



Methodological Evaluation and Time-Series Forecasting for Yield Improvement in Ghanaian Smallholder Farm Systems,

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Abstract

This study examines the methodological evaluation of smallholder farms in Ghana to forecast yield improvements in the agricultural sector. A comprehensive review of existing literature on smallholder farming practices was conducted to identify methodologies used in Ghanaian farms. A time-series forecasting model based on ARIMA (AutoRegressive Integrated Moving Average) methodology was applied to forecast yield improvement over a five-year period, with uncertainty quantified using robust standard errors. The application of the ARIMA model demonstrated significant variability in yield improvements across different regions, with an average increase of 12% in maize yields predicted over the study period. Specific factors such as soil fertility management and irrigation practices were identified as critical influencers. The time-series forecasting approach validated its effectiveness for predicting yield improvement in Ghanaian smallholder farms, highlighting the importance of sustainable agricultural practices to enhance productivity. Further research should focus on integrating local knowledge and traditional farming methods into the model, while policymakers should promote investment in infrastructure and extension services to support farmers' adoption of improved technologies and practices. Ghanaian smallholder farms, yield improvement, time-series forecasting, ARIMA model, agricultural productivity. The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Ghana, Smallholder, Methodology, Forecasting, Time-Series, Econometrics, Agroecology

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