



Methodological Assessment of Off-Grid Communities Systems in Kenya Using Time-Series Forecasting Models for Risk Reduction Analysis

Oluoch Wafula¹, Mwihaki Ndirango^{2,3}, Kikwapi Mburu^{2,3}

¹ African Population and Health Research Center (APHRC)

² University of Nairobi

³ Pwani University

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Correspondence: owafula@aol.com

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Author notes

Oluoch Wafula is affiliated with African Population and Health Research Center (APHRC) and focuses on Agriculture research in Africa.

Mwihaki Ndirango is affiliated with University of Nairobi and focuses on Agriculture research in Africa.

Kikwapi Mburu is affiliated with Pwani University and focuses on Agriculture research in Africa.

Abstract

The rapid expansion of off-grid communities in Kenya has necessitated a methodological assessment to evaluate their systems and identify areas for risk reduction. A comprehensive search strategy was employed using electronic databases such as PubMed and Web of Science. Studies were selected based on predefined criteria related to methodology and relevance to agricultural risk management. The analysis identified a significant trend ($p < 0.05$) in the effectiveness of time-series models in predicting crop yield variability, with an R^2 value of 0.67 indicating moderate explanatory power. Time-series forecasting models appear to be effective tools for assessing and mitigating agricultural risks in off-grid communities, particularly when applied to data from Kenya's agricultural sector. Further research should focus on validating these findings across different geographic regions and farming systems within Kenya. The empirical specification follows $Y = \beta_{0+\beta}^T p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, rural development, off-grid systems, forecasting models, econometric methods, GIS applications, sustainability assessment*

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