



Methodological Evaluation of Smallholder Farm Systems in Ethiopia Using Difference-in-Differences Models to Gauge System Reliability

Yared Mekonnen¹, Birtukan Girma²

¹ Ethiopian Public Health Institute (EPHI)

² Debre Markos University

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Correspondence: ymekonnen@yahoo.com

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Author notes

Yared Mekonnen is affiliated with Ethiopian Public Health Institute (EPHI) and focuses on Agriculture research in Africa. Birtukan Girma is affiliated with Debre Markos University and focuses on Agriculture research in Africa.

Abstract

Smallholder farming systems in Ethiopia face challenges that hinder their sustainability and productivity. A difference-in-differences model was employed to analyse changes in smallholder farm performance before and after specific interventions. The DiD approach compares treated and control groups over time to isolate the effect of intervention. The DiD analysis revealed a significant positive impact on yield improvements by 20% in the treatment group compared to controls, with robust standard errors indicating confidence in these results. The use of difference-in-differences models successfully gauged system reliability and identified key areas for future interventions in smallholder farming systems in Ethiopia. Further research should explore scalability of these findings across different regions and contexts to inform broader policy recommendations. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, smallholder farming, econometrics, impact evaluation, intervention studies, randomized controlled trials, yield gap assessment*

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