



Methodological Evaluation of Smallholder Farm Systems in South Africa Using Quasi-Experimental Design to Measure Cost-Effectiveness

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Abstract

In South Africa, smallholder farms are a significant part of agricultural production, yet their economic viability is uncertain. A quasi-experimental design was employed to assess the efficiency of different farming practices among smallholders. Data on costs, yields, and inputs were collected from 50 randomly selected farms over two years. The analysis revealed that by adopting improved agricultural techniques, farm productivity increased by an average of 20% with a confidence interval of $\pm 5\%$. This indicates significant potential for cost reduction while enhancing output. This study provides empirical evidence on the effectiveness of specific farming practices in improving smallholder farm systems' economic performance. Farmers and policymakers should be encouraged to adopt these techniques, which can lead to more sustainable and economically viable agricultural practices. Smallholder farms, cost-effectiveness, quasi-experimental design, South Africa The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agroecosystems, farm management practices, cost-benefit analysis, experimental design, resource utilization, sustainability indicators, quantitative methods*

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