African Food Chemistry (Food Science)

Methodological Evaluation of Off-Grid Communities Systems in Senegal: A Randomized Field Trial for Risk Reduction Analysis

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Abstract

Off-grid communities in Senegal are increasingly adopting renewable energy solutions to address electricity access challenges. However, there is a need for methodological evaluation to assess their effectiveness and identify potential risks. A mixed-method approach was employed, including a randomized control trial (RCT) design to assess system performance and a qualitative assessment for detailed insights. Data collection involved surveys, interviews, and observational studies. The randomized field trial showed that the solar photovoltaic systems reduced electricity outages by an average of 45%, indicating significant risk reduction in agricultural activities such as irrigation and post-harvest processing. The study demonstrated that off-grid communities can significantly benefit from solar photovoltaic systems, with a notable decrease in power outages affecting critical agriculture processes. Policy makers should prioritise the roll-out of solar photovoltaic systems to enhance agricultural productivity and resilience in Senegal's off-grid regions. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, Randomized controlled trial, Renewable energy systems, Risk assessment, Community development, Energy poverty, Participatory monitoring*

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