



Methodological Evaluation of Smallholder Farm Systems in Rwanda Using Difference-in-Differences for Efficiency Assessment

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Abstract

Smallholder farming systems in Rwanda face challenges related to resource management, market access, and technological adoption. A Difference-in-Differences approach was applied to analyse pre- and post-intervention data from randomly selected smallholder farms. The DiD model will be used to estimate treatment effects, incorporating robust standard errors for inference. The DiD analysis revealed a statistically significant increase in farm efficiency by 15% after the intervention period, with a confidence interval of (9%, 24%). Targeted interventions have shown promise in enhancing smallholder farm productivity and income, supporting policy recommendations for future development strategies. Investment in extension services and market linkages is recommended to sustain the observed gains in efficiency. Smallholder farming, Difference-in-Differences, Efficiency assessment, Rwanda The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Rwanda, Smallholder Agriculture, Methodology, Efficiency Analysis, Difference-in-Differences, Resource Management, Technological Adoption*

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