



# Methodological Evaluation of Manufacturing Plant Systems in South Africa: A Randomized Field Trial for Cost-Effectiveness Assessment

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## Abstract

Recent advancements in manufacturing technologies have led to increased interest in evaluating their cost-effectiveness across various regions, including South Africa. This study aims to contribute to this field by providing a methodological framework for assessing such systems. A randomized field trial was conducted across multiple sites, with each site receiving one of four different plant manufacturing systems. Key variables such as production yield, operational costs, and maintenance requirements were measured over a period of six months. Data collection utilised statistical models to account for potential confounders. The analysis revealed that System A achieved the highest production yield (15% higher than baseline) with an overall cost reduction of 20%, when compared to the control group, although there was some variability across different sites. This study provides a robust methodological framework for assessing plant manufacturing systems in South Africa and offers insights into their cost-effectiveness. The findings suggest that System A is particularly advantageous in terms of both yield and cost reduction. Based on the results, it is recommended that further research be conducted to validate these findings at larger scales and over extended periods. Additionally, a standardised method for system evaluation should be developed to ensure consistency across different contexts. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Geographic, African, Manufacturing, Evaluation, Methodology, Analysis, Benchmarking*

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