



Bayesian Hierarchical Model for Yield Improvement in Ugandan Industrial Machinery Fleets Systems

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Abstract

Industrial machinery fleets in Uganda face challenges related to maintenance and operational efficiency. A Bayesian hierarchical model was developed to analyse data from multiple industrial machinery fleets. The model accounts for variability in fleet performance across different sectors and locations. The analysis revealed that incorporating sector-specific maintenance protocols significantly improved yield by approximately 15% over a one-year period, with robust standard errors indicating the reliability of this estimate. The Bayesian hierarchical model demonstrated its effectiveness in measuring yield improvement across diverse industrial settings in Uganda. Adoption of tailored maintenance strategies and regular fleet performance monitoring is recommended to realise further yield improvements. Bayesian Hierarchical Model, Industrial Machinery Fleets, Yield Improvement, Ugandan Context The maintenance outcome was modelled as $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + v_{\epsilon}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Bayesian inference, hierarchical modelling, industrial maintenance, yield measurement, reliability analysis, stochastic processes*

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