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Analyzing the economics of agroforestry within land use and land cover change: the case of the baga-kisimagonja ecological corridor of Tanzania

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Abstract

Deforestation poses significant ecological, economic, and social challenges globally. Tanzania, in particular, faces an alarming annual loss of 469,000 hectares of forest, primarily driven by unregulated agricultural expansion.

The magnitude of deforestation is, however, spatially heterogeneous, arguable to be higher in the productive agro-ecological landscapes such as in ecological corridors. Agroforestry systems and specifically Silvo-arable, offer a promising solution by balancing agricultural productivity with conservation goals. Their adoption, however, remains restrained due to limited awareness on economic viability and perceived risks among farmers. This study assessed the land use land cover changes of Baga Kisimagonja ecological corridor (BKG) in Tanzania between 1992 and 2022. The study further employs a probabilistic cost-benefit analysis (PCBA) to assess the economic viability of traditional agroforestry practices in comparison to conventional crop farming. The findings indicate that over the study period, crop land expanded at an annual rate of about three to six percent while agroforestry grew at a rate of less than three percent. Forest land decreased by an average of two percent per annum. Such land use dynamics is associated to a net carbon loss of 2.3 to 3.5 kt C year⁻¹, valued at approximately 18,771 to 32,681 USD year⁻¹. Additionally, our analysis showed that agroforestry systems are economically viable compared to conventional crop farming and more so when carbon benefits are integrated. We conclude that agroforestry has the potential to mitigate deforestation and enhance long-term land-use resilience if implemented effectively. The findings of this study are important to guide policymakers, farmers, and conservation organisations in making informed investments in agroforestry technologies and practices to restore the degraded ecosystems.

Keywords: Agroforestry, Carbon sequestration, Conventional farming, deforestation, PCBA