

ABSTRAK

Penelitian ini bertujuan untuk melakukan analisis perbandingan metode Regresi Linear dan *Triple Exponential Smoothing* dalam meramalkan tingkat hasil produksi pertanian di Kabupaten Bener Meriah menggunakan data historis 240 observasi periode April 2015-Desember 2024. Data mencakup variabel luas lahan, hasil produksi, dan jumlah petani yang diproses melalui *preprocessing*, normalisasi fitur, dan ekstraksi fitur temporal dengan pembagian data *training* (80%) dan *testing* (20%) secara temporal. Hasil penelitian menunjukkan perbedaan performa yang sangat signifikan, dimana *Triple Exponential Smoothing* menghasilkan nilai MAE 0.32 ton, RMSE 0.41 ton, dan MAPE 0.62%, sedangkan Regresi Linear menghasilkan MAE 36.89 ton, RMSE 39.10 ton, dan MAPE 77.56% pada data *testing*. Berdasarkan nilai MAPE dari metode *Triple Exponential Smoothing* dan metode Regresi Linear menunjukkan bahwa nilai MAPE metode *Triple Exponential Smoothing* 0.62% lebih kecil dari nilai MAPE metode Regresi Linear 77.56%. Jadi, algoritma *Triple Exponential Smoothing* lebih baik diterapkan untuk memprediksi hasil produksi pertanian. Parameter optimal *TES* ($\alpha=0.990$, $\beta=0.015$, $\gamma=0.010$) mengindikasikan responsivitas tinggi terhadap perubahan data terkini. Proyeksi periode 2025-2029 menunjukkan *TES* memproyeksikan pertumbuhan berkelanjutan dari 58.62 ton hingga 129.86 ton, sementara *Regresi Linear* memproyeksikan pertumbuhan modest dari 6.95 ton menjadi 9.02 ton. Analisis pola musiman mengidentifikasi periode produktivitas tertinggi pada Agustus-Oktober dengan puncak September (40.08 ton rata-rata).

Kata Kunci: Metrik Evaluasi, Peramalan Produksi Pertanian, *Triple Exponential Smoothing*, *Regresi Linear*, *Time Series*

ABSTRACT

This study aims to conduct a comparative analysis of the Linear Regression and Triple Exponential Smoothing methods in forecasting agricultural production levels in Bener Meriah Regency using historical data of 240 observations from the period April 2015-December 2024. The data includes variables such as land area, production output, and the number of farmers, which were processed through preprocessing, feature normalization, and temporal feature extraction with a temporal division of training data (80%) and testing data (20%). The research results show a very significant performance difference, where Triple Exponential Smoothing produces an MAE value of 0.32 tons, RMSE of 0.41 tons, and MAPE of 0.62%, while Linear Regression produces an MAE of 36.89 tons, RMSE of 39.10 tons, and MAPE of 77.56% on the testing data. Based on the MAPE values from the Triple Exponential Smoothing method and the Linear Regression method, it shows that the MAPE value of the Triple Exponential Smoothing method (0.62%) is smaller than the MAPE value of the Linear Regression method (77.56%). Therefore, the Triple Exponential Smoothing algorithm is better applied for predicting coffee production results. The optimal TES parameters ($\alpha=0.990$, $\beta=0.015$, $\gamma=0.010$) indicate high responsiveness to recent data changes. The projection for the period 2025-2029 shows that TES forecasts sustainable growth from 58.62 tons to 129.86 tons, while Linear Regression forecasts modest growth from 6.95 tons to 9.02 tons. Seasonal pattern analysis identifies the highest productivity period from August to October, with a peak in September (an average of 40.08 tons).

Keywords: *Agricultural Production Forecasting, Evaluation Metrics, Linear Regression, Time Series, Triple Exponential Smoothing.*