



Methodological Assessment and Time-Series Forecasting of Smallholder Farm Systems in Rwanda: An Evaluation of Yield Improvement Strategies

Rugamba Habimana¹, Ingabiriro Ndayishimiye², Kigutu Musabyeza^{3,4}

¹ Rwanda Environment Management Authority (REMA)

² Department of Research, Rwanda Environment Management Authority (REMA)

³ African Leadership University (ALU), Kigali

⁴ University of Rwanda

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Correspondence: rhabimana@outlook.com

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Author notes

Rugamba Habimana is affiliated with Rwanda Environment Management Authority (REMA) and focuses on Environmental Science research in Africa.

Ingabiriro Ndayishimiye is affiliated with Department of Research, Rwanda Environment Management Authority (REMA) and focuses on Environmental Science research in Africa.

Kigutu Musabyeza is affiliated with African Leadership University (ALU), Kigali and focuses on Environmental Science research in Africa.

Abstract

Smallholder farming systems in Rwanda face challenges related to yield improvement due to climate variability and limited resource management strategies. A comprehensive search strategy was employed across various databases to identify relevant studies. Studies were assessed using predefined criteria and synthesized according to their methodologies and findings. The analysis revealed that the application of ARIMA (AutoRegressive Integrated Moving Average) time-series forecasting models significantly improved yield predictions by reducing forecast errors by an average of 15% over a five-year period in Rwandan smallholder farms. The systematic literature review underscores the effectiveness of ARIMA models for enhancing yield forecasting accuracy, providing valuable insights for policy makers and farmers aiming to optimise agricultural productivity. Policy makers should prioritise investment in research and development focused on improving resource management techniques. Farmers are encouraged to adopt more sustainable farming practices based on empirical evidence from this review. The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, smallholder farming, yield improvement, resource management, econometrics, time-series analysis, geographical information systems*

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