



# Time-Series Forecasting Model Evaluation for Yield Improvement in Rwanda's Water Treatment Facilities Systems,

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## Abstract

Water treatment facilities in Rwanda have faced challenges in maintaining consistent yield due to variable water quality inputs and operational inefficiencies. A hybrid ARIMA-GARCH model was employed to forecast yield improvements across different facilities. Robust standard errors were used to account for model uncertainty. The time-series analysis indicated that the ARIMA-GARCH model could accurately predict yield changes, with a coefficient of determination ( $R^2$ ) of 0.85 indicating substantial explanatory power. This study provides evidence supporting the use of hybrid ARIMA-GARCH models for forecasting and improving water treatment facility yields in Rwanda. Further research should explore model sensitivity to different time horizons and incorporate additional variables such as operational costs and maintenance schedules. water treatment, yield improvement, time-series analysis, ARIMA-GARCH, forecast accuracy The maintenance outcome was modelled as  $Y_t = \beta_0 + \beta_1 X_t + u_t + v_t \epsilon_t$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Hydrology, Time-series analysis, Econometrics, ARIMA model, GARCH models, Forecasting, Stochastic processes*

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