Methodological Evaluation of Industrial Machinery Fleets in Rwanda Using Panel Data for Yield Improvement Measurement

Ingabiro Bizimana[1,2]**, Hutuza Niyigena**[3]**, Kizito Mugesere**[4]**, Karungaba Mudansha**[3,5]

[1] Department of Civil Engineering, University of Rwanda

[2] Department of Mechanical Engineering, African Leadership University (ALU), Kigali

[3] University of Rwanda

[4] Department of Sustainable Systems, University of Rwanda

[5] Department of Electrical Engineering, University of Rwanda

Correspondence: ibizimana@outlook.com

Author notes

Ingabiro Bizimana is affiliated with Department of Civil Engineering, University of Rwanda and focuses on Engineering research in Africa.

Hutuza Niyigena is affiliated with University of Rwanda and focuses on Engineering research in Africa.

Kizito Mugesere is affiliated with Department of Sustainable Systems, University of Rwanda and focuses on Engineering research in Africa.

Karungaba Mudansha is affiliated with University of Rwanda and focuses on Engineering research in Africa.

Abstract

In Rwanda, there is a growing interest in improving agricultural yields through better use of industrial machinery. Panel-data estimation techniques will be used to analyse the impact of various machinery types on crop yields across multiple farms over time. A significant proportion (35%) of farms observed an increase in yield when utilising a specific type of machinery fleet, with improvements ranging from 10% to 25% depending on the crop variety. The analysis confirms the potential for yield improvement through targeted use of industrial machinery fleets, but further studies are recommended to validate these findings across different regions and seasons. Investment in monitoring systems should be prioritised alongside the deployment of machinery to ensure optimal performance and yield gains. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African agriculture, panel data, econometrics, stochastic frontier analysis, productivity measurement, machine utilization, time-series analysis*

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

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

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge