Methodological Evaluation and Time-series Forecasting Model for Monitoring Smallholder Farm Systems in Nigeria

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Abstract

Smallholder farming systems in Nigeria have been characterized by variability and unpredictability in yield and resource use efficiency. A comprehensive methodological evaluation was conducted, including statistical analysis of yield variability using mixed-effects models. A time-series forecasting model was developed and validated using autoregressive integrated moving average (ARIMA) methodology. The ARIMA model demonstrated a predictive precision for future yields with an R-squared value of 0.85 and a 95% confidence interval around the forecasts. The time-series forecasting model provided insights into yield trends, allowing for more effective resource allocation by smallholder farmers in Nigeria. Farmers should utilise these predictive tools to enhance their management practices and improve overall farm performance. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African, Methodology, Smallholder, Farming, Systems, Evaluation, Forecasting*

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