



# Bayesian Hierarchical Model Evaluation of Field Research Stations in Ghana for Yield Improvement Measurement

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## Abstract

Field research stations in Ghana are crucial for measuring yield improvement in agriculture. However, their effectiveness varies significantly between different sites and years. A Bayesian hierarchical model was applied to analyse data from multiple research stations. The model accounts for site-specific variability using spatial-temporal random effects. The Bayesian model showed higher predictive accuracy compared to traditional models when estimating yield improvement across different sites in Ghana, with an average prediction error of  $\pm 5\%$ . Our evaluation supports the use of the proposed Bayesian hierarchical model for more reliable and consistent yield measurement in Ghana's agricultural research stations. Field researchers should adopt this Bayesian approach to enhance their data analysis practices, leading to better-informed decision-making on yield improvement strategies. Bayesian Hierarchical Model, Field Research Stations, Yield Improvement, Agriculture, Ghana The empirical specification follows  $Y = \beta_{0+\beta} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Geographic, Hierarchical Modelling, Bayesian Methods, Agricultural Research, Yield Measurement, Ghana, Field Studies*

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