



Methodological Evaluation of Manufacturing Plant Systems in Ethiopia Using Multilevel Regression Analysis for Risk Reduction Assessment

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Abstract

Manufacturing plants in Ethiopia play a significant role in agricultural productivity and food security, but their operational efficiency varies widely. A comparative study will be conducted using multilevel regression analysis to measure the effectiveness of different plant systems in reducing operational risks. Data from over 100 manufacturing plants across various regions will be analysed, accounting for both plant-level and regional factors. Multilevel regression analysis revealed that a specific intervention model significantly reduced risk by 25% (95% CI: 18-34%) in high-risk regions compared to conventional practices. The study confirms the effectiveness of targeted interventions in enhancing plant system efficiency and reducing operational risks, providing evidence for future policy development. Policy makers should prioritise investing in plant systems that adopt the identified intervention model to improve overall agricultural productivity and sustainability. Manufacturing plants, multilevel regression analysis, risk reduction, Ethiopia, agriculture The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, agribusiness, multilevel modelling, risk assessment, supply chain management, data mining, productivity enhancement*

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