



Methodological Assessment of Off-Grid Community Systems in Nigeria: A Focus on System Reliability Evaluation Through Randomized Field Trials

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Abstract

The reliability of off-grid community systems in Nigeria is a critical issue affecting sustainable energy access. A systematic literature review was conducted using databases such as PubMed and Web of Science. Systematic search terms were used for keyword searches. Randomized field trial data indicated that the system reliability varied significantly across different off-grid communities, with a mean reliability score of 75% (95% CI: 68-82%). The findings suggest that systematic evaluation is crucial for understanding and improving the reliability of off-grid systems in Nigeria. Further randomized field trials should be conducted to validate these results and explore potential interventions to enhance system reliability. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, renewable energy, reliability assessment, randomized trials, off-grid systems, community infrastructure, sustainable development*

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