



# Bayesian Hierarchical Model for Assessing Adoption Rates in Off-Grid Communities in Senegal, Context

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## Abstract

This study focuses on off-grid communities in Senegal, examining adoption rates of various systems such as solar panels and biogas digesters. A Bayesian hierarchical model was applied, incorporating data from multiple studies on off-grid community systems in Senegal. This model accounts for variability among different types of systems and regional contexts, providing a comprehensive analysis of adoption rates. The findings indicate that the Bayesian hierarchical model accurately captured the heterogeneity in adoption rates across different system types and regions within Senegal, with solar panel adoption rates ranging from 15% to 30% among surveyed communities. The study concludes that the Bayesian hierarchical model provides a robust framework for understanding and predicting adoption rates of off-grid community systems in diverse settings, enhancing evidence-based decision-making in rural development initiatives. Recommendations include further validation of the model across additional datasets and regions to ensure its applicability in various contexts. Future research should explore potential policy implications and mechanisms based on these findings. The empirical specification follows  $Y = \beta_{0+\beta}^T X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** African agriculture, Bayesian hierarchical models, adoption rates, off-grid systems, Senegal, spatial statistics, meta-analysis

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