



# Methodological Evaluation of Process-Control Systems in Kenya: A Randomized Field Trial for Cost-Efficiency Measurement

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## Abstract

Process-control systems are critical for efficient operation in various industries, including agriculture, manufacturing, and healthcare, particularly in resource-limited settings like Kenya. A randomized field trial design was employed, with process-control systems installed at randomly selected agricultural and manufacturing facilities. Data on operational costs, energy consumption, and product yields were collected over a six-month period for analysis. The findings indicate that the optimised configuration of process-control systems reduced operational costs by an average of 15% in agricultural settings compared to conventional methods, with confidence intervals suggesting robust cost savings. This study provides empirical evidence on the cost-effectiveness of process-control systems and highlights specific configurations for different sectors. The results suggest significant potential for improving resource efficiency across industries in Kenya. Based on this research, it is recommended that government agencies and private sector entities consider implementing these optimised control systems to enhance operational efficiencies and reduce costs. The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u + \epsilon$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Kenyan, Geographic Information Systems, Control Theory, Randomized Controlled Trials, Cost-Benefit Analysis, Precision Agriculture, Statistical Process Control

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