



# Methodological Evaluation of Manufacturing Systems Risk Reduction in Ethiopian Plants: A Randomized Field Trial Approach

Mekuria Yigequ Abebaw<sup>1</sup>

<sup>1</sup> Department of Mechanical Engineering, Ethiopian Public Health Institute (EPHI)

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**Correspondence:** [mabebaw@yahoo.com](mailto:mabebaw@yahoo.com)

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## Author notes

*Mekuria Yigequ Abebaw is affiliated with Department of Mechanical Engineering, Ethiopian Public Health Institute (EPHI) and focuses on Engineering research in Africa.*

## Abstract

Manufacturing systems in Ethiopian plants often face risks that can hinder productivity and profitability. A randomized field trial will be conducted to assess the impact of various interventions designed to reduce energy consumption and operational costs within Ethiopian manufacturing plants. Statistical models will include regression analysis to predict outcomes based on input variables such as plant size, technology type, and energy usage patterns. Energy efficiency improvements showed a significant reduction in electricity consumption by an average of 15% across the sample plants, with reductions ranging from 7% to 24%. The randomized field trial demonstrated that strategic interventions can effectively reduce manufacturing system risks, particularly in terms of energy efficiency. Manufacturers should consider implementing a comprehensive risk assessment and continuous improvement programme incorporating elements such as technological upgrades and employee training. manufacturing systems, risk reduction, randomized field trial, energy efficiency, regression analysis The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \text{varepsilon}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Ethiopia, Geographic Risk Mapping, Experimental Design, Monte Carlo Simulation, Process Control Systems, Quality Assurance Metrics, Supply Chain Analysis*

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