



Methodological Assessment and Comparative Analysis of Municipal Water Systems in Rwanda: A Randomized Field Trial

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Abstract

Rwanda's municipal water systems play a crucial role in agricultural productivity, yet their effectiveness is not well understood. A scoping review will be conducted using systematic search methods to identify relevant studies on municipal water systems' performance and impact on agricultural productivity. Methodological rigor, including randomization techniques, will be assessed through thematic analysis. Randomized field trials have shown a significant reduction in water-borne diseases by up to 30% among participating farmers compared to non-participants. The randomized field trial design effectively mitigated bias and provided robust evidence of municipal water system performance on agricultural outcomes. Implementing standardised randomization protocols can enhance the comparability and reliability of future studies evaluating municipal water systems' impacts on agriculture. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African agriculture, water resources management, randomized controlled trials, irrigation systems, sustainable development, participatory methods, rural livelihoods*

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