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# Harnessing Biochar to Support Sustainable Development Goals: A Greener Approach

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## ABSTRACT

Biochar, a stable carbon rich material produced through the pyrolysis of biomass, has emerged as a promising tool in addressing multiple global challenges aligned with the United Nations Sustainable Development Goals (SDGs). Its multifunctional properties make it a green solution for improving soil health, enhancing crop productivity, mitigating climate change and managing organic waste. The present title explores the potential of biochar as a sustainable and integrative approach to support various SDGs, particularly those related to zero hunger (SDG 2), clean water and sanitation (SDG 6), climate action (SDG 13), and life on land (SDG 15). The application of biochar to the soils improves nutrient retention power, water holding capacity and microbial activity, leading to enhanced soil fertility and crop yields. At the same time, it offers a long-term carbon sequestration pathway, contributing to the reduction of greenhouse gas emissions and climate mitigation. Additionally, biochar can aid in waste valorization by utilizing agricultural residues, municipal waste, and other biomass sources, thus promoting responsible consumption and production (SDG 12). Despite its benefits, the widespread adoption of biochar faces challenges such as variable quality, lack of standardized guidelines, economic feasibility, and region-specific outcomes. Addressing these limitations through interdisciplinary research, supportive policy frameworks, and community engagement can enhance its integration into sustainable land and resource management strategies. This paper highlights the need for a systems thinking approach to scale up biochar use while ensuring environmental safety, economic viability and social acceptance. By aligning biochar applications with national and global sustainability agendas, it has the potential to serve as a pivotal tool in transitioning toward greener, more resilient agricultural and environmental systems. Harnessing biochar in this way offers a compelling path forward in achieving a more sustainable and equitable future.

**Keywords:** biochar, sustainable development goals (SDGs), soil health, climate change mitigation, sustainable agriculture

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