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FROM WASTE TO WORTH AND WEALTH: CIRCULAR MATERIALS DEVELOPMENT AND ENVIRONMENTAL ASSESSMENT

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Abstract

By reducing waste and optimizing resource efficiency, the circular economy offers a framework for promoting social cohesion, closing gaps, and reviving local economies. Urban by-product valorization can greatly improve material recovery, fostering responsible production and consumption (SDG 12) and the growth of sustainable cities and communities (SDG 11). This research, contextualized in Milan's peri-urban area, aimed to actively engage the community to reduce socio-economic fragility by exploiting territorial resources and generating local stakeholder synergies. The study identified and repurposed two abundant agricultural by-products, wheat straw (WS) and rice straw (RS), to create mulching discs and eggs packaging, respectively. To support local initiatives and associations, the artefacts were produced incorporating artisanal processes using available resources and technologies. Such straw-based products environmental performance was compared to that of currently available commercial alternatives through a Life Cycle Assessment (LCA). The findings show that wheat straw mulching discs have a lower environmental impact than their jute counterparts, especially for water consumption, eutrophication, and ozone depletion. Rice straw-based egg packaging is beneficial under the climate change impact category as against the polystyrene one; however, the presented production method achieved a higher environmental impact, opening to further optimization. This study confirms that bio-based materials like agricultural residues might be used to create sustainable products, promoting circular production models.

Key words: by-products valorization, circular economy, environmental impact, LCA

Received: May, 2025; Revised final: September, 2025; Accepted: September, 2025; Published in final edited form: October, 2025

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