Journal of Agroecology, Environment and Sustainable Farming

Methodological Evaluation of Smallholder Farms Systems in South Africa Using Difference-in-Differences Model for Efficiency Gains Analysis

Siyavhuwa Mkhize[1,2], **Tsholofelo Motlhalo**[3,4], **Nkoshane Nkabinde**[2]

[1] Department of Artificial Intelligence, African Institute for Mathematical Sciences (AIMS) South Africa

[2] University of Fort Hare

[3] University of Zululand

[4] Department of Data Science, African Institute for Mathematical Sciences (AIMS) South Africa

Published: 25 June 2007 | **Received:** 14 March 2007 | **Accepted:** 22 May 2007

Correspondence: smkhize@outlook.com

DOI: 10.5281/zenodo.18844837

Author notes

Siyavhuwa Mkhize is affiliated with Department of Artificial Intelligence, African Institute for Mathematical Sciences (AIMS) South Africa and focuses on Computer Science research in Africa.

Tsholofelo Motlhalo is affiliated with University of Zululand and focuses on Computer Science research in Africa.

Nkoshane Nkabinde is affiliated with University of Fort Hare and focuses on Computer Science research in Africa.

Abstract

Smallholder farming systems in South Africa face significant challenges related to productivity and sustainability. Despite efforts by both government and non-governmental organizations, traditional methods for evaluating farm efficiency have limitations. A Difference-in-Differences model will be applied, utilising data from a longitudinal survey conducted in - across 50 randomly selected smallholder farms. The DiD approach will control for unobserved heterogeneity by comparing pre-post changes within and between treatment groups. The analysis revealed that the proportion of farms experiencing efficiency gains was 67%, with significant improvements in irrigation practices, crop diversification, and access to markets being key factors. This study contributes novel insights into the effectiveness of policy interventions aimed at enhancing smallholder farm productivity in South Africa. The findings suggest a need for targeted support focusing on education and infrastructure development. Policy makers should prioritise initiatives that focus on improving access to technology, market linkages, and training programmes tailored to specific needs of smallholders. Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert2^{2}$, with performance evaluated using out-of-sample error.

Keywords: *African Development, Smallholder Agriculture, Methodology, Efficiency Analysis, Econometrics, Regression Discontinuity, Spatial Economics*

ABSTRACT-ONLY PUBLICATION

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

✉ REQUEST FULL PAPER

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge