Methodological Evaluation of Smallholder Farm Systems in Rwanda Using Difference-in-Differences Models to Measure Cost-Effectiveness

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Abstract

Smallholder farms in Rwanda are crucial for agricultural productivity and poverty reduction. However, understanding their cost-effectiveness is challenging due to data limitations. We employed a DiD model to compare changes pre- and post-intervention among treatment and control groups. Data were collected through farmer surveys and administrative records, ensuring robustness and validity of findings. Our analysis revealed that the intervention increased farm productivity by 15% (95% CI: 7%, 23%) compared to controls in two-thirds of the cases studied. The DiD model proved effective for assessing cost-effectiveness, providing actionable insights for policy makers and agricultural development initiatives. Future research should expand the dataset to include more smallholder farms and sectors to generalize findings across different contexts. Smallholder farming, Rwanda, Difference-in-Differences (DiD), Cost-Effectiveness Analysis The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Rwandan, Smallholder, Farming Systems, Difference-in-Differences, Econometrics, Agricultural Productivity, Resource Allocation*

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