



Revisiting Quasi-Experimental Designs in Off-Grid Community Systems: Methodological Validation in Ghana's Agricultural Ecosystems,

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Abstract

This study revisits quasi-experimental designs to evaluate off-grid community systems in Ghana's agricultural ecosystems. A replication of previous studies, this investigation employs a randomized controlled trial (RCT) with matched control groups. Key features include random assignment of communities to treatment and control groups, detailed baseline measurements, and follow-up assessments over one year. After analysing yield data from the intervention period, it was observed that communities receiving off-grid energy systems saw an average increase in crop yields by 15% compared to controls. This suggests a significant positive impact of technology on agricultural productivity. The quasi-experimental design proved robust and effective for measuring yield improvements in Ghana's agricultural settings. Future research should consider scaling up these findings with larger sample sizes and longer-term follow-up studies. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, randomized controlled trial, intervention analysis, sampling design, econometric methods, spatial statistics, agricultural extension*

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