African Animal Welfare Studies (Agri/Animal Science)

Bayesian Hierarchical Model for Risk Reduction in Smallholder Farm Systems of Tanzania

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Abstract

This study focuses on smallholder farm systems in Tanzania, aiming to evaluate risk reduction strategies within these agricultural settings. A Bayesian hierarchical model was employed, incorporating data from multiple farms to estimate risk factors with uncertainty quantification using robust standard errors. The analysis revealed a significant proportion (35%) of farms faced substantial financial risks, necessitating targeted interventions to mitigate these impacts. This study validates the utility of the Bayesian hierarchical model in assessing and reducing risks for Tanzanian smallholder farmers. Policy makers should prioritise support programmes that align with the identified risk factors based on this model's findings. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, Bayesian statistics, hierarchical modelling, risk assessment, precision farming, smallholder agriculture, stochastic methods*

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