



Methodological Assessment and Time-Series Forecasting for Adoption Rates in Smallholder Farms Systems in South Africa,

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Abstract

The adoption rates of new agricultural technologies in smallholder farms systems have been a subject of interest for researchers aiming to understand and improve productivity. The study employed mixed-methods research including surveys and field observations to gather data on technology uptake in farms across various regions of South Africa. Time-series forecasting was conducted using a SARIMA model (Seasonal AutoRegressive Integrated Moving Average). A preliminary analysis revealed that the adoption rate for precision farming technologies varied significantly between different geographical regions, with an average adoption rate of 35%. The time-series forecasting models provided insights into potential future adoption patterns but highlighted challenges in data collection and technology accessibility across the country. Further research should focus on enhancing data collection methods to improve accuracy and consider implementing targeted interventions to increase adoption rates where necessary. The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Geography, Adoption Rates, Methodology, Smallholder Farms, Time Series Analysis, Quantitative Methods, Econometrics*

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