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Power-Distribution Equipment Systems Yield Improvement in Tanzania: A Multilevel Regression Analysis

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Abstract

Power distribution equipment (PDE) systems play a critical role in energy infrastructure, particularly in resource-rich regions like Tanzania where access to electricity is uneven. A multilevel regression model was employed to analyse data collected from multiple sites in Tanzania. The model accounts for both fixed effects (e.g., site-specific conditions) and random effects (site variability). The multilevel analysis revealed that an increase of 20% in the use of energy-efficient PDE components led to a 15% improvement in yield, with robust standard errors indicating reliable estimates. Multilevel regression analysis provided valuable insights into how various factors influence yield from PDE systems and highlighted the importance of component efficiency for performance enhancement. Based on findings, it is recommended that Tanzania invests in upgrading energy-efficient components to maximise yield improvements and improve overall system reliability. Power-Distribution Equipment Systems, Multilevel Regression Analysis, Yield Improvement, Tanzania The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Tanzania, Geographic Information Systems (GIS), Power-Distribution Equipment (PDE), Multilevel Modelling, Regression Analysis, Energy Infrastructure, Resource Allocation*