



Smart Village Irrigation Systems in Ethiopian Rural Areas: Metrics and Farmer Satisfaction

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Abstract

This study explores the implementation of smart irrigation systems in Ethiopian rural villages to enhance water efficiency and farmer satisfaction. A mixed-method approach was employed, including pre- and post-installation assessments using a validated irrigation efficiency metric (η) and structured farmer satisfaction surveys. Water usage decreased by an average of 15% in treated areas compared to controls, with farmer satisfaction scores increasing by 20% on a Likert scale. The smart irrigation systems demonstrated significant improvement in water efficiency and enhanced farmers' livelihoods. Further research is recommended to assess long-term sustainability and scalability of these systems across different climatic zones. smart irrigation, water efficiency, farmer satisfaction, Ethiopian rural areas Model estimation used $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \operatorname{Vert}\theta \operatorname{Vert}^2$, with performance evaluated using out-of-sample error.

Keywords: Ethiopia, Geospatial Analysis, Sensor Networks, Precision Agriculture, Rural Development, Quantitative Metrics, Qualitative Research

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