Time-Series Analysis in Kenyan Agriculture: Stability and Convergence Proofs for Yield Prediction

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Abstract

Agricultural yield prediction in Kenya is crucial for food security and economic stability. However, existing models often struggle with capturing temporal dynamics effectively. We employ ARIMA (AutoRegressive Integrated Moving Average) model for forecasting and conduct theoretical proofs using Lyapunov's stability criterion and Kolmogorov's limit theorem. Our analysis reveals that the Kenyan agricultural data exhibits stable and convergent behaviour, validating our theoretical models over different time horizons. The empirical findings confirm the robustness of ARIMA in predicting agricultural yields in Kenya, providing a solid foundation for future policy development. Policy makers should consider integrating these predictive models into their decision-making frameworks to enhance food security and economic planning. The analytical core is $\hat{\{y\}}t = mathcal\{F\}(xt;\theta)$ with $\hat{\{\theta\}} = argmin_\theta L(\theta)$, and convergence is established under standard smoothness conditions.

Keywords: *Kenya, Time-Series Econometrics, ARIMA, Cointegration, Unit Root Test, Granger Causality, Long Memory Processes*

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