

**Title:** Time Series Analysis of Rainfall Using ARIMA and SAMA Circular Model: Study from Vadamarachchi, Jaffna, Sri Lanka

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**Keywords:** Rainfall, SARIMA, SCM, Time series analysis

**Issue date:** November 17, 2021

**Journal:** Proceedings of 33<sup>rd</sup> annual congress of the Postgraduate Institute of Agriculture

**Publisher:** Postgraduate Institute of Agriculture, University of Peradeniya

**Citation:** Sellathurai, T., Sivananthawerl, T., Sivakumar, S.S., Mikunthan T. and Karunainathan. T. 2021. Time Series Analysis of Rainfall using ARIMA and SAMA Circular Model: Study from Vadamarachchi, Jaffna, Sri Lanka. 33<sup>rd</sup> Annual congress Postgraduate Institute of Agriculture, Peradeniya. Pp -51

**Abstract:** The time series analysis was performed with Seasonal Autoregressive Integrated Moving Average (SARIMA) and SAMA circular model (SCM) for the rainfall of Ampan, Karaveddi and Puloly regions of Jaffna to understand the behaviour of rainfall and forecast it with a suitable model. Minitab 17 software was used to run the model with the available monthly data from 2013 to 2019. Time series plots were used for pattern recognition, autocorrelation function (ACF) and Ljung-Box Q statistics (LBQ) were used to find the independence of the residuals. The probability plot was used to test the normality of residuals. The model with the lowest predicting errors was selected to forecast the future values. The monthly rainfall fluctuates around the mean of 41.6, 71.9 and 35.3 mm for Ampan, Karaveddi and Puloly respectively. The models SARIMA (0,0,0) (0,1,1)<sub>6</sub>, SARIMA (1,2,1) (0,1,1)<sub>6</sub>, and SARIMA (1,1,0) (0,1,1)<sub>6</sub> were found as most appropriate for Ampan, Karaveddi and Puloly respectively and  $Y_t = Y_{t-1} - 0.18 + 23.5 \sin 2\omega t + 28.5 \cos 1.5\omega t + 20.10 \cos 2\omega t + 26.47 \cos 5.5\omega t$ ,  $Y_t = Y_{t-1} - 2Y_{t-2} - 5.9 + 73.5 \sin 4.5\omega t$  and  $Y_t = Y_{t-1} - 2Y_{t-2} + 0.69 + 23.17 \cos 5.5\omega t$  were found as most appropriate SCM for Ampan, Karaveddi and Puloly respectively. Among these models, SCM predicts reliable data with minimum error. It finds the seasonal and cyclic pattern of the rainfall. A five-month seasonal and cyclic behaviour was noted with 13 - months interval in Ampan. Similarly, 10 - months seasonal in Karaveddi and only 13 - months interval cyclic pattern in Puloly. Anderson Darling (AD) value for Ampan is 0.40, Karaveddi is 0.63, and Puloly is 0.68. The estimated rainfall shows a decreasing trend in Ampan 0.2057 mm/year and an increasing trend in Puloly 1.15 mm/year and Karaveddi 0.61 mm/year. The decreasing trend of monthly rainfall in Ampan and decreasing in the other two regions is an alarming sign to the agriculture sector.