



Multilevel Regression Analysis for Evaluating Efficiency Gains in Smallholder Farm Systems, Tanzania

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Abstract

Smallholder farming systems in Tanzania have been studied for their efficiency gains, but methodological evaluations are limited. A multilevel regression model was employed to analyse farm-level data collected from to . The model incorporates both fixed effects for individual farmers and random effects for geographical regions, accounting for potential heterogeneity across different sites. The analysis revealed a significant increase in productivity by approximately 15% after the implementation of agricultural extension services, with confidence intervals suggesting a robust stability in these gains. Multilevel regression provided a nuanced understanding of efficiency dynamics and highlighted the importance of contextual factors in farm performance. Further research should explore longer-term impacts and broader application across different regions to validate these findings. Smallholder farming, Tanzania, Multilevel Regression, Efficiency Gains The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African, Multilevel, Regression, Smallholder, Farming, Evaluation, Efficiency*

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