African Ruminant Veterinary Science

Bayesian Hierarchical Model for Risk Reduction in Smallholder Farms Systems of Kenya: A Meta-Analysis

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Abstract

The prevalence of smallholder farms in Kenya presents significant challenges in terms of risk management and productivity. A comprehensive meta-analysis approach was employed to synthesize data from various studies conducted in Kenya's smallholder farms. The analysis utilised a Bayesian hierarchical model to account for heterogeneity and variability among different farms and regions. The findings indicate that the Bayesian hierarchical model significantly improved risk assessment, with an estimated reduction of 15% in farm-level risks when compared to traditional models. This study underscores the utility of Bayesian hierarchical modelling in enhancing risk management strategies for smallholder farmers in Kenya's agricultural sector. Policy-makers and extension services are encouraged to adopt this methodological approach for more accurate risk predictions, thereby supporting sustainable farming practices. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, Bayesian statistics, hierarchical modelling, meta-analysis, smallholder farming, risk assessment, stochastic methods*

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