Evaluating the Suitability of Natural Fibre Boards as Sustainable Alternatives in Interior Applications

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***Abstract*—This study investigates the acceptance and suitability of natural fibre boards specifically agricultural-waste-based composites as sustainable alternatives in interior applications. The research addresses the observed hesitation among users regarding durability, performance reliability, and cost-effectiveness despite increasing awareness of sustainable practices. A mixed-method approach was used, incorporating a comprehensive literature review and a structured survey distributed to a diverse audience including students, business professionals, and designers. Survey findings reveal high awareness of sustainability, strong environmental motivation, and willingness to adopt eco-friendly boards—conditional upon proven durability and performance. Literature analyses support the potential of natural fibres for interior products, highlighting sustainability, insulation, and versatility, while also identifying gaps in standardisation and market awareness. The study concludes that although natural fibre boards are well-received conceptually, greater user trust depends on performance validation and material familiarity. The findings offer direction for manufacturers, designers, and policymakers to promote broader adoption of sustainable composite boards in interior environments.**

***Index Terms*—Natural fibre boards; Sustainable materials; Agricultural-waste composites; User perception; Interior applications; Material adoption.**

I. Introduction

Sustainability has become a critical focus area within interior design, driven by environmental concerns, health awareness, and a shift towards eco-conscious material choices. With rapid urbanisation and resource depletion, the need for alternative, responsibly sourced materials has become more pressing. Natural fibre boards made from agricultural waste (such as bagasse, rice husk, and jute) offer a promising direction due to their biodegradability, low embodied energy, and reduced environmental impact.

Despite these advantages, a notable gap exists between awareness and actual adoption. Many users remain unsure about durability, long-term performance, and availability. This uncertainty forms the basis of the research problem. The literature review conducted reveals strong scientific support for natural fibre composites, yet adoption at consumer level remains limited.

This study aims to evaluate user perception, willingness to adopt, and factors influencing acceptance of natural fibre boards. The paper integrates a structured survey, hypotheses, variable analysis, and literature insights to form a comprehensive review of suitability and acceptance trends in the interior design sector.

II. AIM, OBJECTIVES & SCOPE

1) Aim

To evaluate the functional, aesthetic, and environmental suitability of natural fibre boards for interior applications.

2) Objectives
   - Examine market availability and variations of natural fibre boards.
   - Evaluate performance in strength, durability, and maintenance.
   - Analyse aesthetic adaptability in interiors.
   - Identify environmental benefits.
   - Determine barriers and opportunities for adoption.
3) Scope
   Focuses on natural fibre boards used for interior elements such as wall panels, partitions, and furniture.
4) Limitations
   Does not cover structural applications or compare all sustainable materials; limited to boards relevant to interiors.

III. MATERIAL AND METHODS

1) Research Design
   A quantitative survey-based study supported by qualitative interpretation. Literature review was used to establish context and identify gaps.
2) Tools and Data Collection
   - Google survey circulated among students, working professionals, designers, and general users.
   - Charts (to be inserted by you) representing awareness, trust, priorities, and willingness-to-adopt.
3) Variables
   - **ndependent Variable (IV):** Type of material used (agri-waste natural fibre boards vs. conventional boards like plywood/MDF).
   - **Dependent Variable (DV):** User acceptance (trust, durability perception, preference, willingness to adopt/pay).
4) Hypotheses
   The hypotheses for this study were developed to examine how the type of material used—specifically agricultural-waste natural fibre boards—affects user acceptance within interior applications. Since durability, performance confidence, and awareness emerged as major determinants in the survey and literature, these factors form the basis of the dependent variables. The study hypothesises that natural fibre boards can positively influence user willingness to adopt sustainable alternatives, particularly when their durability and environmental benefits are understood. Correspondingly, null hypotheses state that there is no relationship between material type and user acceptance. Additional question-based hypotheses explore whether increased awareness, proven durability, and performance equivalence can significantly shift user preferences toward natural fibre boards. Together, these hypotheses guide the research by linking user perception with material characteristics, enabling a structured evaluation of acceptance patterns.

   A. Declarative Hypothesis
   Natural fibre boards increase user willingness to adopt sustainable materials.

IV. LITERATURE REVIEW

1) Natural Fibre Boards - Cárdenas-Oscanoa, 2024
   This review highlights the potential of natural fibre insulation boards, discussing adhesives, board performance, thermal properties, and sustainability benefits. The paper emphasizes that natural fibres show promising mechanical and insulation values comparable to commercial boards. Limitations include lack of standardized testing, inconsistent performance between fibre types, and minimal market penetration.

Author & Year	Purpose of the Study	Method Used	Key Findings	Limitations / Gaps
Cárdenas-Oscanoa, 2024	To review product types, adhesive technologies and performance of natural-fibre boards/insulation.	Systematic literature review and product/adhesive analysis.	Natural-fibre boards show thermal/acoustic benefits; bio-binders promising; variability in mechanical performance.	Broad scope but limited interior-design focus (user perception, installation, aesthetics); lacks standardised interior-testing protocols.

2) Developing Engineered Wood Products from Natural Fibers — Limbaro (2025)
Limbaro's work focused on developing engineered wood products using locally sourced natural fibres in the Philippines. The study demonstrated improved environmental performance, feasibility for interior products, and material strength comparable to existing boards. Limitations included scaling challenges and limited consumer awareness, echoing the adoption gap seen in this research.

Author & Year	Purpose of the Study	Method Used	Key Findings	Limitations / Gaps
Limbaro, 2025	To investigate use of local natural fibres/agri-residues for engineered wood products for regional sustainability.	Mixed methods: review of raw materials + experimental trials + supply-chain/socio-economic discussion.	Agricultural residues can manufacture fibreboards; local circular economy benefits; viable production pathways indicated.	Region-specific; lacks quantified interior use performance; limited designer/user perception and standards information.

3) Sugarcane Bagasse & Jute Fibre Reinforced Bio-Composite Boards
Researchers found that sugarcane bagasse and jute fibre bio-composite boards show improved density, tensile strength, and stability when combined with suitable binders, making them comparable to low-density commercial panels. The materials offer benefits such as low embodied energy, biodegradability, and effective use of agricultural waste. However, they remain sensitive to moisture and require controlled manufacturing, with performance varying by fibre treatment. These issues align with user concerns about durability and reliability, highlighting the need for standardisation and better user awareness.

Author & Year	Purpose of the Study	Method Used	Key Findings	Limitations / Gaps
Ariharasudhan ,2024	To evaluate mechanical & thermal behaviours of bagasse-jute bio-composites for board/insulation use.	Experimental fabrication (varying fiber ratios + PVA binder) and lab testing (tensile, flexural, thermal conductivity).	Jute-rich mixes improved tensile/flexural strength; bagasse improved insulation; optimal mix produced balanced performance.	Lab-scale; only certain fiber/binder combos; no interior testing (moisture, finish, aesthetics).

V. SURVEY ANALYSIS

1) Factors Influencing Material Choice

Durability ranked highest, followed by cost and aesthetic considerations. Eco-friendliness was valued but not the top priority.

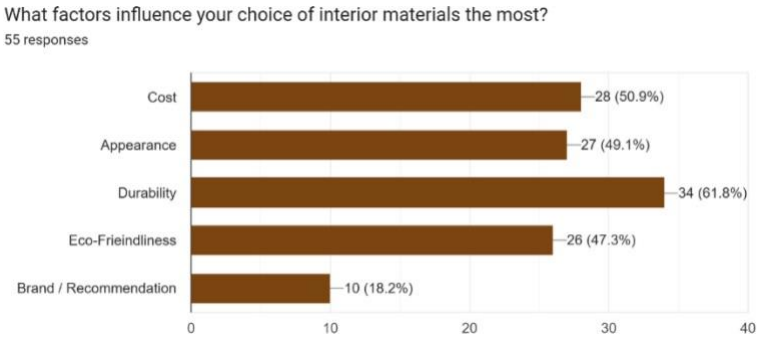

Figure 1. Key factors influencing material selection in interior applications.

2) Willingness to Switch to Eco-Friendly Boards

A majority expressed willingness to adopt natural fibre boards if performance is demonstrated.

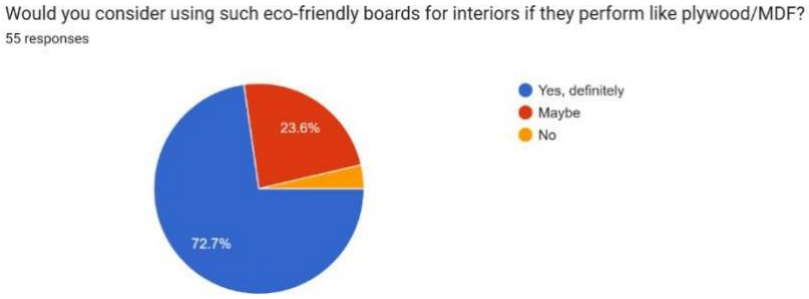

Figure 2. Willingness of respondents to switch to eco-friendly board materials.

3) Motivating Factors for Choosing Eco-Friendly Boards

Environmental protection was the strongest motivator, followed by health and sustainability values.

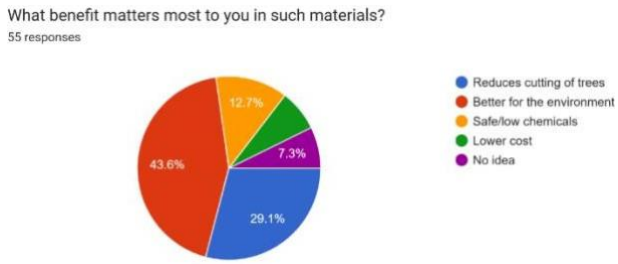

Figure 3. Factors motivating respondents to choose sustainable board materials.

4) Adoption Drivers for choosing eco friendly interior materials

Proven durability, awareness, and professional recommendation emerged as top drivers.

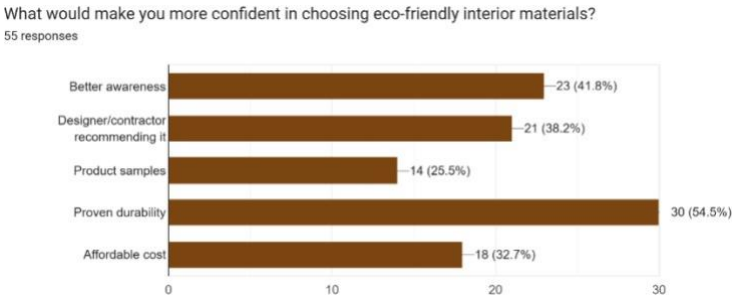

Figure 4. Factors motivating respondents to choose sustainable board materials.

5) Awareness of Agricultural-Waste Based Alternative Boards

Most respondents were aware of agricultural-waste board materials, while a smaller group remained uncertain.

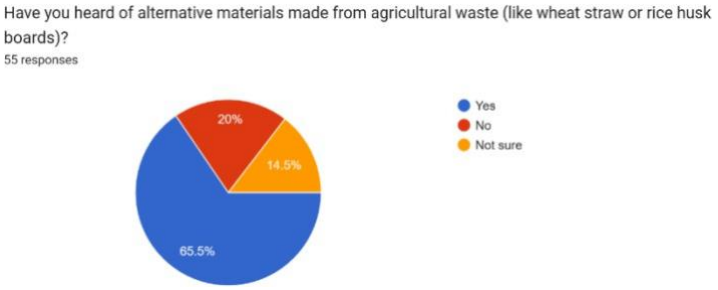

Figure 5. Awareness of agricultural-waste based alternative boards among respondents.

VI. DISCUSSION

Survey results indicate a strong conceptual acceptance of sustainable materials but reveal hesitation when it comes to adopting natural fibre boards specifically. Users prioritize durability, performance reliability, and affordability — aligning directly with the dependent variable (user acceptance). The findings validate the hypotheses that awareness, perceived durability, and performance influence acceptance.

The literature review supports the scientific viability of natural fibre boards but highlights gaps such as inconsistent performance data and limited market visibility. This aligns with user uncertainty identified in the survey.

The discussion suggests that increasing demonstrations, certifications, and professional endorsements can significantly increase market trust. Designers and manufacturers should focus on communicating performance metrics, showcasing case studies, and enhancing product visibility.

VII. CONCLUSION

The study concludes that natural fibre boards are perceived positively, and users show strong willingness to adopt them—provided that durability and reliability are demonstrated. Environmental motivation is high, but decision-making is still driven by practical factors. Literature findings and survey results collectively show that natural fibre boards have strong potential for interior applications if supported by awareness strategies, performance validation, and professional advocacy. Future studies may involve experimental testing, prototype development, and material performance comparisons across different interior functions.

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