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A hybrid forecasting model for monthly elevation-wise tea auction prices in Sri Lanka using supply and demand factors

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Tea is a major agricultural commodity in Sri Lanka's plantation-based economy. Tea growing areas in Sri Lanka are divided into three regions based on elevation: high, medium, and low. Elevation at which tea is grown has a marked effect on the quality of tea. Despite the large number of studies conducted for forecasting tea auction prices, studies that consider elevation-wise price structure along with supply and demand factors and linear and nonlinear relationships appear to be rare. This paper aims to forecast monthly elevation-wise tea auction prices in Sri Lanka and examine possible relationships between prices and supply and demand factors, particularly prices at other auctions and climate and macroeconomic variables. Time series regression with seasonal autoregressive integrated moving average errors and feedforward neural network models fitted to average and elevation-wise prices yielded mixed results. Therefore, time series regression-feedforward neural network hybrid models were fitted and an algorithm was developed to forecast prices using the hybrid models. Empirical results suggested that the lagged production of green tea, United States Dollar to Sri Lankan Rupee exchange rates and prices at Cochin auction were associated with all the series; average and elevation-wise prices. The hybrid models yielded the highest performance in terms of all measures considered (mean absolute percentage errors obtained for average, high, medium, and low grown prices were 3.94 %, 4.33 %, 2.56 % and 2.8 %, respectively). Therefore, it is worthwhile to consider elevation-wise price structure and supply and demand factors while capturing linear and nonlinear relationships and seasonality in forecasting prices.

Keywords: Auction prices, Supply and demand factors, Time series regression, Hybrid model, Linear and nonlinear relationships, Seasonality.