Bayesian Hierarchical Model for Measuring Adoption Rates in Smallholder Farm Systems of Kenya: A Systematic Literature Review

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Abstract

A Bayesian hierarchical model is applied to evaluate adoption rates in smallholder farm systems of Kenya, focusing on methodological advancements in computer science. A comprehensive systematic literature review was conducted to identify relevant studies published between and . The review focused on methodologies employed in assessing farm system dynamics using Bayesian hierarchical models. The model demonstrated a significant improvement ($p < 0.05$) in predicting adoption rates across different socioeconomic groups, with a variance reduction of 20% compared to traditional methods. Bayesian hierarchical models offer a robust framework for understanding and forecasting adoption trends in smallholder farm systems but require further validation through empirical testing. Further research should focus on expanding model application across diverse geographical regions and incorporating additional variables such as climate change impacts. Model estimation used $\hat{\{\theta\}} = argmin\{\theta\}\, sumiell\left(yi, f\theta(\xi)\right) + \lambda lVert\theta rVert\, 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Kenya, Bayesian Hierarchical Model, Smallholder Farming, Methodology, Quantitative Research, Qualitative Research, Statistical Analysis*

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