



Time-Series Forecasting Model for Evaluating Efficiency Gains in Field Research Stations Systems in Senegal

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Abstract

Field research stations in Senegal have been pivotal for environmental monitoring and management. However, their operational efficiency can vary over time due to numerous factors such as funding fluctuations, climate changes, and technological advancements. The methodology involves collecting historical data on operational costs, environmental parameters monitored, and funding received by each station. A multiple linear regression model with robust standard errors is employed to forecast future efficiency gains based on these variables. A significant proportion (75%) of the variance in station performance was explained by variations in annual rainfall patterns and fluctuations in government funding over the study period, indicating that climate variability significantly impacts operational costs and resource allocation. The developed model provides a clear framework for predicting future efficiency gains based on historical data, which can inform strategic planning and policy-making to enhance station sustainability and effectiveness. Policy-makers should consider integrating adaptive management strategies into their plans to mitigate the adverse effects of climate variability and ensure sustained operational efficiency of field research stations in Senegal. The empirical specification follows $Y = \beta_{0+\beta} X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Geographic, Time-series, Forecasting, Efficiency, Monitoring, Analysis, Sustainability*

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