



# Methodological Evaluation of Process-Control Systems in Ghana: Multilevel Regression Analysis for Yield Improvement

Kofi Adzido<sup>1,2</sup>, Yaw Agyeman<sup>3</sup>, Amma Owusu<sup>2,3</sup>

<sup>1</sup> Ghana Institute of Management and Public Administration (GIMPA)

<sup>2</sup> Department of Electrical Engineering, Kwame Nkrumah University of Science and Technology (KNUST),  
Kumasi

<sup>3</sup> Accra Technical University

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**Correspondence:** [kadzido@outlook.com](mailto:kadzido@outlook.com)

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## Author notes

*Kofi Adzido is affiliated with Ghana Institute of Management and Public Administration (GIMPA) and focuses on Engineering research in Africa.*

*Yaw Agyeman is affiliated with Accra Technical University and focuses on Engineering research in Africa.*

*Amma Owusu is affiliated with Department of Electrical Engineering, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi and focuses on Engineering research in Africa.*

## Abstract

Recent studies in Ghana have highlighted variations in yield across different processing units, suggesting a need for systematic methodological improvements to enhance efficiency. A multilevel regression analysis was employed, incorporating data from multiple levels including individual units within larger facilities. The model accounts for both fixed effects (common factors affecting all units) and random effects (unit-specific variations). The multilevel regression revealed that the implementation of a centralized monitoring system significantly improved yields by an average of 15% across different stages of processing, with notable variance explained by unit-specific operational conditions. This study provided empirical evidence supporting the efficacy of standardised process-control systems in enhancing yield consistency and productivity in Ghanaian food processing environments. Based on the findings, it is recommended that all new or upgraded processing units adopt a centralized monitoring system to optimise yields and improve efficiency. Ghana, Process-Control Systems, Yield Improvement, Multilevel Regression Analysis The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Sub-Saharan, regression, multilevel, econometrics, stochastic, optimization, productivity

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