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Desiccated Coconut Meat And Coconut Husk As A By Products For Sustainability

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Abstract. *This study explores the potential of desiccated coconut meat and coconut husk as sustainable materials for furniture and household items, assessing their durability, strength, and resistance as alternatives to traditional wood. A quantitative experimental approach was used, exposing coconut-based furniture prototypes to moisture and heat and analyzing results with One-Way ANOVA. Findings showed excellent durability and strength (both rated 5, Excellent Quality), comparable to wood, while resistance was slightly lower (4, Good Quality). Despite this, their renewable nature and ability to reduce agricultural waste make them a viable option. This study underscores the practical and environmental benefits of repurposing agricultural by-products, reducing reliance on virgin wood, and promoting sustainability. The findings supported waste-to-resource innovation and provide a foundation for further research in eco-conscious material development.*

Keywords: *Desiccated coconut, Coconut husk, Sustainable materials, Eco-friendly furniture, Durability, Strength, Resistance, Waste repurposing, Sustainability.*

Introduction

Coconut is known as the "Tree of Life" due to its versatility, as all its parts can be used for various materials. A few examples of coconut use included fresh or dried coconut flesh, which had a high fat content, making it a valuable ingredient in cooking and baking. The green nut's juice, coconut water, was a refreshing beverage rich in nutrients and electrolytes. Copra, the dried extracted kernel or meat from which coconut oil, a significant vegetable oil, was produced, was another valuable product of the harvested coconut, as cited by Melissa Petruzello (2025). Coconut shells were often used for crafting bowls, utensils, and charcoal, while the fibers, or coir, were processed into ropes, mats, brushes, and mattresses.

Harvesting coconut fruit was essential for producing globally utilized edible products, such as coconut oil, by small owners and large producers worldwide in the food, cosmetics, and pharmaceutical industries. Concerns had arisen due to the substantial amount of agro-industrial residue generated in this process, which posed environmental risks if it was not adequately managed.

Currently, Coconuts are produced and commercially exploited in over 90 countries, accounting for an annual worldwide production of 64 million tons of fruits. Indonesia, the Philippines, and India were the largest producers, with 17.5 Mt, 14.7 Mt, and 11 Mt of Coconut produced per year in a harvest area of 2.8, 3.6, and 2.2 million ha, respectively. Indonesia and the Philippines were also the leading suppliers of coconut fruit (fresh, dried, or dissected) and its derived products (32.1% and 24.2% of the total amount of exported products).

Innovation was a key driver of economic and social development in European countries. Through innovation, they can enhance efficiency, productivity, quality of life, and sustainability and maintain competitiveness in a globalized and technological world. Being innovative in the present time is crucial not only for the development of a country but also for personal growth. Various European countries have undertaken specific initiatives to foster innovation in industry, mobility, renewable energy, and fashion sectors. It must be utilized to shape and guide these nations towards a sustainable future fully aligned with the Sustainable Development Goals (SDGs). This must examine the relationship between innovation, SDGs compliance, and overall competitiveness. Without this understanding, effective policymaking and utilizing innovation's potential as a catalyst for sustainable growth will be impossible. (Shyla Del-Aguila-Arcentales, 2023)

Transforming vegetable waste into valuable resources was an approach in contributing to sustainable waste management. For instance, anaerobic digestion of vegetable waste can produce biogas, a renewable energy source. Additionally, advanced composting techniques can convert vegetable waste into nutrient-rich organic fertilizers, enhancing soil health and reducing the need for chemical fertilizers. Biotechnology innovations also enable the extraction of valuable compounds like pigments, antioxidants, and enzymes from vegetable waste for use in food, cosmetics, and pharmaceuticals. These methods reduce waste and support the development of sustainable products within a circular economy. (Yingdan Zhu 2023)

Coconut meat is the white, fleshy part of the fruit, rich in nutrients such as healthy fats, fiber, and essential minerals. The milk was extracted from the meat through grating, resigning, and filtering to achieve the desired desiccated coconut. This finely shredded coconut can now be used in various products.

However, after extracting these products from the coconut, dried or desiccated coconut often becomes waste, creating an environmental problem if not managed properly. While it could be used as compost, such methods were considered underutilizing its potential. Instead of discarding it, desiccated coconut can be repurposed into alternative materials for practical and creative uses, including functional and decorative items.

For instance, desiccated coconut can be processed into particle boards, which are lightweight and durable, making them suitable for furniture or wall panels. It can also be integrated into biodegradable composite materials, which are increasingly popular in sustainable construction. The material's texture and natural appeal make it ideal for crafting home decor items like lampshades, photo frames, and table centerpieces. By innovatively repurposing desiccated coconut, we reduce waste, create valuable products that support sustainability, and promote eco-friendly practices.

With the desiccated coconuts and husk, fine texture was a key reason for its unreliability in furniture making; this characteristic could be addressed by incorporating an adhesive solution. Mixing desiccated coconut and its husk with appropriate binders or resins could mold and structure it into durable furniture components, opening new possibilities for use in this sector.

According to Kyung-Nam Kim (2023), a chemical reaction occurs when a resin is mixed with a powder. This reaction was often initiated by adding a hardener or catalyst, which triggers the resin to polymerize and harden. The resin acts as a binder, encapsulating the powder particles and creating a strong bond between them. This binding process ensures that the powder particles are held together firmly, resulting in a solid and cohesive material. Combining resin and powder creates a composite material that is more durable than the individual components alone. The resin provides flexibility and resistance to environmental factors, while the powder adds strength and stability1.

This makes the mixture resistant to wear, impact, and other forms of mechanical stress. This technique was widely used in various industries, such as construction, automotive, and art. For example, resin-modified powders were used in construction to create strong, durable coatings and adhesives.

Desiccated coconut byproducts, particularly coconut husk, were rich in lignocellulosic materials, including cellulose, hemicellulose, and lignin. According to Barba et al. (2020), these fibers exhibit excellent mechanical properties, such as high tensile strength and resistance to moisture, making them suitable for composite materials. Additionally, Ali (2019) observed that coconut fibers were lightweight, biodegradable, and resistant to fungal growth, which was particularly advantageous for outdoor furniture exposed to harsh weather conditions.

Statement of the Problem

This study reused desiccated coconut meat and coconut husked as a by-product for sustainability in Diplahan National High School, S.Y. 2025.

Specifically, this study sought to achieve the following objectives:

1. What is the level of desiccated coconut meat and coconut husk as a by-product for sustainability in terms of:

1.2 Durability

1.2 Strength

1.3 Resistance

2. What is the level of wood items in terms of durability, strength, and resistance?

3. Is there a significant difference between wood items, desiccated coconut meat, and coconut husk as products for sustainability?

Methodology

The research applied a quantitative-experimental research design to determine the feasibility of dried coconut meat and coconut husk as eco-friendly substitutes for use in furniture-making. The researchers sought to examine the durability, strength, and resistance of the materials when subjected to different environmental conditions, more specifically moisture and heat. As a starting point, the coconut meat and husk were first separated, shredded, and then boiled. The treated raw materials were then blended with wood adhesive in a proportion of 500 grams of coconut by-product per 250 milliliters of adhesive. The blend was put into moldings to produce desired shapes, sun-dried, and then varnished to produce finished prototypes. The furniture samples were subject to controlled testing, and their performance against weight loss, structural integrity, and appearance was evaluated over a period of five days. Equipment like a blender, casserole, measuring cups, mixing bowls, and molding containers were utilized in the manufacturing process. In data analysis, researchers used a One-Way Analysis of Variance (ANOVA) to check if there were statistically significant

differences in coconut-based furniture performance when compared to the conventional wood. This research strategy enabled the researchers to rigorously evaluate the prospect of using agricultural by-products for sustainable material consumption.

Results and Discussion

This chapter analyses and interprets the data gathered from the results of Converting Desiccated Coconut Meat and Coconut Husk into Useful Furniture.

The study on Desiccated Coconut Meat and Coconut Husk as Products for Sustainability led to the following results:

Level of desiccated coconut meat and coconut husk as a by-product for sustainability

The desiccated coconut meat and coconut husk exhibited high durability and strength, receiving an Excellent Quality rating. The resistance score of 4.6, classified as Good Quality, suggests that while the material was resilient, it may require minor refinements to enhance its ability to withstand environmental factors. With an average mean score of 4.6, the material falls under the Good Quality category, indicating that it was a strong and durable alternative but may benefit from slight improvements in resistance for optimal performance.

Table 1 (The result of the quality of the desiccated coconut meat and coconut husk as products)

Quality	Score	Level of Quality
Durability	5	Excellent Quality
Strength	5	Excellent Quality
Resistance	4	Good Quality
Average Mean	4.6	Good Quality

Figure 4. illustrates that durability and strength achieved the highest rating of 5, which is classified as Excellent Quality, while resistance scored 4, indicating Good Quality.

Level of wood items in terms of durability, strength, and resistance

The wood items exhibited high durability, strength, and resistance, receiving an Excellent Quality rating. With an average mean score of 5, the results indicated that the material maintains exceptional performance across all evaluated criteria. This suggests that the wood items were highly durable, structurally strong, and capable of withstanding environmental factors.

Table 2 (The resulted of the quality level of wood items)

Quality	Score	Level of Quality
Durability	5	Excellent Quality
Strength	5	Excellent Quality
Resistance	5	Excellent Quality
Average Mean	5	Excellent Quality

Figure 4: Demonstrates that all parameters (durability, strength, and resistance) scored 5, indicating Excellent Quality across all factors.

Comparison between Desiccated Coconut Meat and Coconut Husk as Products to Wood Items

The comparison of desiccated coconut meat and coconut husk with wood items shows significant differences in quality parameters. Wood items achieved the highest average mean score of 5.00 and were classified as "Excellent Quality." Meanwhile, desiccated coconut meat and coconut husk had a slightly lower average mean score of 4.6, placing them in the "Good Quality"

category. However, the difference between the two materials was minimal rather than substantial, indicating that desiccated coconut-based material demonstrates considerable potential as a sustainable alternative.

Table 4 (Comparison between Desiccated Coconut Meat and Coconut Husk as Products to Wood Items)

Product	Durability	Strength	Resistance	Average Mean	Level of Quality
Desiccated Coconut Meat and Coconut Husk as Products	5	5	4	4.6	Good Quality
Wood Items	5	5	5	5	Excellent Quality

Figure 5: Shows that while wood items maintain consistently high scores across all criteria, desiccated coconut-based material scored slightly lower in resistance, contributing to its overall classification as Good Quality.

ANOVA Results

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Value	P-Value
Between Groups	1.80	1	1.80	6.00	0.004
Within Groups	1.20	4	0.30		
Total	3.00	5			

Figure 6: Comparison of Mean Scores for Desiccated Coconut-Based Furniture and Wood Items.

We obtained an F-value of 4.80 and a p-value of 0.004 based on the ANOVA results. Since the p-value is less than 0.05, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). This indicates a statistically significant difference in the quality of furniture made from desiccated coconut meat and coconut husk compared to wood items. The findings suggest that while desiccated coconut-based materials exhibit strong potential, they require further refinement.

Conclusions

In line with the conclusions, the study established that desiccated coconut meat and coconut husk had a high level of potentiality as sustainable alternatives to conventional wood in furniture manufacture. The two materials showed very high durability and strength, clearly proving their resistance to high levels of stress and retaining structural stability over time. While their resistance to environmental elements was lower compared to wood, they still qualified for a good quality rating, signifying their suitability for everyday use with slight improvements. The tiny disparity between the two in terms of overall quality reflected the potential for using agricultural by-products to decrease virgin wood reliance, lower waste levels, and promote environmental sustainability. Their use was in line with the principles of a circular economy and highlighted the critical role of innovative use of materials in sustainable development.

Recommendations

Based on the findings, the researchers suggested further improvement to enhance the performance of desiccated coconut meat and husk, particularly in resistance through the application of improved binding agents or protective coatings. It was proposed that wood glue alternatives be sought and mechanical methods, including compression molding or press-drying, be utilized to enhance the structural consistency and durability of the end products. The research also suggested that the use of coconut-based

materials be extended from indoor furniture to outdoor and construction uses. In addition, public awareness promotion and industry adoption of these green alternatives were considered necessary. Educational campaigns, industry partnerships, and policy efforts were urged to promote the use of coconut by-products and further environmentally friendly material innovation.

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