African Environmental Engineering (Technology focus)

Bayesian Hierarchical Model Replication Study for Yield Improvement in Senegal's Process-Control Systems

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Abstract

This study builds upon previous research in Senegal that utilised a Bayesian hierarchical model to evaluate process-control systems' yield improvement. The methodology involves re-analysing existing data from Senegal's agricultural sector using a Bayesian hierarchical regression model. The model accounts for both fixed effects (e.g., farm management practices) and random effects (e.g., variability across farms). Findings indicate that the proportion of farms achieving yield improvements was 75%, with significant differences observed in regions with higher soil fertility. The replication study confirms the effectiveness of the Bayesian hierarchical model in measuring yield improvement, particularly highlighting its utility in assessing regional variations. Recommendation is for further research to validate these findings across other sectors and contexts, potentially leading to more tailored policy recommendations. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African, Bayesian, Hierarchical, Model, Methodology, Quality, Replication*

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