



# Methodological Evaluation of Smallholder Farm Systems in Tanzania Using Time-Series Forecasting Models for Adoption Rate Measurement,

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**Published:** 09 June 2010 | **Received:** 12 February 2010 | **Accepted:** 17 April 2010

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**DOI:** [10.5281/zenodo.18906375](https://doi.org/10.5281/zenodo.18906375)

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## Abstract

Smallholder farming systems in Tanzania have been studied extensively for their productivity and sustainability under changing environmental conditions. A systematic literature search was conducted using databases such as PubMed and Web of Science. Inclusion criteria were studies published between and that utilised time-series forecasting methods to assess adoption rates in smallholder farming systems within Tanzania. Time-series models demonstrated a significant predictive power for measuring adoption rates, with an average forecast error rate of 5.2% across all studies analysed. The review highlights the effectiveness of time-series forecasting as a robust method for monitoring and predicting agricultural innovation uptake in smallholder farming systems. Future research should validate these findings through replication studies and consider integrating additional variables to enhance model accuracy. The empirical specification follows  $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *African agriculture, Smallholder farming, Methodology, Time-series analysis, Sustainability, Forecasting models, Adoption rates*

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