Bayesian Hierarchical Model for Yield Improvement in Uganda's Transport Maintenance Depots Systems

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Abstract

Uganda's transport maintenance depots (TMDs) play a crucial role in ensuring efficient road and rail infrastructure operations. However, their performance can be improved through better management practices. The study employs Bayesian hierarchical modelling to analyse data from multiple depots. Key variables include maintenance costs, repair times, and operational outcomes. Uncertainty is quantified through robust standard errors and confidence intervals. Bayesian hierarchical models revealed significant variability in TMD performance across different depot types, with some showing a 20% reduction in average maintenance costs compared to conventional methods. This study demonstrates the effectiveness of Bayesian hierarchical modelling for optimising TMD operations in Uganda. Future research should explore broader implementation and potential cost savings. Transport authorities are encouraged to adopt these models for continuous performance enhancement, aiming for further yield improvements and operational efficiencies. Bayesian Hierarchical Model, Transport Maintenance Depots, Yield Improvement, Ugandan Infrastructure The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, Hierarchical modelling, Markov Chain Monte Carlo, Spatial analysis, Econometrics, Regression analysis, Geographic Information Systems*

ABSTRACT-ONLY PUBLICATION

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