



# Methodological Diagnostics of Municipal Water Systems in Rwanda

*A Systematic Review of the Difference-in-Differences Model for Yield Optimisation*

Marie Chantal Uwase<sup>1,2</sup>, Tharcisse Niyonzima<sup>3</sup>

Valentine Mukamana<sup>3</sup>, Jean de Dieu Uwimana<sup>3,4</sup>

<sup>1</sup> Department of Animal Science, Rwanda Environment Management Authority (REMA)

<sup>2</sup> Department of Agricultural Economics, University of Rwanda

<sup>3</sup> African Leadership University (ALU), Kigali

<sup>4</sup> Department of Animal Science, African Leadership University (ALU), Kigali

Correspondence: [muwase@hotmail.com](mailto:muwase@hotmail.com)

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## Author notes

Marie Chantal Uwase is affiliated with Department of Animal Science, Rwanda Environment Management Authority (REMA) and focuses on Agriculture research in Africa.

Tharcisse Niyonzima is affiliated with African Leadership University (ALU), Kigali and focuses on Agriculture research in Africa.

Valentine Mukamana is affiliated with African Leadership University (ALU), Kigali and focuses on Agriculture research in Africa.

Jean de Dieu Uwimana is affiliated with Department of Animal Science, African Leadership University (ALU), Kigali and focuses on Agriculture research in Africa.

## ABSTRACT

**Background:** Municipal water systems are critical for agricultural productivity and rural development. In Rwanda, optimising the yield of these systems is a policy priority, yet rigorous methodological evaluations of impact assessment models, particularly quasi-experimental designs, are lacking in the literature.

**Purpose and objectives:** This systematic review aims to critically evaluate the application and methodological rigour of the difference-in-differences (DiD) model for measuring yield improvements in Rwandan municipal water systems within the agricultural sector.

**Keywords:** *difference-in-differences, water resources management, agricultural productivity, Sub-Saharan Africa, impact evaluation, irrigation systems, Rwanda*

### Article Highlights

- Limited corpus of studies identified in systematic review
- Frequent failure to test parallel trends assumption in DiD applications
- Treatment effects often lack confidence intervals or robust errors
- Methodological practice remains nascent despite theoretical suitability

### Core Model Specification

Canonical two-way fixed effects:  $Y_{it} = \alpha + \beta(\text{Treat}_i \times \text{Post}_t) + \gamma_i + \delta_t + \varepsilon_{it}$

*This review audits methodological rigor rather than reporting intervention outcomes.*



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