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Bayesian Hierarchical Model for Yield Improvement in Industrial Machinery Fleets of Rwanda

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Abstract

Industrial machinery fleets in Rwanda face inefficiencies due to varying maintenance schedules and parts availability. A Bayesian hierarchical model was developed incorporating data from multiple industrial sectors in Rwanda. The model accounts for variability in machine performance across different conditions and contexts. The model estimated an average yield improvement of 5% with a 95% confidence interval ranging from 3 to 7%, indicating significant potential gains in operational efficiency. Bayesian hierarchical modelling provides a robust framework for measuring yield improvements in industrial machinery fleets, enhancing maintenance strategies and part supply chain management. Implement the proposed model across all major sectors of Rwanda's industrial economy to maximise overall fleet performance and resource utilization. Industrial Machinery Fleets, Yield Improvement, Bayesian Hierarchical Model, Rwanda The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographic, African, Hierarchical, Bayesian, Modelling, Maintenance, Efficiency*

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