Bayesian Hierarchical Model Assessment of Smallholder Farm Systems in Tanzania

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Abstract

The study aims to evaluate the reliability of smallholder farm systems in Tanzania through a Bayesian hierarchical model. A Bayesian hierarchical model was applied to analyse data collected from smallholder farmers in Tanzania. The model accounts for variability across different farm systems and incorporates prior knowledge about system parameters. The analysis revealed significant differences in the reliability of soil management practices among various smallholder farms, with a proportion exceeding 70% showing optimal performance under the new model. The Bayesian hierarchical model provides a robust method for evaluating system reliability and can be used to guide interventions aimed at improving agricultural productivity in Tanzania. Farmers should focus on implementing soil management practices that are consistent with those identified as reliable by the model, while policymakers can use this information to design targeted support programmes. Bayesian hierarchical model, smallholder farms, reliability assessment, agriculture, Tanzania 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, smallholder farming, reliability assessment, spatial analysis, econometrics*

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