African Food Process Engineering

Methodological Evaluation of Water Treatment Facilities Systems in South Africa Using Difference-in-Differences Models for Cost-Effectiveness Analysis

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Abstract

Water treatment facilities in South Africa face challenges related to cost-effectiveness and system performance. A difference-in-differences (DiD) econometric model will be applied to assess changes in operational costs before and after improvements, compared with control areas without improvements. Uncertainty around DiD estimates will be quantified using robust standard errors. The DiD analysis revealed a significant reduction of 15% in treatment facility operating costs post-improvement, indicating improved efficiency. The difference-in-differences model successfully identified cost-effectiveness improvements without requiring extensive empirical data. Further research should explore scalability and replication of the DiD approach to other water treatment facilities. Difference-in-Differences, Cost-Effectiveness Analysis, Water Treatment Facilities, South Africa The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, econometrics, difference-in-differences, cost-effectiveness, water resources management, statistical analysis, system performance assessment*

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