Methodological Assessment of Smallholder Farm Systems in Kenya Using Panel Data

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Abstract

This study focuses on methodological assessments of smallholder farm systems in Kenya, with a particular emphasis on leveraging panel data to evaluate system reliability. Panel data analysis was employed using a fixed-effects model to assess system reliability across different regions of Kenya. Econometric software was used to estimate the model, accounting for potential omitted variable bias through robust standard errors and likelihood-based inference. The panel-data estimation revealed significant variation in system performance across geographical zones, with some regions showing up to 20% higher yields when employing improved data collection methods. This study highlights the importance of consistent data collection protocols for enhancing the reliability of smallholder farm assessments. The fixed-effects model provided a robust framework for identifying systematic differences among regions. Researchers are encouraged to adopt standardised data collection practices, and policymakers should consider implementing incentives for improved agricultural data reporting in rural areas. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Pan-African, Smallholder Agriculture, Panel Data Analysis, Econometric Methods, Agroecology, Sustainability Metrics, Spatial Statistics*

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