



Methodological Evaluation of Power-Distribution Equipment Systems in South Africa Using Multilevel Regression Analysis for Adoption Rates Assessment

Fikile Sello¹, Aphane Motshega^{2,3}, Dumiso Tshabalala³, Makgopolo Mogapi^{4,5}

¹ Department of Mechanical Engineering, University of KwaZulu-Natal

² Department of Electrical Engineering, University of the Western Cape

³ University of the Witwatersrand

⁴ Department of Sustainable Systems, University of the Witwatersrand

⁵ Department of Civil Engineering, University of KwaZulu-Natal

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Correspondence: fsello@gmail.com

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Author notes

Fikile Sello is affiliated with Department of Mechanical Engineering, University of KwaZulu-Natal and focuses on Engineering research in Africa.

Aphane Motshega is affiliated with Department of Electrical Engineering, University of the Western Cape and focuses on Engineering research in Africa.

Dumiso Tshabalala is affiliated with University of the Witwatersrand and focuses on Engineering research in Africa.

Makgopolo Mogapi is affiliated with Department of Sustainable Systems, University of the Witwatersrand and focuses on Engineering research in Africa.

Abstract

Recent advancements in power-distribution equipment systems have been pivotal for enhancing agricultural productivity in South Africa. However, understanding the adoption rates of these technologies remains a challenging task. The study employs multilevel regression analysis with fixed effects, incorporating both individual and contextual variables. A random intercept model is used at the household level to account for unobserved heterogeneity. In a sample of 120 households across five provinces, the estimated fixed effect indicates an adoption rate of 45%, suggesting significant variation in adoption likelihood based on socio-economic factors. Multilevel regression analysis is identified as a robust method for assessing adoption rates of power-distribution equipment systems in diverse rural settings. Future research should consider additional contextual variables to refine the model and enhance its predictive accuracy. Power-Distribution Equipment, Adoption Rates, Multilevel Regression Analysis, South Africa 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, African, SpatialStatistics, DeterminantsOfAdoption, MultilevelModels, RandomEffectsModel, GeographicDynamics*

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