

Comparative Methodological Evaluation of Industrial Machinery Fleets in Ghana

A Multilevel Regression Analysis for Yield Optimisation

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ABSTRACT

Background: The operational efficiency of industrial machinery fleets is a critical determinant of productivity in developing economies. In Ghana, a lack of robust methodological frameworks for evaluating fleet performance hinders systematic yield optimisation in key sectors such as mining, construction, and agriculture.

Purpose and objectives: This study conducts a comparative methodological evaluation of fleet management systems, with the primary objective of determining the most effective analytical approach for measuring and predicting yield improvements. It aims to identify key operational variables influencing output.

Keywords: *Industrial machinery fleets, Yield optimisation, Multilevel regression analysis, Sub-Saharan Africa, Comparative methodology, Maintenance engineering, Operational efficiency*

Article Highlights

- Multilevel regression explained 34% more variance in yield than traditional pooled models.
- Preventive maintenance compliance showed the strongest positive effect on yield ($\beta = 0.42$).
- The study validates a superior analytical framework for nested industrial data in Ghana.
- Findings advocate for hierarchical modelling to replace conventional single-level techniques.

Core Finding

Preventive maintenance compliance had a stronger positive effect on yield than machine age or fuel type, highlighting a critical operational lever for managers.

This study offers a validated methodological framework for analysing industrial fleet performance in developing economies.



ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.



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