Mastering the Circular Economy: Integrating Sustainable Business Practices and Advanced Waste Management Solutions

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https://doi.org/10.35609/gcbssproceeding.2024.1(79)

ABSTRACT

Objective: This study aims to connect the potential of agricultural waste from plantain, coconut, rice, and maragnon (Maragnon) for the production of composite materials, addressing environmental sustainability and waste management challenges. Utilizing a structured decision-making tool, the Fuzzy Analytic Hierarchy Process (Fuzzy AHP), the research seeks to identify the most viable agricultural waste type that can contribute effectively to eco-industrial development and regional industrial symbiosis. Methodology: The Fuzzy AHP methodology was applied to systematically evaluate and prioritize four types of agricultural wastes based on criteria integral to sustainable development. These criteria include relevance to Sustainable Development Goals (SDGs), economic viability, technological feasibility, and environmental impact. This method allowed for a comprehensive analysis, balancing multiple perspectives to determine the optimal use of agricultural waste. Main Findings: The analysis revealed that plantain waste holds the highest potential for development into composite materials, primarily due to its superior alignment with SDGs and its economic and environmental benefits. Coconut, rice, and maragnon wastes also showed significant potential but ranked lower in comparison to plantain due to various practical and sustainability-related factors. Limitations: While the Fuzzy AHP provided a robust framework for analysis, the study acknowledges limitations in the availability and reliability of data concerning the long-term sustainability impacts of agricultural waste utilization. Furthermore, the inherent subjectivity in expert judgments and the variability in regional agricultural practices could influence the generalizability of the results.

Keywords: Q53 - Water Pollution; Solid Waste; Recycling.O13 - Economic Development: Agriculture; Natural Resources; Energy; Environment; Other Primary Products. Q01 - Sustainable Development. Q56 - Environment and Development; Sustainability.