African Energy Access Studies (Interdisciplinary -

# Methodological Evaluation of Field Research Stations Systems in Ghana: Time-Series Forecasting Model for System Reliability Assessment

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## Abstract

Field research stations in Ghana play a critical role in energy access studies by providing data on renewable energy systems and their reliability over time. A comparative study using time-series analysis with a Box-Jenkins ARIMA model for forecasting system failures. Uncertainty is quantified through standard errors and confidence intervals. The forecasting model shows that solar PV systems in the study area experience an average of 5% annual reliability issues, identified from historical data over five years. Our time-series approach provides a robust method for assessing system reliability and highlights areas needing improvement in Ghana's renewable energy infrastructure. Further research should validate these findings with additional stations to ensure the model's applicability across different regions of Ghana. reliability assessment, field research stations, time-series forecasting, ARIMA model, solar PV systems The empirical specification follows $Y = \vec{\beta_{0+\beta}} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Sub-Saharan, renewable, reliability, forecasting, econometrics, GIS, sustainability*

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