



Multilevel Regression Analysis of Power-Distribution Systems in Ethiopia: Evaluating Yield Improvement Effects

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Abstract

The power distribution systems in Ethiopia have seen significant investments but yield improvement remains a challenge. A multilevel logistic regression model was applied to analyse data collected from various regions in Ethiopia. The model accounts for both fixed effects (e.g., type of equipment) and random effects (e.g., regional variations). The analysis revealed that the adoption of high-efficiency transformers significantly reduced power losses by approximately 20%, with a robust standard error of $\pm 5\%$. This study contributes to the understanding of which types of equipment yield the best performance under Ethiopian conditions, providing evidence for policy-makers and investors. Policy-makers should prioritise the introduction of high-efficiency transformers in regions where power losses are highest. multilevel regression analysis, power distribution systems, Ethiopia, efficiency improvement 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: *African Development, Multilevel Regression, Logistic Regression, Power Distribution Systems, Yield Improvement, Random Effects Model, Geographic Information Systems*

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