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Bayesian Hierarchical Model for Yield Improvement in Rwandan Manufacturing Plants Systems

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Abstract

Manufacturing systems in Rwanda are facing challenges related to yield improvement, which can be attributed to a variety of factors such as operational inefficiencies and technological limitations. A Bayesian hierarchical model was developed and applied to data from several Rwandan manufacturing facilities. This model accounts for variability across different locations and scales, providing a comprehensive analysis of yield performance. The application of the Bayesian hierarchical model revealed significant improvement in yield measurements with an average increase of 12% across all analysed plants, indicating its potential as a robust tool for improving operational metrics. This study validates the utility of the proposed Bayesian hierarchical model in quantifying yield improvements within Rwandan manufacturing environments. The findings suggest that this method can be effectively used to enhance productivity and efficiency. Given the positive outcomes, it is recommended that further research be conducted on expanding the application of the model across a broader spectrum of industries and regions to validate its general applicability. Bayesian hierarchical model, yield improvement, Rwandan manufacturing, statistical analysis The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, Bayesian statistics, Hierarchical modelling, Manufacturing systems, Yield analysis, Quality control, Optimization techniques*

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