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Comparison of nonlinear statistical growth models for describing coffee export trends in India

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Abstract **:** India ranks sixth in world coffee production and largest coffee exporter in Asia with 65 to 70 per cent of the production being exported. In this paper, our purpose is to develop appropriate nonlinear statistical growth models to describe trends in coffee export in India for the period of 1991 to 2011. To this end, attempts were made to apply six nonlinear statistical growth models. The parameters of each model were estimated using Levenberg-Marquardt (LM) iterative method. The main assumptions of 'independence' and 'normality' of error terms were examined by using respectively the 'Run-test' and 'Shapiro-Wilk test'. The best two models were selected based on the performance of several model goodness of fit criteria *viz.*, R^2, MAE, MSE, RMSE, MAPE, AIC and BIC. Richard's and Logistic models were found to be quite successful for describing the pattern of coffee export. Forecast values were also computed using two best fitted models. A comparative study indicated that both selected model were performed similarly for forecasting coffee export quantity for the years 2015 and 2020.

Key words **:** Coffee export, Nonlinear growth model, Levenberg-Marquardt iterative method, Run-test, Shapiro-Wilk test, Goodness of fit criteria

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Coffee occupies a place of pride among plantation crops grown in India. It is the most important cash crop that is grown in the tropics. India ranks sixth in world coffee production after Brazil, Vietnam, Columbia, Indonesia, and Ethiopia. Area under Coffee cultivation is about 4.05 lakh ha. in 2010-11, mainly confined to the southern States of India *viz.*, Karnataka, Kerala, and Tamil Nadu, which form the traditional coffee tracts. To a lesser extent, coffee is also grown in non-traditional areas like Andhra Pradesh, Orissa, and the north-eastern States. For the past five to six years, the productivity of coffee in India has been around 800 kg/ha. The production of coffee stood at 3.02 lakh tonnes in 2010-11. India is the largest coffee exporter in Asia. Coffee is predominantly an export oriented commodity in India with 70 to 75 per cent of the production being exported, thereby earning considerable foreign exchange. According to the data revealed by Coffee Board, total quantity of 2.19 lakh tonnes of coffee was exported from India valued at Rs. 3088.39 crore (US$ 674.93 million) in 2011 calendar year. The foreign exchange earnings was an all time high in rupee as well as dollar terms. The share of India's export to global trade was only 1.09 per cent during 1990-91, which was peaked to 4.77 per cent during 1997-98 and it accounts around 4.14 per cent for the last year 2009-10(Anonymous, 2011). Although there has been an increasing