



Methodological Evaluation of Power-Distribution Equipment Systems in Nigerian Environments: A Randomized Field Trial on Adoption Rates

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Abstract

In Nigeria, power distribution systems are often inefficient and unreliable, leading to significant challenges in various sectors such as agriculture and manufacturing. A mixed-method approach combining quantitative surveys and qualitative interviews was employed. Randomized assignment of participants to control and experimental groups ensured unbiased results. Data analysis revealed that the innovative hybrid solar-diesel system showed a 25% higher adoption rate compared to traditional diesel-only systems in arid regions, while grid integration led to a 10-20% increase in rural areas where electricity is scarce. The randomized field trial provided valuable insights into which power distribution solutions are most suitable for Nigerian conditions, paving the way for future policy recommendations and technological advancements. Policy makers should prioritise investment in hybrid solar-diesel systems to enhance reliability in arid zones, whereas grid integration strategies tailored to rural settings could significantly boost electricity access. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Randomized Controlled Trial, Technological Adoption, Geographic Information Systems, Power Distribution, Energy Efficiency, Rural Electrification*

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