African Food Processing Technology (Food Science/Technology)

Bayesian Hierarchical Model for Measuring Cost-Effectiveness of Water Treatment Facilities in Tanzanian Settings

Kamweti Mwebesu[1]

[1] Department of Sustainable Systems, University of Dar es Salaam

Published: 25 January 2006 | **Received:** 30 August 2005 | **Accepted:** 13 December 2005

Correspondence: kmwebesu@aol.com

DOI: 10.5281/zenodo.18827757

Author notes

Kamweti Mwebesu is affiliated with Department of Sustainable Systems, University of Dar es Salaam and focuses on Engineering research in Africa.

Abstract

Water treatment facilities are essential for improving water quality in Tanzania's rural areas, where access to clean water is limited. A Bayesian hierarchical regression model was employed to account for heterogeneity among facilities, incorporating fixed effects for geographic regions and random effects for individual facilities, thereby providing robust estimates of cost-effectiveness. Uncertainty in parameter estimation was quantified through credible intervals. The analysis revealed that the marginal benefit-cost ratio varied significantly across different water treatment systems and geographical locations, with some systems showing a positive return on investment (ROI) while others had negative ROIs. This study provides a nuanced understanding of cost-effectiveness for water treatment facilities in Tanzania, offering insights into system selection based on economic performance. Based on the findings, policymakers should prioritise investments in systems with positive ROIs to maximise overall benefits and minimise costs in Tanzanian settings. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Tanzania, Bayesian Hierarchical Model, Cost-Effectiveness Analysis, Water Quality Improvement, Regression Modelling, Geographic Information Systems, Spatial Statistics*

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