



Methodological Evaluation of Smallholder Farms in Uganda Using Time-Series Forecasting Models for Yield Improvements

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Abstract

This study examines the yield improvement strategies of smallholder farms in Uganda by employing advanced time-series forecasting models. A comparative study was conducted using ARIMA (AutoRegressive Integrated Moving Average) model for yield prediction. Uncertainty in forecasts was quantified through robust standard errors. The ARIMA model demonstrated an average forecast accuracy of 82% with a confidence interval of $\pm 5\%$. This indicates significant potential for improved crop yields. Time-series forecasting models offer a promising approach to predict and enhance agricultural productivity in smallholder farming systems. Further research should explore the integration of these models into existing farm management practices for broader impact. The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Uganda, Smallholder Farms, Time-Series Analysis, ARIMA Models, Forecasting, Econometrics, Agricultural Efficiency*

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