



Methodological Evaluation of Smallholder Farm Systems in Uganda Using Difference-in-Differences for Risk Reduction Analysis

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Abstract

Smallholder farming systems in Uganda face significant challenges related to climate variability and market instability, necessitating methods to mitigate risks. A difference-in-differences (DiD) regression model was employed to assess the impact of agricultural interventions on reducing farming risks among smallholders in Uganda. The analysis included econometric techniques to account for potential confounding variables and uncertainties inherent in field data collection. The DiD model revealed a statistically significant reduction in crop failure rates by approximately 15% after implementing agricultural insurance schemes, indicating effective risk mitigation strategies. This study provides robust evidence supporting the utility of DiD models for evaluating risk reduction measures in smallholder farming systems. Further research should explore scalability and long-term sustainability of these interventions across different regions and contexts. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, Smallholder agriculture, Difference-in-Differences (DiD), Methodology, Risk assessment, Econometrics, Sustainability models*

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