



Low-Cost Irrigation Systems Design in Drought-Prone Mali Terrains: A Comparative Study

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Published: 03 May 2002 | **Received:** 31 December 2001 | **Accepted:** 04 March 2002

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DOI: [10.5281/zenodo.18745382](https://doi.org/10.5281/zenodo.18745382)

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Abstract

Drought-prone areas in Mali require innovative low-cost irrigation systems to ensure agricultural productivity and food security. Field surveys were conducted using Geographic Information Systems (GIS) to map terrain features. A comparative analysis of system performance metrics was performed using a linear regression model with robust standard errors. In the Sahel region, systems utilising contour drip irrigation showed an average water efficiency improvement of 20% compared to traditional furrow irrigation methods. The study highlights the effectiveness of locally adapted low-cost irrigation designs in improving agricultural productivity and resilience against drought conditions. Recommendation for policymakers is to implement a phased approach with pilot projects before nationwide adoption. Irrigation design, Low-cost systems, Drought-resistant agriculture, Linear regression model

The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \varepsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Mali, Geographic Information Systems (GIS), Precision Agriculture, Sustainable Irrigation Practices, Low-Input Water Management, Crop Diversification, Adaptive Management

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