

Methodological Framework for Yield Optimisation in Senegalese Industrial Machinery Fleets

A Randomised Field Trial

Abdoulaye Sarr^{1,2} | Mamadou Diop^{3,4} | Aminata Ndiaye^{4,5}

Department of Sustainable Systems, Institut Pasteur de Dakar • Université Alioune Diop de Bambey (UADB) •
Department of Sustainable Systems, Université Alioune Diop de Bambey (UADB) • Institut Pasteur de Dakar •
African Institute for Mathematical Sciences (AIMS) Senegal

Correspondence: asarr@gmail.com

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ABSTRACT

Background: Industrial machinery fleets in West Africa face persistent yield inefficiencies due to suboptimal operational protocols and maintenance scheduling. Existing optimisation studies often rely on retrospective data or simulation, lacking rigorous field validation in the regional context.

Purpose and objectives: This article presents a methodological framework for conducting a randomised field trial to measure and optimise the yield of industrial machinery fleets. The primary objective is to detail a replicable procedure for evaluating incremental improvements in operational output through controlled intervention.

Keywords: *Yield optimisation, Industrial machinery fleets, Randomised controlled trial, Sub-Saharan Africa, Maintenance scheduling, Field experiment, Operational protocols*

Article Highlights

- Framework for a cluster-randomised field trial in Senegalese industrial settings.
- Linear mixed-effects model controls for inter-site heterogeneity in machinery fleets.
- Procedure evaluates yield via productive output per fuel unit under revised protocols.
- Simulation validates design power without presenting empirical trial results.

Core Analytical Model

Yield is modelled as: $Y_{ij} = \beta_0 + \beta_1 T_{ij} + u_j + \varepsilon_{ij}$, with site-level random effects and clustered inference.

This article details a methodological framework, not the results of a completed field trial.

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