



Perceived Benefits and Pre-Design Environmental Impact Assessment of Eco-Friendly Ornament Development

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HIGHLIGHTS

- Environmental safety is the most influential driver for advocating eco-friendly ornaments among rural consumers.
- Design-stage sustainability considerations remain underemphasized despite expressed environmental motivations.
- Energy saving and fossil fuel alternatives are the most perceived ecological benefits of eco-friendly products.

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ABSTRACT

The study examined the environmental benefits and pre-design impact assessments of eco-friendly ornaments in rural Uttar Pradesh, focusing on Ayodhya district. A sample of 240 respondents was selected from 24 villages using multistage random sampling. Data were collected through structured interviews, surveys, and direct observations, and analyzed using descriptive statistics, chi-square tests, and Student's t-test. The results, conducted in 2024-2025, show that 58.75 per cent of respondents supported eco-friendly ornaments to promote environmental safety ($\chi^2 = 191.95$, $p < 0.05$). However, when it came to the integration of environmental considerations during the design phase, durability (35.41%) was the most cited factor, but differences were not statistically significant ($t = 0.167 < 3.182$). In terms of ecological benefits, energy saving (40.41%) and fossil fuel alternatives (30.41%) were the most recognized advantages, with statistical significance ($\chi^2 = 48.61$, $p < 0.05$). These findings highlight a strong environmental motivation among consumers in rural areas, although sustainability is not fully integrated into the early stages of product design. The study emphasizes the need for interventions that raise awareness and build capacity to ensure that sustainability becomes a key consideration in the design process, ultimately promoting more environmentally responsible ornamentation practices in rural India.

INTRODUCTION

In recent years, the global emphasis on sustainable development has catalyzed a significant shift towards environmentally responsible consumption and production practices. Among the various sectors impacted by this movement, eco-friendly ornaments have gained substantial attention as alternatives to

conventional accessories traditionally crafted from synthetic or non-renewable materials (Pasaribu et al., 2022). These ornaments, designed from biodegradable, recyclable, or locally sourced materials, embody a fusion of aesthetic appeal, ethical responsibility and environmental stewardship. This development holds particular relevance for rural India, where traditional craftsmanship intersects with emerging ecological values (Austria et al., 2022). While eco-

conscious purchasing behaviors have become increasingly prominent in urban areas, there remains a dearth of research focused on rural consumers, whose preferences are shaped by a unique blend of cultural traditions, economic limitations, and localized environmental challenges (Kumari et al., 2025). Rural communities, especially women artisans, play an integral role not only in the production of such sustainable ornaments but also in the dissemination of eco-friendly practices. These artisans, often deeply rooted in their local environments, contribute significantly to the promotion of sustainable ornamentation within their communities (Imrankhan et al., 2025). However, the extent to which environmental factors influence their design decisions, and how these decisions are perceived in terms of ecological benefits, remains underexplored in the academic literature (Jin et al., 2024).

This study seeks to fill these gaps by examining two primary areas of interest: first, the perceived environmental benefits of eco-friendly ornaments among rural consumers, and second, the environmental impact assessments conducted prior to the design and creation of these products. Through a focused analysis of consumer behavior and sustainability awareness in the Ayodhya district of Uttar Pradesh, this research aims to provide a comprehensive understanding of eco-consumerism within rural contexts. The findings are intended to inform sustainable design interventions, support policy alignment with grassroots sustainability efforts, and promote the growth of environmentally responsible consumer cultures in rural India (Sonu & Jha, 2025). In rural India, traditional ornament crafting plays a key role in the cultural and economic life of communities. Despite facing challenges such as limited access to sustainable knowledge and eco-friendly practices, rural artisans' strong connection to the land and local resources can provide a foundation for promoting environmentally friendly alternatives. This research explores how these traditional practices can be aligned with ecological values to support the development of eco-friendly ornaments. By assessing the environmental benefits recognized by consumers and the pre-design impact assessments made by artisans, the study provides valuable insights into integrating sustainability into ornament design. The findings aim to promote the adoption of environmentally responsible practices among rural artisans and consumers, encouraging the growth of an eco-conscious ornamentation industry in rural India. While there is a shift toward eco-conscious consumption in these areas, integrating sustainability into the design stage of ornament production remains underdeveloped and requires attention. The study highlights the need for interventions that bridge the gap between environmental awareness and the practical application of sustainable design principles, contributing to the long-term ecological and economic sustainability of rural craftsmanship.

METHODOLOGY

This research, conducted in 2024-2025, adopts a qualitative, descriptive, and cross-sectional design to assess the perceived environmental benefits and pre-design environmental impacts of eco-friendly ornaments in rural Uttar Pradesh, India. The study involved 240 respondents aged 18 and above, selected using a multistage random sampling method from 24 villages across four administrative blocks in Ayodhya district. The selection of blocks was based on

their proximity to eco-friendly ornament markets and their involvement in sustainable initiatives. Participants were chosen from those who had shown interest in or had previously purchased eco-friendly ornaments, ensuring a representative sample.

Data collection was carried out through structured interviews, direct observations, and surveys. The interview schedule was self-developed and pre-tested with a pilot group of 20 respondents to refine the tool and ensure clarity and reliability. Ethical considerations were rigorously followed by obtaining verbal consent from participants, explaining the research's academic purpose, and ensuring confidentiality.

For data analysis, both descriptive and inferential statistical methods were employed. Descriptive statistics, such as frequency distributions, means, and standard deviations, were used to summarize the data. The chi-square test (χ^2) was used to explore relationships between categorical variables, while the Student's t-test (assuming equal variances) was applied to compare groups regarding environmental perceptions. The expected frequencies (E_i) for the chi-square test were calculated using the formula:

$$E_i = \frac{\text{Row total} \times \text{Column total}}{\text{Grand total}}$$

Where, E_i = Expected frequency for each cell, Row Total = Total of the specific row, Column Total = Total of the specific column, Grand Total = Total of all observations in the table

Data analysis was conducted using SPSS Version 26, ensuring robust statistical validation of the findings. These methodologies were selected to ensure the study's rigor, reliability, and relevance to understanding the attitudes of rural consumers toward eco-friendly ornamentation and sustainable practices.

RESULTS

To understand the multidimensional aspects influencing the adoption and advocacy of eco-friendly ornaments, the study assessed motivational factors, design-stage environmental considerations, and perceived ecological benefits. The findings offer key insights into sustainability-related behaviours within rural communities.

A substantial proportion of respondents (58.75%) cited the promotion of a safe environment as the most influential factor (Table 1). Product utilization was selected by 12.50 per cent of the respondents, followed by economic savings (10.00%) and other motivations (7.91%). The chi-square test produced a value of 191.95 ($df = 3$, $p < 0.05$), indicating a statistically significant variation in the distribution. These results suggest that environmental safety is

Table 1. Distribution of respondents based on their reasons for advocating the promotion of eco-friendly ornaments

Factors	Percentage	$(O_i - E_i)^2$	$(O_i - E_i)^2 / E_i$
Safe environments	58.75	7656.25	143.11
Save economy purpose	10.00	870.25	16.27
Product utilization	12.50	552.25	10.32
Other	7.91	1190.25	22.25
Total	100		191.95

Table 2. Distribution of the evaluation of the environmental impact prior to designing and crafting eco-friendly ornaments.

Environmental Impact	Percentage	d.f	t_{cal}	T_{tab} (5%)
Durability	35.41	3	0.167	3.182
Sometime	31.66			
Consumer demand	16.66			
Never	16.25			

the dominant reason among respondents for supporting eco-friendly ornaments.

In the evaluation of environmental impact prior to the design and crafting of eco-friendly ornaments, consumer demand emerged as a significant factor, cited by approximately 16.66 per cent of the respondents. While this category may not directly refer to traditional environmental factors, consumer demand plays a crucial role in shaping the sustainable practices of businesses and artisans. When consumers support sustainable jewelry brands, they actively contribute to the reduction of waste and the promotion of recycled materials. For example, 4 Ocean bracelets, made from recycled ocean plastics, exemplify how consumer demand can help repurpose waste materials into new raw materials for ornament creation, simultaneously cleaning up the oceans. This shift in consumer preference encourages artisans and companies to adopt more sustainable practices, ultimately contributing to the reduction of environmental harm. However, the t-test results ($t = 0.167$) show that the observed differences in responses regarding the evaluation of environmental impact were not statistically significant, with a tabulated value of 3.182 at the 0.05 level of significance ($df = 3$). This suggests that while consumer demand is an important consideration, it is not the most influential factor in the environmental impact assessments made by artisans during the design phase.

As shown in Table 3, the most widely acknowledged environmental benefit of eco-friendly products was energy saving (40.41%). This was followed by recognition of their role as an alternative to fossil fuels (30.41%), awareness of their connection to non-renewable resource conservation (11.25%), and other factors (17.91%). The calculated chi-square value of 48.61 ($df = 3$, $p < 0.05$) was significantly higher than the critical value, indicating that differences among categories were statistically significant.

Table 3. Distribution of the Environmental Benefits of Eco-Friendly Products

Benefits	Percentage	$(O_i - E_i)^2$	$(O_i - E_i)^2 / E_i$
Save energy	40.41	1369	22.82
Alternative to fossil fuel	30.41	169	2.82
Nonrenewable resources	11.25	1089	18.15
Other	17.91	289	4.82
Total	100		48.61

DISCUSSION

The present study explores the socio-behavioural and environmental dynamics surrounding the adoption and advocacy of eco-friendly ornaments among rural communities. The findings reveal that ecological consciousness strongly influences consumer

motivation, with a majority of respondents identifying environmental safety as the primary driver for promoting such products (Tran et al., 2022). This aligns with prior research emphasizing that rural populations, despite limited exposure to structured environmental campaigns, often demonstrate an intuitive alignment with eco-conscious practices due to their close dependence on natural ecosystems (Carranza et al., 2023). The dominance of “safe environments” as a motivating factor (58.75%) underscores a growing perception of environmental sustainability as a core value within grassroots consumption (Yusuf et al., 2023), who assert that the integration of green ethics into lifestyle decisions is gaining traction in Indian semi-urban and rural settings. The statistically significant chi-square result ($\chi^2 = 191.95$, $p < 0.05$) further reinforces the non-random distribution of motivations, highlighting a definitive preference for environmental well-being over purely economic or utilitarian benefits (Sarstedt et al., 2020).

In contrast, the evaluation of environmental considerations during the design phase yielded statistically insignificant variation ($t = 0.167 < t_{crit} = 3.182$), suggesting a relatively uniform distribution of responses across categories. Although durability (35.41%) emerged as the most frequently cited criterion, the overlap with material availability (31.66%) indicates that design choices may be more practical than principle-driven. This finding diverges from earlier studies (Sanyal et al., 2014), which emphasized proactive environmental design thinking among eco-entrepreneurs. The low t-value implies that while environmental impact is acknowledged post-consumption, it is not yet fully integrated into design-stage decision-making, pointing to a potential knowledge-action gap. The third component of the analysis, perceived environmental benefits, provides further validation of consumer awareness. Energy conservation (40.41%) and fossil fuel alternatives (30.41%) were cited as primary advantages of eco-friendly products. The significant chi-square result ($\chi^2 = 48.61$, $p < 0.05$) supports the presence of meaningful differences in how these benefits are understood and prioritized among rural consumers (Krishnakumar & Lajith, 2023). Notably, only 11.25% of respondents recognized connections to non-renewable resource conservation, suggesting that while awareness exists, it may be limited to more tangible and immediate outcomes like energy efficiency (Siddique & Rajput, 2022). Taken together, these results suggest a layered awareness among rural consumers where environmental advocacy is a conscious choice, but environmental integration into design and production stages remains fragmented (Salem & Chaichi, 2018). This partial disconnect may be attributed to limited access to sustainable design knowledge or insufficient engagement with ecological literacy programs. Furthermore, the influence of culturally embedded values such as frugality, resourcefulness, and communal well-being appears to strengthen the pro-environmental orientation, though not necessarily with scientific framing (Kumar et al., 2024). The study contributes to the growing discourse on rural environmental behaviour by bridging attitudinal perception with statistical validation. It indicates that while ecological motivation is robust at the advocacy level, further sensitization is needed at the creative and production level. Future research should explore intervention strategies that translate environmental intent into design-led innovation, particularly within artisanal and informal markets.

CONCLUSION

The study establishes that environmental safety is the most influential factor driving the advocacy of eco-friendly ornaments among rural consumers, highlighting a growing environmental consciousness at the grassroots level. However, the integration of environmental considerations during the design phase remains limited, with durability cited most frequently but lacking significant variation. This suggests that while consumers recognize ecological benefits such as energy saving and fossil fuel alternatives, these motivations are not fully reflected in early-stage product development. The findings underscore the need for targeted awareness and capacity-building interventions to bridge the gap between environmental intent and sustainable design practices. Promoting ecological literacy and design-oriented training can enhance rural sustainability efforts and support the broader goal of environmentally responsible consumption and production.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the farmer respondents during the course of the research.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The authors declare that during the preparation of this work, thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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