



# Methodological Evaluation of Off-Grid Communities Systems in Ethiopia Using Difference-in-Differences for Yield Improvement Measurement

Yonas Berihu<sup>1,2</sup>, Tekle Asmelash<sup>3,4</sup>, Fikru Abera<sup>1,3</sup>, Mulugeta Desta<sup>4</sup>

<sup>1</sup> Ethiopian Institute of Agricultural Research (EIAR)

<sup>2</sup> Department of Soil Science, Mekelle University

<sup>3</sup> Mekelle University

<sup>4</sup> Africa Centers for Disease Control and Prevention (Africa CDC), Addis Ababa

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**Correspondence:** [yberihu@hotmail.com](mailto:yberihu@hotmail.com)

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## Author notes

*Yonas Berihu is affiliated with Ethiopian Institute of Agricultural Research (EIAR) and focuses on Agriculture research in Africa.*

*Tekle Asmelash is affiliated with Mekelle University and focuses on Agriculture research in Africa.*

*Fikru Abera is affiliated with Ethiopian Institute of Agricultural Research (EIAR) and focuses on Agriculture research in Africa.*

*Mulugeta Desta is affiliated with Africa Centers for Disease Control and Prevention (Africa CDC), Addis Ababa and focuses on Agriculture research in Africa.*

## Abstract

Off-grid communities in Ethiopia rely on solar-powered irrigation systems to enhance agricultural productivity. There is a need for robust methodological approaches to evaluate these systems effectively. A comprehensive search strategy was employed to identify relevant studies. Studies were assessed based on their methodology, data quality, and whether they utilised DiD models effectively for yield improvement measurement. The review identified several studies applying DiD models, but there is variability in the implementation of these models across different regions. Some studies reported significant improvements in yields with solar irrigation systems, while others noted mixed results due to varying environmental conditions and system designs. While DiD models offer a powerful tool for evaluating yield improvement from off-grid solar irrigation systems, their effectiveness is contingent upon proper model specification and robustness checks. Future research should focus on refining the application of DiD models through more detailed econometric analyses and cross-validation with other methodological approaches. Additionally, studies should consider incorporating additional control variables to enhance model validity. The empirical specification follows  $Y = \beta_{0+\beta}^{-} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** African agriculture, Methodology, Off-grid systems, Solar power, Irrigation, Yield measurement, Difference-in-differences



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