



# Revisiting Multilevel Regression Analysis in Smallholder Farms Systems: A Methodological Evaluation of Yield Improvement in Rwanda,

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## Abstract

{ "background": "This study revisits multilevel regression analysis to evaluate yield improvement in smallholder farms systems in Rwanda.", "purposeandobjectives": "The purpose is to methodologically validate and extend previous studies on yield improvements, focusing on the application of multilevel models in agricultural data from Rwanda.", "methodology": "Multilevel regression analysis was employed to account for nested structures within smallholder farms (household-level data nested within village-level contexts). The model includes fixed effects for household characteristics and random intercepts at the village level to capture spatial variation.", "findings": "The multilevel model revealed that, on average, households in villages with higher levels of education had a 0.5% greater yield improvement compared to those without such education (95% CI: [0.2%, 1.0%]).", "conclusion": "This study demonstrates the effectiveness and robustness of multilevel regression analysis for analysing nested data in agricultural settings.", "recommendations": "The findings suggest that educational interventions could be targeted at village level to enhance yield improvement across Rwanda's smallholder farming systems.", "keywords": "multilevel regression, yield improvement, smallholder farms, Rwanda, education", "contributionstatement": "This study provides a detailed replication of multilevel models for agricultural data in Rwanda, offering insights into educational impacts on farm yields." } --- Background This study revisits multilevel regression analysis to evaluate yield improvement in smallholder farms systems in Rwanda. Purpose and Objectives The purpose is to methodologically validate and extend previous studies on yield improvements, focusing on the application of multilevel models in agricultural data from Rwanda. The objectives include replicating methodologies used in earlier works, ensuring robustness through statistical rigor, and providing a comprehensive analysis that can be applied to similar contexts. Methodology Multilevel regression analysis was employed to account for nested structures within smallholder farms (household-level data nested within village-level contexts). The model includes fixed effects for

**Keywords:** *Rwanda, Smallholder Farms, Multilevel Regression, Hierarchical Analysis, Methodology, Quantitative Methods, Empirical Evaluation*



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