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Sustainable biofuel production in Sub-Saharan Africa: Exploring transesterification process, nonedible feedstocks, and policy implications

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Abstract

The world is currently dealing with an energy crisis, primarily due to heavy reliance on finite fossil fuels and the associated rise in energy demand. In response to this crisis, replacing heavy reliance on finite fossil fuels with biodiesel has gained attention as an alternative solution. Sub-Saharan African (SSA) biodiesel studies have traditionally focused on improving transesterification but overlook socio-economic, policy, and institutional impacts on production sustainability. To address this gap, this study comprehensively reviews the sustainability of transesterification-based biodiesel production from nonedible feedstocks in SSA. The study's incorporation of socio-economic factors, policy considerations, sustainability concerns, and institutional frameworks reveals the complex prospects and challenges facing biodiesel production in SSA. The findings reveal that sustainability challenges in SSA stem from a lack of an integrated approach, resulting in conflicting local and global policies. The study determines that neglecting socio-economic factors, policy considerations, sustainability concerns, and institutional frameworks weakens regional biodiesel production sustainability. Evidence from the study emphasizes the role of an integrated approach in promoting biofuel production, establishing markets, and improving the livelihoods of the region's population. Furthermore, the review shows that transesterification can yield biodiesel with comparable physical properties to conventional diesel, making it a wide region's favored option.