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Methodological Evaluation of Smallholder Farms Systems in Ghana: A Randomized Field Trial for Measuring Cost-Effectiveness

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Abstract

Smallholder farming systems are critical to agricultural productivity in Ghana, particularly for food security and poverty reduction. However, understanding their cost-effectiveness is complex due to varying resource availability and management practices. A randomized controlled trial (RCT) was conducted among 200 randomly selected smallholder farmers. The trial included three treatment groups: traditional farming practices, improved agricultural technologies, and a combination of both. Data collection encompassed farm inputs, outputs, and costs over a one-year period. The analysis revealed that the combination of traditional farming practices with improved technologies led to an average increase in crop yields by 15% compared to traditional methods alone, while maintaining comparable input costs (standard error ±2%). The randomized field trial provided robust evidence on the cost-effectiveness of different farm management strategies. Policy makers should prioritise interventions that combine both traditional and modern agricultural practices to enhance productivity sustainably. Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, Agricultural Economics, Spatial Analysis, Causal Inference, Experimental Design, Resource Allocation, Field Experiment*

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