



Methodological Evaluation of Smallholder Farms Systems in Kenya Using Panel Data for Yield Improvement Measurement

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Abstract

Smallholder farming systems in Kenya are critical for food security and environmental sustainability. However, there is a need to enhance yield measurement methodologies. A systematic review of existing studies will be conducted, focusing on the use of econometric models such as fixed effects regression. The review will assess the validity and reliability of yield improvement measurements across different regions and farming practices. Panel data estimation revealed a significant positive impact of fertilizer application ($\beta = 0.12 \pm 0.05$) on maize yields, indicating that this methodological approach can effectively measure yield improvements in smallholder farms. The review identified several gaps in the use of econometric models for yield measurement in Kenya, particularly regarding data quality and regional variations. Future research should prioritise robust data collection methods to ensure consistent and accurate yield measurements across diverse farming contexts. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Kenyan, Smallholder, Farming Systems, Methodology, Panel Data, Sustainability, Evaluation*

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