African Population Geography
(Geography/Social/Demography)

Methodological Evaluation of Off-Grid Community Systems in Uganda: A Randomized Field Trial for Cost-Effectiveness Assessment

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Abstract

Off-grid community systems in Uganda face challenges in cost-effectiveness due to varying implementation methods. A mixed-method approach combining quantitative data from surveys and qualitative insights from interviews was employed. Randomization was used to ensure unbiased comparison of the systems. The analysis revealed that solar home systems were significantly more cost-effective than diesel generators, reducing energy costs by an average of 45% over a year. This study provides robust evidence for policymakers and investors in favour of solar home systems as a reliable off-grid solution in Uganda. Policymakers should prioritise the adoption of solar home systems to enhance access to energy while minimising costs, thus improving quality of life. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, randomized trials, cost-effectiveness, community systems, sustainability assessments, evaluation methods, geographic information systems*