



# Multilevel Regression Analysis of Industrial Machinery Reliability in Ugandan Fleetsystems

Grace Amama<sup>1</sup>, James Ssebuliba<sup>1,2</sup>, David Kizza<sup>1,3</sup>

<sup>1</sup> Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit

<sup>2</sup> Department of Mechanical Engineering, National Agricultural Research Organisation (NARO)

<sup>3</sup> Busitema University

**Published:** 18 January 2011 | **Received:** 15 October 2010 | **Accepted:** 26 November 2010

**Correspondence:** [gamama@outlook.com](mailto:gamama@outlook.com)

**DOI:** [10.5281/zenodo.18929404](https://doi.org/10.5281/zenodo.18929404)

## Author notes

*Grace Amama is affiliated with Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit and focuses on Engineering research in Africa.*

*James Ssebuliba is affiliated with Department of Mechanical Engineering, National Agricultural Research Organisation (NARO) and focuses on Engineering research in Africa.*

*David Kizza is affiliated with Medical Research Council (MRC)/UVRI and LSHTM Uganda Research Unit and focuses on Engineering research in Africa.*

## Abstract

Industrial machinery reliability is a critical factor in Ugandan fleetsystems' productivity and maintenance costs. Multilevel regression analysis was employed to model the hierarchical structure of Ugandan fleetsystems, incorporating both fixed effects (e.g., machine age) and random effects (e.g., fleet-specific variations). The multilevel model revealed that operational environment conditions significantly impact machinery reliability, with a coefficient estimate of -0.56 for air pollution levels. This study contributes to the understanding of industrial machinery reliability in Ugandan fleetsystems by introducing a robust multilevel regression framework. Further research should explore interventions aimed at mitigating environmental impact on machinery performance. Industrial Machinery, Reliability Analysis, Multilevel Regression, Ugandan Fleetsystems The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, multilevel, hierarchical, econometric, reliability, maintenance, productivity*

## ABSTRACT-ONLY PUBLICATION

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

✉ **REQUEST FULL PAPER**

**Email:** [info@parj.africa](mailto:info@parj.africa)

Request your copy of the full paper today!

## SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We welcome your submissions!**

Join our community of African scholars and share your groundbreaking work.

**Submit at:** [app.parj.africa](http://app.parj.africa)



Scan to visit [app.parj.africa](http://app.parj.africa)

**Open Access Scholarship from PARJ**

Empowering African Research | Advancing Global Knowledge