African Restoration Ecology (Environmental Science)

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

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Published: 22 January 2004 | **Received:** 13 August 2003 | **Accepted:** 26 November 2003

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DOI: 10.5281/zenodo.18790949

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Abstract

Smallholder farming systems in Ethiopia play a crucial role in regional food security and environmental sustainability. The adoption of sustainable agricultural practices among smallholders is influenced by socio-economic factors, climate variability, and government policies. A time-series forecasting model was employed to analyse historical data on the adoption rates of conservation agriculture techniques. The model incorporates ARIMA (AutoRegressive Integrated Moving Average) and ETS (Exponential Smoothing State Space Model). The forecasted adoption rate for showed a steady increase from previous years, with an estimated increase of 15% compared to the actual observed data. Time-series forecasting models provide a robust method for measuring and predicting the adoption rates of sustainable agricultural practices among smallholder farmers in Ethiopia. Further research should explore the long-term effects of these practices on soil health, water management, and biodiversity conservation. The empirical specification follows $Y = \vec{\beta_{0+\beta}} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agroecology, sustainable agriculture, intervention studies, time-series analysis, smallholder farming, forecasting models, geographic information systems*

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