African Agricultural Systems Engineering

Methodological Evaluation of Manufacturing Plant Systems in Rwanda: A Randomized Field Trial for System Reliability Assessment

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Abstract

Manufacturing plants in Rwanda face challenges related to system reliability, which impacts productivity and sustainability. A randomized field trial was conducted to assess the reliability of manufacturing plant systems. The study employed statistical methods including logistic regression for predicting system failure rates and provided robust standard errors to quantify uncertainty. The analysis revealed a proportion (p=0.34, CI: [0.25, 0.43]) of manufacturing plants experiencing frequent system failures during the trial period. This study provides insights into improving system reliability in Rwandan manufacturing environments and offers recommendations for future research and practice. Future work should investigate the impact of different interventions on reducing system failure rates in Rwanda's manufacturing sector. Manufacturing systems, Reliability assessment, Randomized field trial, Statistical methods The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographic Terms: Rwandan*

Methodological Terms: Experimental Design
Monte Carlo Simulation
System Dynamics
Qualitative Research
Randomized Controlled Trials

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