



Time-Series Forecasting Model for Risk Reduction in Off-Grid Communities Systems in Uganda,

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Abstract

Off-grid communities in Uganda face challenges in accessing reliable electricity sources, particularly for irrigation systems which are crucial for agricultural productivity. A time-series forecasting model was developed using ARIMA (AutoRegressive Integrated Moving Average) methodology with robust standard errors for uncertainty quantification. The model predicted a 20% reduction in energy supply disruptions, highlighting the potential of solar energy systems to enhance agricultural resilience. The time-series forecasting model demonstrated effectiveness in evaluating off-grid community systems' reliability and provided insights into risk management strategies. Future studies should focus on integrating renewable energy solutions with local governance structures for sustainable development. The empirical specification follows $Y = \beta_{0+\beta} X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Agricultural, Economics, Time-Series, Forecasting, Sustainability, Modelling*

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