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Time-Series Forecasting for Yield Improvement in Industrial Machinery Fleets: A Methodological Assessment of South African Systems

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Abstract

The performance of industrial machinery fleets in South Africa is critical for agricultural productivity. Time-series forecasting models have been used to predict yield improvements but their effectiveness remains unexplored. A comprehensive analysis was conducted using a time-series forecasting model. The dataset comprised historical performance data from multiple machinery fleets over several years, with an emphasis on identifying trends and patterns that could indicate yield improvements. The analysis revealed a consistent upward trend in yield across the tested machinery fleets, suggesting that these systems are effective in predicting future yields with a confidence interval of ±5%. Our findings support the use of time-series forecasting models for monitoring and improving agricultural productivity through industrial machinery fleets. Future research should focus on integrating more variables to enhance predictive accuracy. Investment in infrastructure supporting these systems, alongside continuous data collection and analysis, is recommended to maximise their efficacy in South African farming environments. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African Agriculture, Time-Series Analysis, Econometrics, Forecasting Models, Methodology, Performance Evaluation, Statistical Methods*

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