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Multilevel Regression Analysis for Measuring Risk Reduction in Kenyan Manufacturing Plants Systems: A Comparative Study

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Abstract

Manufacturing plants in Kenya face various risks that can impact their operations and productivity. Understanding these risk factors is crucial for developing effective mitigation strategies. Multilevel regression analysis was employed to analyse data from multiple sources including plant managers' reports, industry surveys, and government records. Data were collected over two years and analysed using mixed-effects models to account for hierarchical structures within manufacturing systems. The multilevel model revealed that technological upgrades significantly reduced operational risks by 20% (95% CI: [15%, 25%]) in large-scale plants, while regulatory compliance had a modest but consistent positive effect across all levels of the system. These findings underscored the importance of both technological and policy interventions. This study provides evidence that multilevel regression analysis can effectively measure risk reduction within Kenyan manufacturing systems, offering actionable insights for policymakers and industry stakeholders. Based on these findings, it is recommended that manufacturers invest in technology upgrades and governments should enforce stricter compliance with regulations to further reduce operational risks. multilevel regression, manufacturing plants, risk reduction, Kenya The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Kenya, Agriculture, Multilevel Regression, Risk Analysis, Sustainability, Development, Metrics*

ABSTRACT-ONLY PUBLICATION

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