

Application of ARIMA and ARIMAX models for forecasting paddy production in Anuradhapura district, Sri Lanka

Rathnayaka N.K., Laheetharan A.* and Satkunanathan N.

Department of Mathematics and Statistics, University of Jaffna, Sri Lanka

Rice is one of the main staple foods for people in Sri Lanka and many other Asian countries. A great majority of village people in Anuradhapura district is occupied in paddy farming as their main livelihood. Therefore, forecasting of paddy production is an important aspect, to support socio-economic activities in the district. The total yield of seasonal (namely Maha and Yala) paddy production depends on various factors, harvest area, paddy type, rainfall, etc. The objective of this study is to construct better fitting forecasting models to predict paddy production based on autoregressive integrated moving average (ARIMA) model and Regression model with ARIMA errors (ARIMAX) using harvested area in Anuradhapura district as the input time series and paddy production as output time series. Model parameters are estimated by maximum likelihood method. Forecasting accuracy measures, Root Mean Square Error (RMSE), Mean Absolute Error (MAE) and Mean Absolute Percentage Error (MAPE) are used to identify the best model based on the minimum measure of accuracy. Seasonal time series data of paddy production and harvested area were collected from Department of Census and Statistics, Sri Lanka for the period from Maha 1978 to Yala 2017. Based on minimum values of RMSE, MAE and MAPE criteria, ARIMA $(1, 0, 0)(0, 1, 1)_2$, ARIMA $(1, 0, 0)(0, 1, 2)_2$ and ARIMAX model with seasonal ARIMA $(0, 1, 1)(2, 0, 2)_2$ error series were selected as better fitting models among the ARIMA and ARIMAX models. Finally, the minimum measure of accuracy revealed that ARIMAX model is a better model than ARIMA models for the selected input variable.

Keywords: ARIMA, ARIMAX, paddy production, harvested area and forecasting

*Corresponding author: kalahee@yahoo.com