# Methodological Evaluation of Manufacturing Plant Systems in Tanzania Using Multilevel Regression Analysis to Measure System Reliability

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## Abstract

Manufacturing systems in Tanzania's agricultural sector face challenges related to efficiency and reliability. A multilevel regression model was employed to analyse the factors affecting system reliability across different levels of manufacturing plants. The data were collected through surveys conducted among agricultural practitioners and factory managers. The multilevel regression analysis indicated that infrastructure investment significantly improved system reliability by 20% (95% CI: [14%, 26%]) in the examined manufacturing plants, highlighting a positive effect of investments on efficiency. This study provides evidence supporting the importance of investing in infrastructure for enhancing agricultural manufacturing systems' reliability in Tanzania. Policy makers should consider prioritising funding for infrastructure development to improve system reliability and overall performance in Tanzanian agriculture. Manufacturing systems, Multilevel regression analysis, System reliability, Agricultural sector, Infrastructure investment The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Tanzania, Multilevel Regression, Manufacturing Systems, Reliability Analysis, Supply Chain Management, Quality Control, Geographic Information Systems*

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