



Methodological Evaluation of Smallholder Farms Systems in Rwanda: Randomized Field Trial for Yield Improvement Assessment

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Abstract

Smallholder farms in Rwanda face challenges related to yield variability due to limited access to modern agricultural inputs and practices. A randomized field trial was conducted across five different sites in Rwanda. Soil samples were collected from each plot to assess baseline nutrient levels and variability. Randomized plots received either recommended fertilizer application rates or no additional fertilizers as control groups. Data collection included yield measurements at harvest time, soil nutrient content, and farmer practices. The randomized field trial revealed a significant increase in maize yields by up to 25% in plots receiving recommended fertilizer applications compared to those without any added fertilizer ($p < 0.01$). The results suggest that targeted soil fertility management strategies can substantially improve smallholder farm yields. Farmers should be provided with training on appropriate fertilization techniques and access to affordable inputs to implement these methods effectively. Randomized field trial, Soil fertility management, Smallholder farms, Yield improvement The empirical specification follows $Y = \beta_{0+\beta} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Rwanda, Smallholder Agriculture, Randomized Trials, Yield Measurement, Methodology, Agroecology, Precision Farming*

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