



Methodological Evaluation of Off-Grid Community Systems in Senegal: A Time-Series Forecasting Model for Yield Improvement Analysis

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Abstract

Off-grid community systems in Senegal face challenges in yield improvement due to varying climatic conditions and technological inefficiencies. A scoping review of existing methodologies applied to off-grid systems in Senegal will be conducted. A time-series forecasting model will be used to forecast yield improvement trends and assess the robustness of these approaches. The analysis indicates that while some models show a positive direction for yield improvements, there is significant variability across different geographical regions within Senegal. Current methodologies lack comprehensive regional specificity, necessitating further research tailored to local conditions. Develop and validate region-specific time-series forecasting models incorporating climatic data to enhance system efficiency and predict yield improvement accurately. 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, geospatial analysis, econometrics, predictive modelling, data analytics, renewable energy, IoT applications*

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