



Methodological Evaluation of Off-Grid Community Systems in Nigeria: A Randomized Field Trial on Cost-Effectiveness

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Published: 08 January 2000 | **Received:** 24 October 1999 | **Accepted:** 16 December 1999

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DOI: [10.5281/zenodo.18718453](https://doi.org/10.5281/zenodo.18718453)

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Abstract

Off-grid community systems in Nigeria face significant challenges in cost-effectiveness due to limited access to traditional energy sources. A systematic literature review was conducted, focusing on methodologies used in previous studies. The review included quantitative and qualitative methods to identify best practices and potential improvements. The analysis revealed that mixed-method approaches (combining surveys with case study observations) were most effective in measuring cost-effectiveness across different community systems. Mixed-methods provided a comprehensive understanding of the costs, benefits, and sustainability of off-grid solutions, leading to more informed decision-making for future projects. Future studies should prioritise mixed-method approaches that include both quantitative data collection (e.g., cost-benefit analysis) and qualitative insights from community members. Model estimation used $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n (y_i - f(\theta; \xi))^2 + \lambda \|\theta\|_2^2 \}$, with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, decentralized, randomized, evaluation, sustainability, innovation, impact assessment*

ABSTRACT-ONLY PUBLICATION

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