Bayesian Hierarchical Model Assessment of Smallholder Farm Systems in Senegal,

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Abstract

This study focuses on smallholder farming systems in Senegal, a region characterized by diverse agricultural practices and environmental conditions. Bayesian hierarchical models were applied to analyse data from smallholder farms in Senegal. The models account for spatial and temporal variations by incorporating prior knowledge into the analysis. The Bayesian hierarchical model demonstrated significant variance in farm productivity, with a proportion of 15% attributed to external environmental factors not accounted for by individual farms alone. The study confirms the robustness of Bayesian hierarchical models for understanding complex agricultural systems and highlights their utility in addressing variability within smallholder farming contexts. Further research should explore integrating additional data sources such as climate indices into the model to improve its predictive accuracy. The empirical specification follows $Y = \vec{\beta_{0+\beta}} \, p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, Bayesian inference, hierarchical models, smallholder farming, econometrics, stochastic processes, spatial analysis*

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