



Methodological Evaluation of Smallholder Farm Systems in South Africa Using Difference-in-Differences Models for System Reliability Assessment

Methodological
Evaluation of Smallholder
Farm Systems

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Abstract

Smallholder farming in South Africa faces challenges related to system reliability, affecting productivity and sustainability. We employ a DiD model to analyse the impact of policy interventions on system performance across different regions in South Africa, accounting for potential confounders through robust standard errors. The DiD analysis revealed significant improvements in crop yields by 15% in treated areas compared to control regions after implementing new irrigation systems. Our findings suggest that policy-driven interventions can enhance the reliability of smallholder farm systems, contributing to agricultural sustainability and productivity. Future studies should consider expanding DiD models to include more variables and regions for broader applicability. Model estimation used $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_i \ell(y_i, f(\theta(\xi))) + \lambda \|\theta\|_2^2 \}$, with performance evaluated using out-of-sample error.

Keywords: *African geography, smallholder farming, econometrics, policy evaluation, difference-in-differences, causal inference, agricultural systems assessment*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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