



Time-Series Forecasting Model for Risk Reduction in Smallholder Farms Systems in Rwanda,: Methodological Evaluation

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Abstract

Smallholder farms in Rwanda are vulnerable to agricultural risks such as climate variability and market fluctuations. A time-series analysis was conducted using econometric methods including ARIMA models. Uncertainty was quantified with robust standard errors and confidence intervals around forecasts. The model predicted a 15% reduction in crop yield variability compared to baseline scenarios, indicating potential for risk mitigation strategies. The time-series forecasting model showed promise for smallholder farms but required further validation through empirical testing. Further studies should incorporate additional variables and longitudinal data to enhance the model's predictive accuracy. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, econometrics, forecasting, smallholder farming, time-series analysis, risk management, spatial econometrics*

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