



# Smart Water Distribution Innovations for Irrigation in Northern Nigeria: Efficiency Gains and Cost Savings Analysis

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## Abstract

Irrigation in semi-arid regions of northern Nigeria is critical for sustainable agricultural production but often suffers from inefficient water distribution systems. A mixed-method approach was employed, combining field surveys with a proportional odds logistic regression model to analyse data collected over two seasons. Smart water distribution systems showed an average increase of 25% in system efficiency compared to traditional methods, achieving cost savings of 10 per hectare annually. The implementation of smart irrigation technologies significantly improved agricultural yield, with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Semi-arid, GIS, IoT, SWDS, Precision irrigation, Remote sensing, Sustainability

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