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"Reconcile land system changes
with planetary health"

Impact of forest landscape restoration on mitigating erosion: A systematic review

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Abstract

Forest Landscape Restoration (FLR) is increasingly vital for balancing ecosystem functionality with sustainable land use amid growing pressures from deforestation. Erosion mitigation, central to soil health and ecosystem services, is a key benefit of FLR with direct implications for planetary health. Yet, the effectiveness of FLR varies widely, and fragmented evidence makes it difficult to determine what works, where, and why, limiting effective planning and implementation. This systematic literature review, conducted in accordance with PRISMA guidelines, synthesizes evidence to identify the most effective FLR practices and explores the factors driving variability in their effectiveness. The review shows that 57.5 % of studies use predictive or simulation methods, while 27.5 % rely on empirical observations. Consistent with previous research, land use and land cover emerge as critical determinants of soil erosion, alongside slope gradient and rainfall intensity. Overall, FLR effectiveness is shown to be highly context-dependent, shaped by a combination of exogenous factors (e.g., environmental conditions) and endogenous ones (e.g., vegetation characteristics). Based on these insights, we propose a decision-making framework to: (i) support context-specific selection of FLR practices, (ii) guide initial decision-making processes, and (iii) emphasise the importance of empirical validation. Given the multiple interacting factors influencing FLR outcomes, trade-offs are often unavoidable. Despite the span of existing literature, significant research gaps remain, particularly the overrepresentation of studies from China (60 % of case studies) and the limited exploration of factor interactions, multi-method validation, and unintended consequences. These findings emphasise the need to move beyond one-size-fits-all restoration approaches toward optimising land management practices under diverse conditions. Future research should focus on refining the proposed framework through experimental validation and expanding its geographical scope.

Keywords: Effectiveness, forest landscape restoration, soil erosion, study contexts

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