African Crop Science (Agri/Plant Science)

Methodological Assessment of Off-Grid Communities Systems in Senegal Using Quasi-Experimental Design for System Reliability Evaluation

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Abstract

Off-grid communities in Senegal face challenges in accessing reliable energy sources for agricultural productivity. A quasi-experimental approach was employed to assess system reliability, including data collection from 120 households over two seasons. Statistical analysis used linear regression models with robust standard errors to account for potential confounding variables. The average system uptime in the experimental group was found to be 95% compared to 87% in the control group ($p < 0.05$), indicating a significant improvement due to intervention measures. Quasi-experimental design effectively measured system reliability, highlighting the importance of targeted interventions for enhancing off-grid community energy systems. Further research should focus on long-term sustainability and cost-effectiveness of proposed solutions in similar contexts. Off-grid communities, Senegal, Quasi-experimental design, System reliability, Agricultural productivity The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, Quasi-experimental design, Energy access, Rural electrification, System reliability, Renewable energy systems, Agricultural productivity assessment*

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