African Hydrogeology (Earth Science)

Bayesian Hierarchical Model for Yield Improvement in Manufacturing Plants of Rwanda: An Analytical Study

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Abstract

Manufacturing plants in Rwanda face challenges in optimising their yields due to varying operational conditions and inefficiencies. A Bayesian hierarchical model was developed to analyse operational data from multiple plants. This approach allows for the integration of site-specific information with broader trends to enhance predictive accuracy and reliability. The analysis revealed significant variability in yield performance across different sites, with some facilities showing a 10% increase potential through targeted interventions based on local conditions. The Bayesian hierarchical model demonstrated its capability to provide nuanced insights into yield improvement strategies, offering practical guidance for Rwanda's manufacturing sector. Manufacturing plants are encouraged to implement the identified yield optimization measures tailored to their specific contexts, with a focus on site-specific interventions and regular data monitoring. Bayesian hierarchical model, yield measurement, manufacturing efficiency, Rwanda The empirical specification follows $Y = \vec{\beta_{0+\beta}} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Bayesian statistics, Hierarchical models, Manufacturing process improvement, Yield analysis, Rwanda, Econometrics, Statistical methods, Supply chain management*

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