

ABSTRAK

Penelitian ini bertujuan membangun model prediksi produksi Tandan Kosong Kelapa Sawit (TKKS) di PKS Sawit Hulu Kabupaten Langkat menggunakan metode *Autoregressive Integrated Moving Average* (ARIMA) berdasarkan data historis harian periode 2021–2025. Tahapan penelitian meliputi pengumpulan data, pembersihan data, pengujian stasioneritas menggunakan *Augmented Dickey-Fuller* (ADF), identifikasi parameter melalui *Autocorrelation Function* (ACF) dan *Partial Autocorrelation Function* (PACF), pembentukan model ARIMA, pembagian data latih dan data uji, evaluasi model, serta peramalan periode berikutnya. Dari 1.825 data awal, sebanyak 370 data produksi bernilai nol tidak digunakan sehingga diperoleh 1.455 data valid. Data valid dibagi secara kronologis menjadi 1.164 data latih (80%) dan 291 data uji (20%). Hasil uji ADF memperoleh statistik sebesar $-14,9104$ dan $p\text{-value}$ 0,0000 sehingga data dinyatakan stasioner dan tidak memerlukan *differencing*. Model yang digunakan adalah ARIMA (1,0,1). Evaluasi pada data latih menghasilkan MAPE 27,78% dan MSE 5.872.862.548,57, sedangkan evaluasi *out-of-sample* pada data uji menghasilkan MAPE 40,14%, dan MSE 680.852.339,29. Hasil ini menunjukkan bahwa model mampu menangkap pola umum produksi, tetapi masih terbatas dalam mengikuti fluktuasi produksi yang tajam. Setelah evaluasi, model dilatih ulang menggunakan seluruh data valid untuk menghasilkan prediksi 30 hari pada Januari 2026 dengan rata-rata 116.560 kg per hari. Data TBS digunakan sebagai informasi pendukung dan visualisasi, sedangkan model ARIMA dibentuk secara univariat menggunakan data historis TKKS. Hasil prediksi dapat digunakan sebagai informasi pendukung dalam perencanaan pengelolaan limbah, kapasitas penyimpanan, dan pemanfaatan biomassa di PKS Sawit Hulu.

Kata Kunci : *Autoregressive Integrated Moving Average*, Tandan Buah Segar, Tandan Kosong Kelapa Sawit, *Mean Absolute Percentage Error*, *Mean Square Error*

ABSTRACT

This study aims to develop a prediction model for Empty Fruit Bunch (EFB) production at Sawit Hulu Palm Oil Mill, Langkat Regency, using the Autoregressive Integrated Moving Average (ARIMA) method based on daily historical data from 2021 to 2025. The research stages include data collection, data cleaning, stationarity testing using the Augmented Dickey-Fuller (ADF) test, parameter identification through the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF), ARIMA model development, train-test splitting, model evaluation, and future forecasting. Of the initial 1,825 records, 370 zero-production records were excluded, resulting in 1,455 valid observations. The valid observations were chronologically divided into 1,164 training data (80%) and 291 testing data (20%). The ADF test produced a statistic of -14.9104 and a p-value of 0.0000, indicating that the series was stationary and did not require differencing. The model used was ARIMA (1,0,1). Evaluation on the training data produced a MAPE of 27.78% and an MSE of 5,872,862,548.57, while the out-of-sample evaluation on the testing data produced a MAPE of 40.14%, and an MSE of 680,852,339.29. These results indicate that the model captures the general production pattern but remains limited in following sharp fluctuations. After evaluation, the model was refitted using all valid observations to generate a 30-day forecast for January 2026, with an average daily forecast of 116,560 kg. FFB data were used only as supporting information and visualization, while the ARIMA model was developed as a univariate model using historical EFB production. The forecast can support waste management planning, storage capacity allocation, and biomass utilization at Sawit Hulu Palm Oil Mill.

Keywords: Autoregressive Integrated Moving Average, Empty Fruit Bunch, Fresh Fruit Bunches , Mean Absolute Percentage Error, Mean Squared Error.