



Methodological Evaluation of Smallholder Farm Systems in Nigeria Using Panel Data for Clinical Outcome Measurement

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Abstract

Smallholder farming systems in Nigeria are pivotal to agricultural productivity and rural livelihoods. However, little is known about their efficiency and effectiveness in achieving desired outcomes. A mixed-method approach was employed, combining quantitative panel-data analysis with qualitative case studies. Panel Data were collected from a representative sample of smallholder farms over two consecutive years. A Random Effects (RE) model was used to estimate clinical outcomes, accounting for unobserved heterogeneity and time-invariant variables. The RE model revealed an average treatment effect of 12% in favour of recommended agricultural practices, with significant variability across different regions and farm sizes. This study provides robust evidence on the impact of recommended interventions on smallholder farms' clinical outcomes. The findings underscore the importance of longitudinal data collection for evaluating long-term impacts. Future studies should consider expanding the sample size to increase generalizability and incorporate more detailed socioeconomic indicators to enhance model accuracy. The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Geographic Terms Related to Africa: Nigerian*

Methodological and Theoretical Terms: Panel data, econometrics, stochastic frontier analysis, household surveys, resource utilization, productivity measurement

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