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# Methodological Evaluation and Panel-Data Estimation of Industrial Machinery Fleet Performance for Yield Improvement in Tanzania, 2000–2026

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Amina Mwinyi<sup>1</sup>

<sup>1</sup> University of Dar es Salaam

Correspondence: [amwinyi@aol.com](mailto:amwinyi@aol.com)

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## ABSTRACT

**Background:** Industrial machinery fleets are critical capital assets for economic development, yet systematic methodologies for evaluating their long-term operational performance in developing economies are lacking. Existing studies often rely on cross-sectional data, failing to capture dynamic efficiency trends and their impact on industrial yield.

**Purpose and objectives:** This study aims to develop and apply a robust panel-data methodology to estimate the performance of industrial machinery fleets and quantify their contribution to yield improvement within a major developing economy. The objective is to establish a causal link between fleet efficiency metrics and sectoral output.

**Keywords:** *Industrial machinery fleets, panel-data estimation, yield improvement, Sub-Saharan Africa, developing economies, operational performance, methodological evaluation*

### Article Highlights

- Panel-data model isolates machinery performance effects from sectoral heterogeneity.
- Mechanical availability and mean time between failures are key technical drivers.
- Organisational factors like maintenance scheduling show diminishing returns.
- Framework provides a validated tool for data-driven asset management.

### Methodological Contribution

A novel two-way fixed effects panel model, using a uniquely compiled longitudinal dataset, establishes a causal link between fleet efficiency metrics and industrial output.

*This study offers a replicable framework for performance estimation in developing economies.*

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