African Supply Chain Management

# Time-Series Forecasting Model for Evaluating Cost-Efficiency of Field Research Stations in Senegal

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## Abstract

Field research stations in Senegal have played a crucial role in various studies but their cost-effectiveness over time has not been systematically evaluated. The methodology involves collecting historical data on operational costs and outcomes from selected research stations. A time-series analysis is conducted using an autoregressive integrated moving average (ARIMA) model to forecast future trends in cost-effectiveness. The ARIMA model, with a confidence interval of ±5%, predicts that the cost-efficiency ratio will increase by approximately 10% over the next five years if current operational strategies are maintained. This study demonstrates the utility of time-series forecasting in evaluating and optimising the performance of field research stations. The ARIMA model offers a robust tool for assessing long-term financial sustainability. Based on findings, it is recommended that resource management teams consider reallocating funds to areas identified as having the greatest potential for cost savings through targeted interventions. Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert 2^{2}$, with performance evaluated using out-of-sample error.

**Keywords:** *African geography, time-series analysis, econometrics, cost-benefit analysis, forecasting models, geographic information systems, predictive analytics*

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