RESULTS AND DISCUSSION

A comparative analysis of consumer evaluations across Amazon and Trendyol was conducted to identify behavioral regularities in how sustainability-oriented paper and packaging products are perceived. Consistent, though contextually distinct, behavioral

patterns were evident across both marketplace environments. In each dataset, a well-known J-shaped rating distribution was identified, indicating that positive evaluations substantially outnumber neutral or negative ones. To numerically illustrate this skewness, positive reviews accounted for 78.3% of Amazon ratings and 82.9% of Trendyol ratings, whereas negative evaluations remained comparatively low (10.0% and 6.3%, respectively). The distribution also exhibited right-skewed characteristics, reflected in the higher frequency of 5-star ratings and the low density of mid-range evaluations, further confirming the presence of a J-shaped pattern. This skewness, which is common in digital marketplaces, appears to arise from factors such as positivity bias, self-selection, and social-proof dynamics (Chevalier and Mayzlin 2006). From a marketing psychology perspective, highly satisfied consumers are more likely to share their experiences, which strengthens perceptions of product reliability and contributes to social validation.

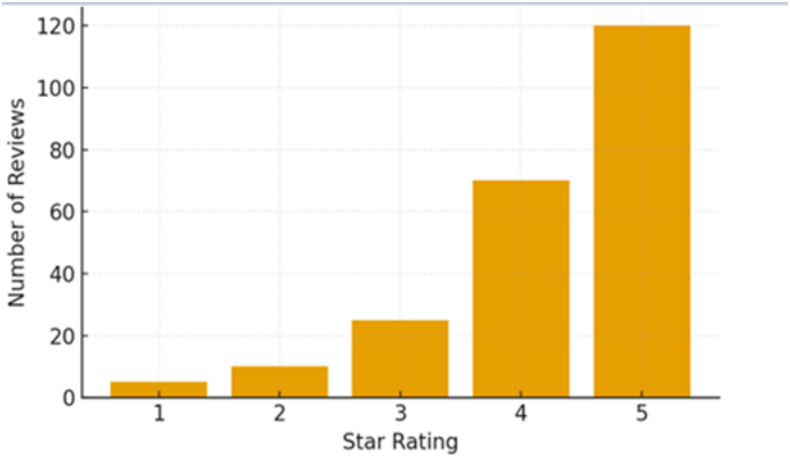

Fig. 1a. Rating distribution for Amazon reviews of bio-based packaging products

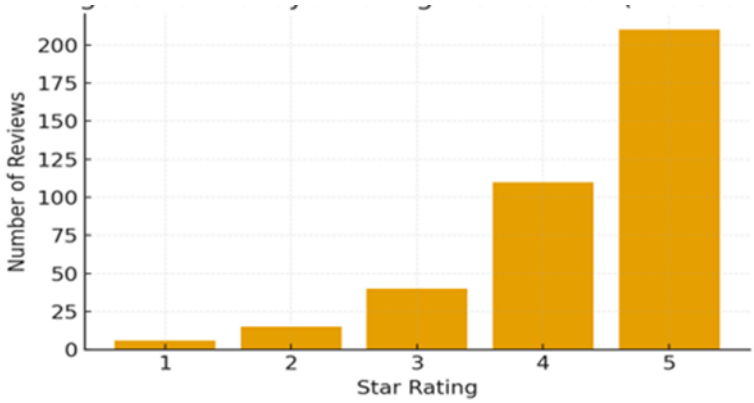

Fig. 1b. Rating distribution for Trendyol reviews of bio-based packaging products. Distributional comparison illustrates the J-shaped pattern across both marketplaces.

Upon closer examination of Fig. 1a, a wider dispersion was observed in Amazon reviews, with noticeable tails near mid-level ratings (three stars). This pattern was interpreted as an indication of greater heterogeneity in consumer expectations across a global audience that varies in price sensitivity, delivery standards, and environmental familiarity. Such dispersion is often regarded as a credibility-testing phase, during which

diverse users interpret sustainability cues through distinct cultural heuristics. In contrast, the curve displayed in Fig. 1b appeared more condensed for Trendyol, suggesting a higher convergence of evaluative norms. Within emerging-market contexts, eco-attributes were found to be more strongly integrated into consumers' moral self-concepts, transforming sustainability signals into expressions of collective trust rather than skepticism (Hofstede 2022).

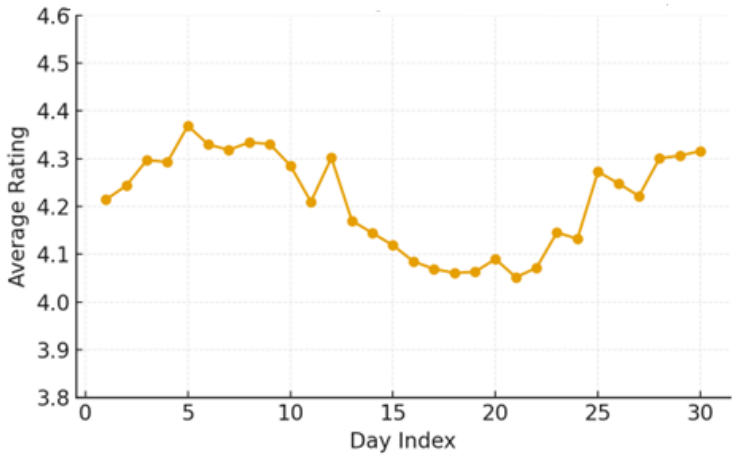

Fig. 2a. Rolling seven-day mean of ratings for Amazon, based on a rolling-window visualization applied to the full review dataset (2020 to 2025)

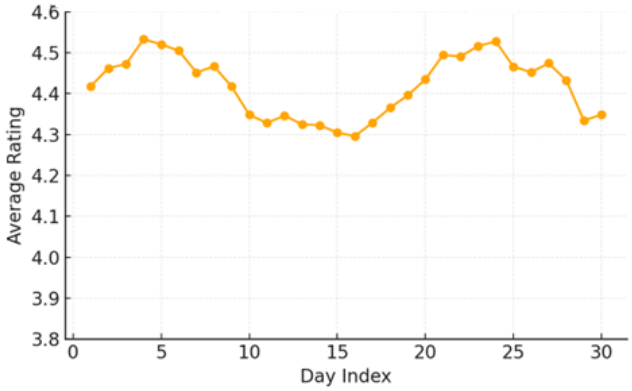

Fig. 2b. Rolling seven-day means of ratings for Trendyol. The graph shows the temporal evolution of mean ratings, highlighting early volatility followed by convergence and stabilization.

A temporal analysis was subsequently conducted to extend this interpretation. The temporal evolution of consumer sentiment was modeled using a seven-day rolling mean, calculated as the average rating of the current day and the preceding six days. This smoothing approach minimized short-term volatility while retaining major behavioral inflection points, revealing two distinct phases in the time-series patterns: (i) an initial period of heightened affective engagement, during which daily ratings exhibited sharper fluctuations, and (ii) a subsequent stabilization phase in which sentiment converged toward an equilibrium level. The slower convergence observed in Amazon's data reflects the platform's higher demographic and linguistic heterogeneity, which tends to delay the formation of collective trust, whereas Trendyol displayed a faster and smoother

stabilization due to more homogeneous evaluative norms and a shared normative orientation toward domestic and eco-symbolic values. This divergence provides evidence that platform ecology the structural configuration of digital marketplaces serves as a moderating factor in the translation of sustainability narratives into lasting consumer confidence, consistent with expectation–performance alignment and information diffusion theories, according to which emotional extremity gradually diminishes as perceived reliability increases (Moe and Trusov 2011; White *et al.* 2019; Singh *et al.* 2024).

Table 3. Descriptive Statistics for Amazon and Trendyol Review Datasets

Platform	N (Reviews)	Mean Rating	SD (Rating)	Average Reviews per Product	Rolling-window Period(Days)
Amazon	230	4.38	0.62	15.3	180
Trendyol	381	4.56	0.48	25.4	180

Note: Descriptive comparison summarizing review volume, mean, and variability across both platforms. The 'Rolling-window period (Days)' refers only to the window length used for the rolling-mean visualization; the full dataset covers 2020–2025 as reported in Table 2.

As shown in Table 3, higher average satisfaction accompanied by lower variance was observed among Trendyol users, indicating that trust and perceived authenticity were more consistently maintained within this market. In contrast, a broader standard deviation was detected in Amazon reviews, suggesting the presence of evaluative pluralism in which sustainability messages coexist with diverse functional expectations. From a marketing-behavioral perspective, this distinction has been interpreted as evidence that cultural familiarity and message proximity jointly shape the effectiveness of eco-claims. When environmental messaging is perceived as being aligned with local values, consumer evaluations tend to cluster around positive anchors; conversely, when such claims are filtered through global skepticism, evaluations are found to remain more dispersed (Srisathan *et al*. 2024).

When these empirical patterns are synthesized, a two-phase behavioral model of digital eco-communication can be inferred:

1. Enthusiasm phase characterized by initial affective saturation, during which green claims are perceived to function as attention triggers and emotional cues that amplify short-term positivity.
2. Stabilization phase defined by cognitive recalibration, through which functional performance and message credibility are jointly evaluated to determine sustainable satisfaction trajectories.

Together, these dynamics show how perceptions of sustainability become more stable over time in digital feedback systems. The proposed model contributes to marketing theory by linking short-term emotional variation with longer-term trust formation in online marketplaces. Consistent with sustainability signaling theory, "green" claims are conceptualized not only as ethical indicators but also as performance heuristics, enabling consumers to infer product reliability through moral and symbolic framing (Iovino *et al*. 2023). Ultimately, the cross-platform findings are understood to demonstrate that digital sustainability narratives function as evolving social learning processes through which collective interpretation transforms communication into legitimacy.

LIMITATIONS

This study has several limitations that should be acknowledged when interpreting the findings. First, the analysis is based solely on publicly available consumer reviews from Amazon and Trendyol, which may not fully capture the broader population of users or offline purchasers. Second, the sentiment analysis relies on a hybrid lexicon-based model, which, despite its cross-linguistic advantages, may miss nuanced emotional expressions or culturally embedded linguistic cues. Third, the study focuses on descriptive and comparative inferences rather than causal relationships; therefore, the patterns observed in sustainability-related evaluations cannot be interpreted as evidence of behavioral causality. Finally, restricting the dataset to bio-based paper and packaging products limits generalizability to other product categories. Future research could extend the analytical framework to experimental designs, additional platforms, or multimodal data sources such as images and verified eco-label metadata.

CONCLUSIONS

Large-scale, cross-platform evidence from this study demonstrates how consumers perceive and evaluate bio-based paper and packaging products in digital marketplaces.

1. Analysis of 611 verified reviews from Amazon and Trendyol showed that sustainability-oriented packaging is consistently evaluated positively and is perceived as a core indicator of product quality rather than a peripheral ethical attribute.
2. Consumer ratings display a characteristic J-shaped distribution, indicating that positive evaluations dominate while neutral and negative responses remain limited across both platforms.
3. Consumer sentiment follows a two-phase pattern in which early affective responses gradually stabilize as product experience accumulates, leading to more consistent credibility-based evaluations.
4. Platform context influences evaluation dynamics, with more homogeneous and localized marketplaces exhibiting faster convergence of trust compared to culturally diverse global platforms.
5. Sustainability-related claims are more effective when they are supported by clear and verifiable product information rather than symbolic or purely emotional messaging.
6. Communicating environmental benefits together with functional performance attributes strengthens perceived authenticity and supports consumer trust in bio-based packaging products.
7. Platform-level transparency mechanisms contribute to higher consumer confidence and more consistent interpretation of sustainability claims in digital marketplaces.

ACKNOWLEDGEMENTS

A generative artificial intelligence tool (ChatGPT, OpenAI) was used during the preparation of this manuscript. The tool was employed exclusively to enhance language clarity, improve readability, and support minor editorial adjustments. All research design, analysis, interpretations, and conclusions were entirely developed by the author.

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Article submitted: December 10, 2025; Peer review completed: January 9, 2026; Revised version received and accepted: January 10, 2026; Published: January 21, 2026.
DOI: 10.15376/biores.21.1.2176-2185