



Methodological Evaluation of Smallholder Farms Systems in South Africa Using Difference-in-Differences Models

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Abstract

Smallholder farms in South Africa face challenges such as limited access to resources and markets, leading to suboptimal agricultural productivity. A comprehensive search of academic databases identified relevant studies. Methodological rigor was assessed based on model specification, implementation, and validation. The analysis revealed that incorporating control variables significantly improved the accuracy of outcome measurement. Difference-in-differences models are robust for evaluating smallholder farm systems in South Africa when properly specified and validated. Future research should focus on replicating findings with additional datasets and explore model extensions to enhance predictive power. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, smallholder farming systems, difference-in-differences (DiD), econometrics, resource allocation models, yield gap analysis, impact evaluation methods*

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