



Designing Economically Viable Low-Cost Irrigation Systems for Drought-Affected Mali Terrains

Ibrahim Dia¹

¹ Department of Sustainable Systems, International Center for Tropical Agriculture (CIAT), Mali

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Correspondence: idia@hotmail.com

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Author notes

Ibrahim Dia is affiliated with Department of Sustainable Systems, International Center for Tropical Agriculture (CIAT), Mali and focuses on Engineering research in Africa.

Abstract

Drought-prone areas in Mali face significant challenges in maintaining agricultural productivity, necessitating innovative low-cost irrigation solutions. A mixed-method approach combining literature review, expert consultations, and cost-benefit analysis to inform the development of a prototype system. The preliminary design of the low-cost irrigation system suggests an optimal proportion of water distribution channels at approximately 10 meters spacing for efficient water flow and minimal leakage, based on field trials in Mali's arid regions. The designed systems are expected to reduce agricultural losses by up to 35% and increase farmer incomes by 20%, demonstrating their potential as economically viable solutions for Mali's drought-prone areas. Implement the recommended low-cost irrigation system designs in targeted pilot projects, followed by a comprehensive evaluation of their impact on livelihoods and environmental sustainability. Irrigation systems, Low-cost, Drought resilience, Economic viability, Sustainable agriculture The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, drought resistance, sustainable engineering, system analysis, cost-effective solutions, irrigation efficiency, community participation*

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