African Maintenance Engineering

Designing Low-Cost Irrigation Systems in Mali: An Engineering Perspective

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Abstract

This study examines the design of low-cost irrigation systems to address water scarcity in drought-prone areas of Mali. The methodology involved a combination of site visits, farmer consultations, and the application of cost-benefit analysis to identify optimal irrigation technologies. Initial assessments indicated that solar-powered drip irrigation systems were particularly effective, reducing water usage by up to 30% in the driest regions compared to traditional flood irrigation methods. The findings suggest a significant potential for scaling these low-cost solutions across Mali's agricultural landscape, enhancing both productivity and sustainability. Farmers should be provided with subsidies or loans to implement solar-powered drip irrigation systems, which are expected to yield substantial economic benefits in the medium term. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, irrigation engineering, sustainable design, water management systems, rural development, participatory methodologies, climate resilience*

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