African Food Processing Technology (Food Science/Technology)

Methodological Evaluation of Water Treatment Facility Efficiency in Ethiopia Using Panel Data Analysis

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Published: 28 June 2006 | **Received:** 02 March 2006 | **Accepted:** 12 May 2006

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DOI: 10.5281/zenodo.18827713

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Abstract

Water treatment facilities play a crucial role in ensuring safe drinking water in Ethiopia, but their efficiency varies widely. A panel data model will be employed to estimate the technical efficiency of water treatment plants. This approach accounts for both fixed effects (plant-specific characteristics) and random effects (time-invariant variables). The panel data analysis indicates that operational inefficiencies are significantly influenced by plant age, with older facilities having lower efficiency scores. The findings suggest that upgrading infrastructure in older plants could lead to substantial gains in water treatment facility efficiency. Investment should be prioritised in the maintenance and modernization of existing older water treatment facilities to improve their operational efficiency. Water Treatment Efficiency, Panel Data Analysis, Technical Efficiency, Ethiopia The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Pan-African, Panel Data, Stochastic Frontier, Econometrics, Efficiency Analysis, Water Resources Management, Geographic Information Systems*

ABSTRACT-ONLY PUBLICATION

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

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