



Methodological Assessment and Risk Reduction in Smallholder Farm Systems Using Difference-in-Differences Models: A Meta-Analysis in Kenya

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Abstract

Smallholder farming systems in Kenya face significant challenges related to risk reduction. A meta-analysis was conducted using published studies that employed difference-in-differences (DID) models to measure risk reduction in smallholder farming contexts within Kenya. Studies were selected based on methodological rigor and relevance to the agricultural sector. The analysis revealed a mixed pattern of effectiveness across different DID model applications, with some interventions showing reductions in risk by up to 30%. DID models appear effective for quantifying risk reduction in smallholder farming systems but require careful methodological consideration to ensure robust results. Further research should explore the generalizability of these findings across different regions and contexts, including longitudinal studies for more comprehensive evaluation. The empirical specification follows $Y = \beta_{0+\beta} X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agroecology, smallholder farming, randomized controlled trials, econometrics, risk assessment, meta-analysis, DID models*

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