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Forecasting Oil Palm Production Based on a Nonlinear Autoregressive Exogenous (NARX) Neural Network Model

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A time series data analysis and prediction tool that is able to predict the yield of oil palm is needed to ensure an acceptable forecasting quality. An attempt was made in this study to develop a Nonlinear Autoregressive Exogenous (NARX) neural network model of oil palm production using MATLAB. This NARX model was used to predict the yield of oil palm in the states of Kelantan, Johor, Sabah and Sarawak in Malaysia. The performance of the NARX model was tested and validated using the Levenberg-Marquardt (LM) training algorithm and was compared with the Autoregressive Integrated Moving Average (ARIMA) model. The best performance of the NARX model was achieved at 70 per cent:15 per cent:15 per cent, with 10 neurons in the hidden layers and a delay value of four for Sarawak. For Kelantan and Johor, the NARX model produced the best result using the parameters of 70 per cent:10 per cent:20 per cent, with 13 neurons in the hidden layers and a delay value of four. The best result for Sabah was achieved using the parameters of 70 per cent:15 per cent:15 per cent, with 13 neurons in the hidden layers and a delay value of four. The results demonstrated that the proposed NARX model was more effective in modeling and forecasting time series data than the ARIMA model. The NARX model registered a minimum mean square error and mean absolute percentage error with a maximum average accuracy percentage and correlation coefficient.

Keywords: Oil palm cultivation, yield predictions, nonlinear autoregressive exogenous neural network, autoregressive integrated moving average.

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