

Ecology, Environment and Sustainable Ecosystems

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Sustainability Prospects of Plant-Origin Packaging Materials in Comparison to Conventional Plastics

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and Desh Deepak³***

ABSTRACT

The growing environmental consequences of plastic pollution have increased global interest in sustainable packaging alternatives. This study evaluates the sustainability of plant-based packaging materials by assessing their environmental, economic, and social performance. Focusing on polylactic acid (PLA), starch-based plastics, cellulose films, and bagasse packaging, it compares these materials with conventional petrochemical plastics using lifecycle assessment indicators such as biodegradability, carbon footprint, resource use, and end-of-life outcomes. Results show that plant-based packaging generally provides notable environmental advantages, including reduced greenhouse gas emissions, lower fossil fuel dependence, and better degradability under suitable conditions. However, challenges such as higher production costs, limited composting infrastructure, scalability issues, and trade-offs in land and water use remain significant barriers. Economic analysis indicates growing market potential driven by consumer awareness and supportive policies, while

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