

# Randomised Field Trial Methodology for Efficiency Diagnostics in Kenyan Manufacturing Systems

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## ABSTRACT

**Background:** Manufacturing systems in Kenya face persistent efficiency challenges, yet rigorous field-based diagnostic methodologies tailored to the local industrial context are scarce. Existing approaches often rely on retrospective data or theoretical models, lacking causal rigour for identifying actionable improvements.

**Purpose and objectives:** This article presents a novel methodological framework for conducting randomised field trials (RFTs) to diagnose and quantify efficiency gains within manufacturing plants. The objective is to provide a structured, evidence-based protocol for engineers to implement controlled interventions and measure their causal impact on system performance.

**Keywords:** *Randomised controlled trial, Efficiency diagnostics, Manufacturing systems, Sub-Saharan Africa, Industrial engineering, Process optimisation, Field experiment*

### Article Highlights

- Presents a multi-stage protocol for randomised field trials in manufacturing plants.
- Designed to detect a minimum 15% improvement in overall equipment effectiveness.
- Prioritises energy and material flow metrics as primary diagnostic indicators.
- Addresses data quality and implementation challenges in local industrial contexts.

### Core Analytical Model

The analysis employs a difference-in-differences model:  $Y_{it} = \beta_0 + \beta_1 \text{Treat}_i + \beta_2 \text{Post}_t + \delta(\text{Treat}_i \times \text{Post}_t) + \varepsilon_{it}$ , with cluster-robust standard errors at the plant level.

*This is a methodology article presenting a framework, not empirical results from a specific trial.*

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