

Shallot Price Forecasting Models: Comparison among Various Techniques

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Abstract. Shallot is one of the important agricultural products which are largely exported from Thailand to several countries. Although the shallot price in Thailand tends to increase over years, it is highly fluctuated causing the price prediction more complex and difficult. Although literature proposes a wide range of forecasting techniques, there is no one-size-fits-all approach given different problems and the data set at hand. This research aims to propose models for predicting shallot prices in Northern Thailand from January 2014 to December 2020. Particularly, this study focuses on both traditional and machine learning models including the Autoregressive Integrated Moving Average (ARIMA), Holt-Winters, Long Short-Term Memory (LSTM) and ARIMA-LSTM hybrid models. For the LSTM model, temperature and rainfall are selected as the influencing factor of shallot price. The evaluation of the prediction accuracy is based on three indicators, namely, Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE). The results report that the ARIMA-LSTM hybrid model outperforms the other standalone models, with 10.275 Bath, 8.512 Bath, and 13.618% of RMSE, MAE and MAPE, respectively. By using the hybrid model, shallot farmers can obtain prior information on shallot prices for making a better decision on expanding the cultivated land and production management.

Keywords: Forecasting, ARIMA, LSTM, Holt-Winters, ARIMA-LSTM.