Bayesian Hierarchical Model for Measuring Adoption Rates in Off-Grid Communities of Tanzania: A Systematic Literature Review

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Abstract

Off-grid communities in Tanzania face unique challenges related to energy access and adoption of renewable energy technologies. A comprehensive search strategy was employed across multiple databases, including academic journals, grey literature, and conference proceedings. Studies were assessed using predefined inclusion criteria focused on Bayesian hierarchical models and off-grid agricultural systems in Tanzania. Bayesian hierarchical models demonstrated high predictive accuracy for adoption rates, with an average coefficient of determination (R^2) above 0.7 across reviewed studies. The systematic review supports the use of Bayesian hierarchical models as a robust method for evaluating and predicting adoption trends in off-grid agricultural settings in Tanzania. Further research should explore model sensitivity to different data inputs, particularly in varying climate conditions and socio-economic contexts. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Tanzania, Bayesian, Hierarchical, Adoption, Models, Communities, Africa*

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