Methodological Evaluation of Smallholder Farms Systems in Uganda Using Time-Series Forecasting Models for Reliability Assessment

Micheal Kasozi[1]**, Joseph Okello**[2]**, Catherine Apio**[2,3]**, Francis Nabwera**[3,4]

[1] Department of Advanced Studies, Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit

[2] Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit

[3] Department of Interdisciplinary Studies, Uganda Christian University, Mukono

[4] Gulu University

Author notes

Micheal Kasozi is affiliated with Department of Advanced Studies, Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit and focuses on Environmental Science research in Africa.

Joseph Okello is affiliated with Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit and focuses on Environmental Science research in Africa.

Catherine Apio is affiliated with Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit and focuses on Environmental Science research in Africa.

Francis Nabwera is affiliated with Department of Interdisciplinary Studies, Uganda Christian University, Mukono and focuses on Environmental Science research in Africa.

Abstract

Smallholder farms in Uganda face challenges such as unpredictable weather patterns, which affect their productivity and sustainability. A comprehensive search strategy was employed to identify relevant studies, focusing on methodologies such as ARIMA (AutoRegressive Integrated Moving Average) and SARIMAX (Seasonal AutoRegressive Integrated Moving Average with eXogenous regressors). The analysis revealed a significant proportion of model accuracy improvements when using SARIMAX over traditional ARIMA models in forecasting smallholder farm yields. SARIMAX outperformed ARIMA, demonstrating higher reliability and precision for forecasting yield variability under different climatic conditions. Future research should consider integrating exogenous variables to enhance the predictive power of time-series models for smallholder farms in Uganda. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Smallholder, Sustainability, Forecasting, TimeSeries, Evaluation, Methodology*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ REQUEST FULL PAPER

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge