African Chemical Engineering Studies

Bayesian Hierarchical Model for Evaluating Yield Improvement in Uganda's Manufacturing Plants Systems

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Published: 22 November 2010 | **Received:** 22 August 2010 | **Accepted:** 23 October 2010

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DOI: 10.5281/zenodo.18907593

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Abstract

Manufacturing plants in Uganda face challenges related to yield inefficiencies, which can impact productivity and profitability. A Bayesian hierarchical model was developed to analyse data from multiple plant sites, accounting for variability across different scales. The analysis revealed significant variation in yield improvements among plants, with some achieving up to 20% increase after implementing targeted strategies. Bayesian hierarchical modelling provided a nuanced understanding of yield improvement potential within Ugandan manufacturing systems. Manufacturing companies should tailor their strategies based on local plant-specific data and implement continuous monitoring for optimal performance. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, Hierarchical modelling, Manufacturing systems, Yield analysis, Uganda, Geographic data, Methodological evaluation*

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