

Replication and Methodological Evaluation of Power-Distribution System Diagnostics for Yield Improvement in Kenya

A Quasi-Experimental Design

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ABSTRACT

Background: Power-distribution system diagnostics are critical for improving agricultural yield in regions with unreliable electricity. Previous studies, predominantly simulation-based, have claimed significant benefits from such interventions, but their methodological rigour and field applicability in sub-Saharan contexts require verification.

Purpose and objectives: This study aimed to replicate and methodologically evaluate a quasi-experimental design for assessing the impact of power-distribution equipment diagnostics on maize yield. The core objective was to test the robustness of the original diagnostic protocol and its reported yield improvements under controlled field conditions.

Keywords: *Power-distribution diagnostics, Quasi-experimental design, Agricultural yield, Sub-Saharan Africa, Methodological evaluation, Smart grid technologies*

Article Highlights

- Quasi-experimental design tested diagnostic protocol for power-distribution systems.
- Yield improvement point estimate: 0.15 tonnes/ha (95% CI: -0.08, 0.38).
- Results sensitive to error clustering and baseline soil quality imbalance.
- Methodology requires stricter pre-intervention matching on agronomic variables.

Methodological Insight

The difference-in-differences model revealed that standard error clustering at substation level significantly affected statistical significance of findings.

This replication study questions the robustness of previously claimed yield benefits from electrical diagnostics.

ABSTRACT-ONLY PUBLICATION

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