



Bayesian Hierarchical Model for Evaluating Efficiency Gains in Rwanda's Field Research Stations Systems,

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Abstract

Field research stations play a critical role in agricultural development by facilitating evidence-based decision-making for farmers and policymakers. Rwanda's system has seen significant investments but lacks comprehensive evaluation of its efficiency. A Bayesian hierarchical model was employed to analyse data collected from multiple sites across different time periods. The model accounts for heterogeneity and correlation among station efficiencies over time. The analysis revealed substantial efficiency gains in research productivity, with an average improvement of 12% compared to baseline years, indicating potential system enhancements. This study provides empirical evidence on the effectiveness of Rwanda's field research stations, contributing valuable insights for future policy and resource allocation decisions. Based on our findings, recommendations are made for implementing continuous monitoring and iterative improvement strategies in Rwanda's agricultural research infrastructure. Bayesian hierarchical model, efficiency gains, field research stations, Rwanda, agricultural development The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: African geography, Bayesian methods, Hierarchical models, Efficiency analysis, Random effects, Spatial statistics, Time series analysis

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