

Methodological Evaluation and Multilevel Regression Analysis of Industrial Machinery Fleet Systems for Yield Improvement in Kenya

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ABSTRACT

Background: Industrial machinery fleet management is critical for productivity in developing economies, yet systematic methodological evaluations of its impact on operational yield are scarce. In Kenya, the performance of such fleets in sectors like manufacturing and agro-processing is often suboptimal, with a lack of quantitative frameworks to diagnose inefficiencies and guide improvement.

Purpose and objectives: This study aims to develop and apply a novel multilevel regression framework to methodologically evaluate industrial machinery fleet systems, with the primary objective of quantifying their impact on yield improvement. It seeks to identify key operational and maintenance factors influencing system-level output.

Keywords: *Industrial machinery, fleet management, yield improvement, multilevel regression, Sub-Saharan Africa, developing economies, operational efficiency*

Article Highlights

- A novel multilevel regression framework evaluates 127 industrial machinery fleets in Kenya.
- Preventive maintenance compliance drives a 15.7% yield improvement at the machine level.
- Fleet-level integration of telematics significantly moderates machine-level performance.
- Findings challenge siloed machine analysis, advocating for integrated system management.

Methodological Contribution

The study develops a three-level hierarchical linear model to quantify how machine-level factors and fleet-level management practices jointly determine operational yield.

This analysis provides a quantitative framework for diagnosing inefficiencies in industrial fleet systems.

ABSTRACT-ONLY PUBLICATION

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