ABSTRAK

Stabilitas harga komoditas pertanian merupakan elemen penting dalam menjaga ketahanan pangan dan stabilitas ekonomi di Daerah Istimewa Yogyakarta (DIY). Namun, harga komoditas strategis seperti beras medium, bawang merah, dan cabai rawit cenderung berfluktuasi tinggi akibat karakteristik data yang nonlinear, nonstasioner, serta dipengaruhi faktor musiman dan dinamika pasar yang kompleks. Model peramalan individual seperti ARIMA, Prophet, dan VAR memiliki keterbatasan dalam menangkap pola deterministik dan komponen stokastik secara simultan. Oleh karena itu, penelitian ini mengembangkan model *hybrid* VAR–Prophet yang mengombinasikan keunggulan Prophet dalam memodelkan tren dan musiman dengan kemampuan VAR dalam menangkap interdependensi antarkomoditas.

Penelitian ini menggunakan metodologi CRISP-DM dengan data harga harian beras medium, bawang merah, dan cabai rawit periode Juli 2020 hingga September 2025. Model *hybrid* dibangun melalui pendekatan *additive* dua tahap, di mana Prophet menghasilkan prediksi awal dan residualnya dimodelkan menggunakan VAR. Sistem prediksi diimplementasikan dalam bentuk prototipe web berbasis R *Shiny*. Hasil evaluasi menunjukkan bahwa model *hybrid* VAR–Prophet unggul secara agregat dengan rata-rata RMSE sebesar 10.266,66, MAE 7.706,88, dan MAPE 22,42%. Temuan ini menunjukkan bahwa pendekatan *hybrid* mampu meningkatkan akurasi prediksi secara keseluruhan dan berkontribusi dalam pengembangan metode peramalan time series multivariat untuk mendukung pengambilan keputusan di sektor pertanian DIY.

Kata Kunci: *additive hybrid*, VAR, Prophet, harga komoditas pertanian, Daerah Istimewa Yogyakarta

ABSTRACT

Price stability of agricultural commodities is a crucial factor in maintaining food security and economic stability in the Special Region of Yogyakarta (DIY). However, prices of key commodities such as medium rice, shallots, and cayenne pepper exhibit high volatility due to nonlinear and non-stationary characteristics, seasonal effects, and complex market dynamics. Individual forecasting models such as ARIMA, Prophet, and VAR are limited in capturing deterministic patterns and stochastic components simultaneously. To address this limitation, this study develops a hybrid VAR–Prophet model that integrates Prophet's strength in modeling trend and seasonality with VAR's ability to capture interdependencies among commodities.

This research adopts the CRISP-DM methodology using daily price data of medium rice, shallots, and cayenne pepper from July 2020 to September 2025. The hybrid model is constructed using a two-stage additive approach, where Prophet generates baseline forecasts and VAR models the residuals. The forecasting system is implemented as a web-based prototype using R Shiny. Evaluation results indicate that the hybrid VAR–Prophet model outperforms baseline models on average, achieving an RMSE of 10,266.66, MAE of 7,706.88, and MAPE of 22.42%. These findings demonstrate that the hybrid approach improves overall forecasting performance and contributes to the development of multivariate time series forecasting methods for decision support in the agricultural sector of DIY.

Keywords: *additive hybrid, VAR, Prophet, agricultural commodity prices, Special Region of Yogyakarta*