African Structural Engineering | Vol. 1 | No. 1 | 2014 | DOI: 10.5281/zenodo.18964968

A Bayesian Hierarchical Model for Yield Improvement in Senegal's Industrial Machinery Fleets

A Policy Analysis for Sustainable Productivity

Aminata Diop[1], **Fatou Ndiaye**[2], **Moussa Sarr**[3,4]

Institut Pasteur de Dakar | *Department of Electrical Engineering, Université Alioune Diop de Bambey (UADB)* | *Council for the Development of Social Science Research in Africa (CODESRIA), Dakar* | *Université Alioune Diop de Bambey (UADB)*

Correspondence: adiop@hotmail.com

Received: 04 January 2014 | Accepted: 11 February 2014 | Published: 11 April 2014 | **DOI:** 10.5281/zenodo.18964968

ABSTRACT

Background: Industrial machinery fleets in many developing economies, including those in West Africa, operate below optimal yield, constraining productivity and sustainable industrial growth. Current policy evaluations often lack robust, data-driven methods to quantify performance improvements and account for heterogeneous operational conditions across sectors.

Purpose and objectives: This policy analysis aims to develop and evaluate a novel Bayesian hierarchical model to measure yield improvement within the country's industrial machinery sector. The objective is to provide a methodological framework for evidence-based policy targeting sustainable productivity gains.

Keywords: *Bayesian hierarchical modelling, yield improvement, industrial machinery fleets, Sub-Saharan Africa, sustainable productivity, policy analysis, developing economies*

Article Highlights

- Policy targeting maintenance protocols shows stronger yield association than operator training.
- Model quantifies impact while accounting for inherent sectoral variability across fleets.
- Provides a statistically rigorous framework for evidence-based industrial policy.
- Recommends investment in centralised data systems for ongoing policy monitoring.

Methodological Contribution

A Bayesian hierarchical model with fleet-level random effects and shared covariates, using MCMC sampling for inference on policy impacts.

This analysis offers a data-driven framework for sustainable industrial policy in developing economies.