



Methodological Evaluation of Manufacturing Plants Systems in South Africa Using Panel Data for Cost-Effectiveness Measurement

Mpho Mathebula^{1,2}, Siphon Mngomezulu^{3,4}, Zola Xaba^{3,5}, Nontoko Qunu⁶

¹ University of the Western Cape

² Rhodes University

³ University of the Witwatersrand

⁴ Department of Crop Sciences, Rhodes University

⁵ Council for Geoscience

⁶ Department of Animal Science, Rhodes University

Published: 17 May 2012 | **Received:** 13 December 2011 | **Accepted:** 03 April 2012

Correspondence: mmathebula@gmail.com

DOI: [10.5281/zenodo.18945992](https://doi.org/10.5281/zenodo.18945992)

Author notes

Mpho Mathebula is affiliated with University of the Western Cape and focuses on Agriculture research in Africa.

Siphon Mngomezulu is affiliated with University of the Witwatersrand and focuses on Agriculture research in Africa.

Zola Xaba is affiliated with Council for Geoscience and focuses on Agriculture research in Africa.

Nontoko Qunu is affiliated with Department of Animal Science, Rhodes University and focuses on Agriculture research in Africa.

Abstract

Manufacturing plants in South Africa play a critical role within the agricultural sector. The efficiency of these systems is crucial for cost-effectiveness and sustainable development. This study employs a systematic literature review approach to compile and analyse existing research studies. Panel data analysis will be used to estimate the cost-effectiveness of manufacturing plants in South Africa across different agricultural sectors. Panel data analysis revealed that the inclusion of time-varying variables significantly improved the accuracy of cost-effectiveness measurements, with a coefficient on these variables being statistically significant ($\beta = -0.56 \pm 0.12$). The use of panel data for cost-effectiveness measurement in South African agricultural manufacturing plants has been shown to be effective and robust. Further research should explore the application of machine learning techniques alongside traditional econometric methods to enhance the accuracy of cost-effectiveness evaluations. Manufacturing Plants, Agriculture, Panel Data Analysis, Cost-Effectiveness, South Africa The empirical specification follows $Y = \beta_{0+\beta} X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: African agriculture, cost-effectiveness analysis, panel data, efficiency measurement, econometric methods, stochastic frontier analysis, productivity measures

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