



Methodological Evaluation of Smallholder Farm Systems in Uganda Using Time-Series Forecasting Models for Yield Improvement Analysis

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Abstract

Smallholder farming systems in Uganda face challenges such as unpredictable weather patterns, limited access to advanced agricultural technologies, and insufficient data on yield variability. This study employs ARIMA (AutoRegressive Integrated Moving Average) models to analyse historical agricultural data from selected regions in Uganda. Model parameters are estimated using maximum likelihood estimation, with a focus on minimising prediction errors within the time-series framework. This theoretical framework provides foundational insights into the utility of time-series forecasting for enhancing agricultural yield prediction among smallholder farmers in Uganda. The empirical evidence supports the potential benefits of adopting these models for improving overall farm productivity. Policy makers should consider supporting research and development initiatives that promote the adoption of robust predictive analytics tools within the Ugandan agricultural sector to address yield variability challenges effectively. The empirical specification follows $Y = \beta_{0+\beta} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, agroecology, econometrics, stochastic processes, spatial analysis, yield gap, time-series*

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