

AN ANALYSIS OF TRENDS OF TEA INDUSTRY IN INDIA

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Abstract

The article intends to study the trend of tea industry in India, using various statistical tools like regression analysis, time series analysis and cluster analysis. To gain the significant insight and knowledge for the present analysis, the data used annual exports and production of tea in India for the period between 1950 and 2006. This study showed that India could not able to export more quantity tea that it produced. It further revealed that how production varies with the regions where tea is grown, namely, north and south. The study concluded to provide important findings and insights about the trend of the industry which contributed to Indian economy.

Keywords: *Regression analysis, ANOVA, time series analysis, cluster analysis, exports*

1. Introduction

The Indian tea industry in India is about 172 years old. The credit for creating India's vast tea empire goes to the British, who discovered tea in India. Tea is grown in the states like Assam, West Bengal, TamilNadu, Kerala, Karnataka, Tripura, Himachal Pradesh, Uttar Pradesh and Bihar. However, production in substantial quantities is limited to the first five states.

On the production front, India has been the major tea producer in the world but the prospects for Indian tea export seems to be very weak due to rising domestic demand, slow increase in yield, slow expansion of area under tea cultivation and the inability to compete with major tea exporting countries. Almost 85% of the total households in the country consume about 81% of the total tea produced. Such a massive domestic consumption has been due to increase in population, greater urbanization, increase in income and standard of living. However, tea being income elastic, and high elasticity for developing countries, India's share of exports to these developing countries is also increasing. India's prospects for tea is therefore optimistic, provided if India improves its export strategy and makes more availability of exports surplus by improving its yield.

The present study is both descriptive and prescriptive. The study considers the exports and production status of the tea industry in India from 1950 to 2006. The study regards tea as one of the oldest organized industry and only commodity in respect of which India leads in productivity and technical innovation while maintaining a high level of quality.

The present article can be helpful and worthy in showing a path to ensure sustainable global competitiveness for Indian tea in terms of internationally approved quality and price. This is a pre-requisite not only for the export market, but also to consolidate India's share in the domestic market.

2. Methodology

The exploration of data started with collecting secondary data on tea production, exports and the auction price. It was possible to obtain large sets of data from the website of the Tea Board of India. The study was carried out by taking the data like annual exports and production of tea from 1950-2006, monthly production according to the region from 1992-2006 and monthly auction price according to the region of production from 1992-2006.

Results were summarized in the form of tables. Graphs and suitable charts were used to present the data graphically so that interpretation could be better. Regression analysis was used to explain the variation in one variable (called the dependent variable), based on the variation in one or more other

variables (called the independent variable). In this study, the regression analysis was applied for explaining variations in the exports of tea based on production.

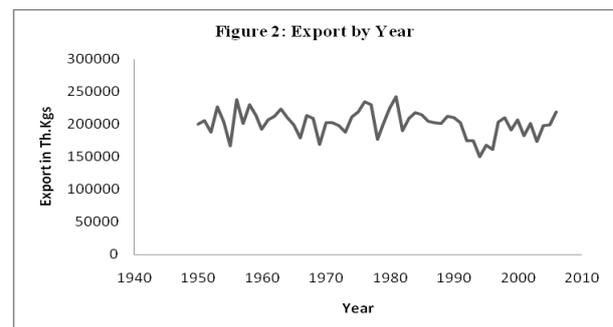
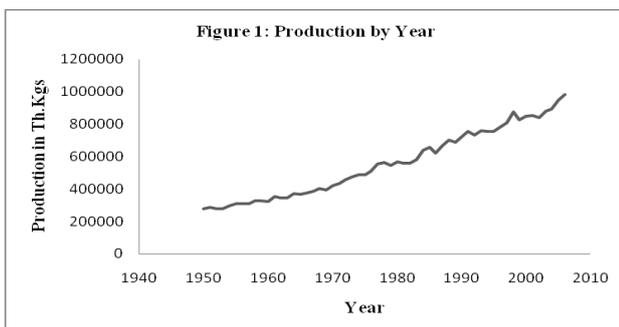
A time series is a set of data on a variable measured at successive time periods or over successive periods of time. The data collected in this study fits the definition of time series. Time series analysis comprises methods to discover a pattern in the historical data and then extrapolate the pattern into the future. Time series includes components like trend, cyclical, seasonal and irregular (Anderson et. al, 2006).

Cluster analysis is a multivariate procedure which is ideally suited to many applications. It involves identifying clusters present in the data. Cluster, by definition, is a group of similar objects, so that the data in each cluster shares some common trait.

In this study, statistical analysis like regression analysis, time series analysis and cluster analysis were used for the purpose of analyzing variations, trends and linkages identification on tea industry of India.

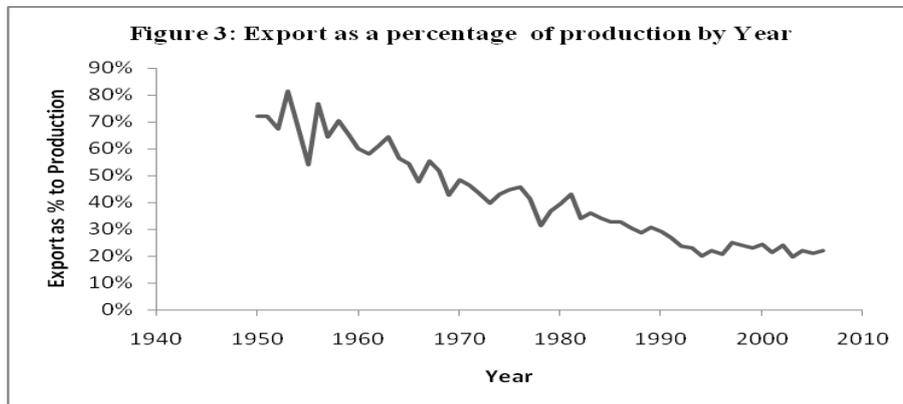
3. Results And Discussions

The data contains annual facts of exports and production of tea (in thousand kilograms) of any region of India. Figure 1 shows that there is a continuous increase in production with respect to the period from 1950 to 2006. However, a constant relationship was found for exports and the time period (see Figure2).



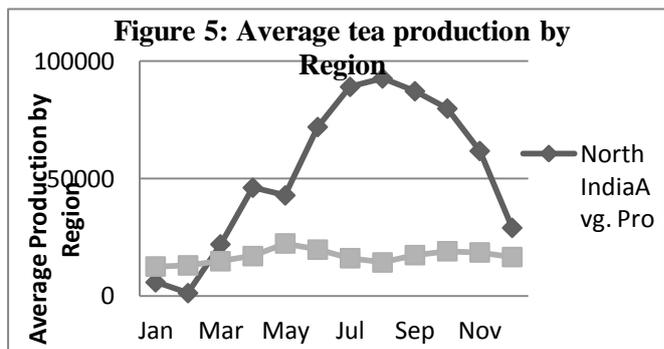
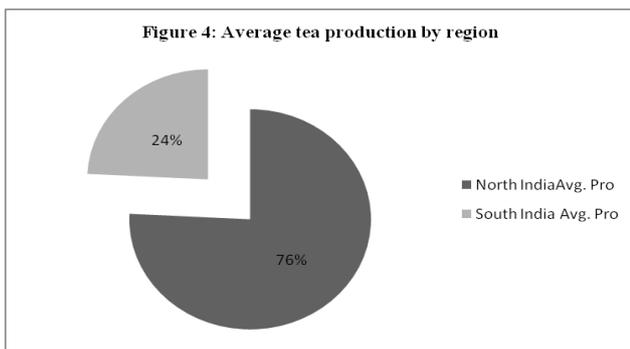
It is observed that India has exported less when compared to the quantity produced. From Figure 3, it can be observed that India's export in terms of its percentage of production is decreasing. In the year 1953, India's tea export as a percentage of production was 81%. This figure has changed to 22% in the year 2006. It means that India could export less amount of tea till now. This was due to the

increase in domestic consumption of tea. India is the world’s largest consumer, with an increasing domestic consumption from 73 M. Kgs in 1951 to 771 M .Kgs in 2006.



The data in Figure 4 shows how the average production of tea from 1950 to 2006 is distributed among the two regions it is grown, namely, north and south. Tea is produced in northern states like Assam, West

Bengal, Tripura and southern regions states like Tamil Nadu, Kerala and Karnataka. North India grown tea contributes 76% of the total production (see Figure 4) whereas south India grown tea production is at 24%. The data in the Figure 5 reflects the average production of a particular month for a period of 15 years.



3.1. Regression Analysis Of Exports On Production

Data of annual production and exports of tea from 1950 to 2006 is indicated in Fig 1 and Fig 2. In Fig 1, it is observed that production of tea increases continuously with time. However, the same relationship was not found for exports with time. This indicates that exports and production do not follow the same pattern with time. It is shown that there is a negative relationship between production of tea and exports. Based on this discussion, the hypothesis suggested that there is a

positive association between exports and the production of tea with time. The ANOVA test revealed that exports of tea ($p < 0.05$) were not statistically significantly related with the production of tea. The scatter plot showed a weak linear correlation ($r = 0.23$) between production of tea and exports. A simple regression was fitted ($\text{export} = 213890.2 - 0.02172 \text{ production}$, $R^2 = 0.054$). Fig 6 showed how the regression line fits the data. It showed a negative trend, which means exports are expected to decrease by 21,720 kg per year.

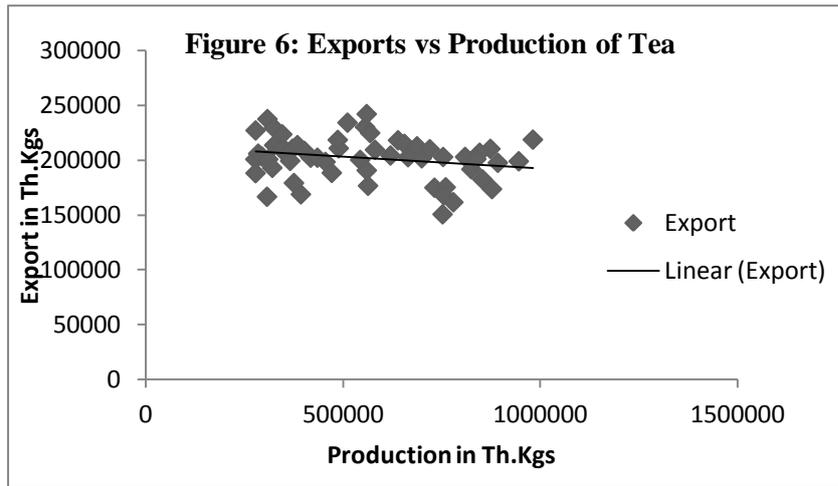
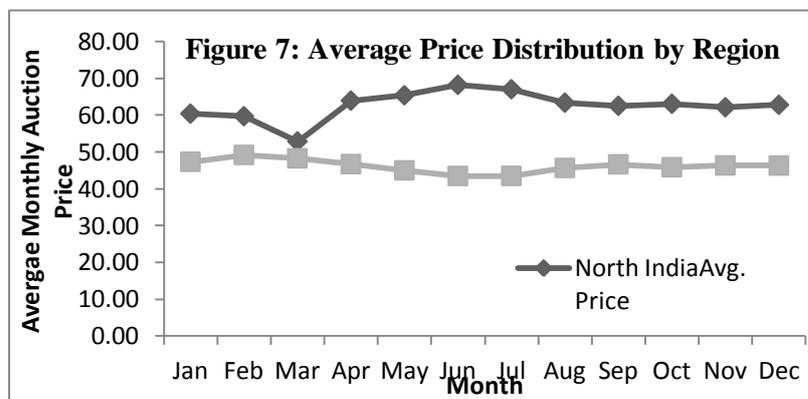


Figure 7 shows the monthly auction prices according to the region of production. On an average, the price of north India grown tea is higher than that of the south India grown tea. Figure reveals that price of tea remains less in the month of November-December. It is important to note that the simple linear regressions explain the variation in auction price in both the regions of tea production. The explanatory power of production of both the regions of production can be estimated because the coefficient of determination for north India was being 33% and for south India being 35%. This indicates that the auction price is somewhat dependent of the amount of production.

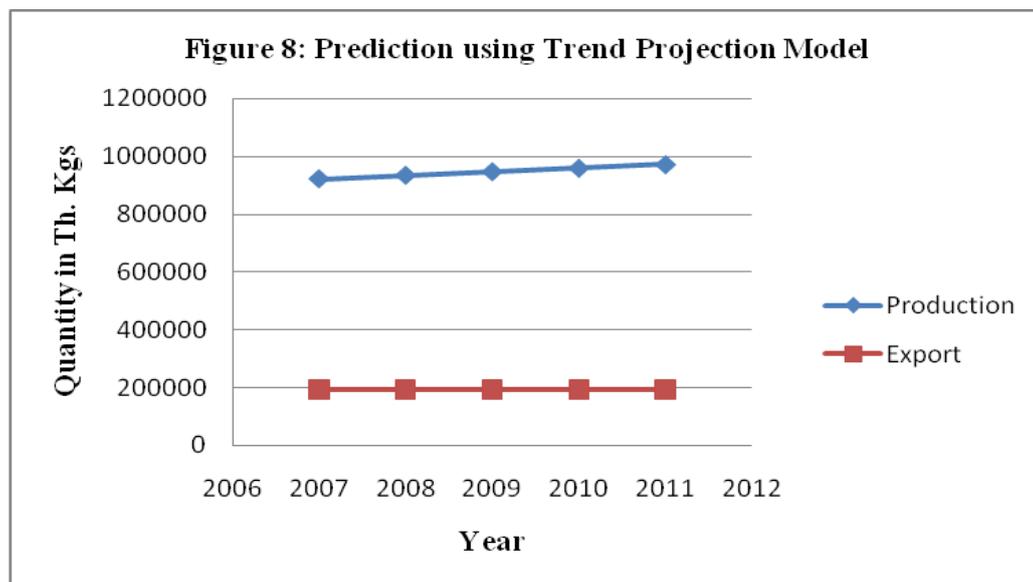


3.2. Time Series Analysis Using Trend Projection Model

The long-run success of the industry is closely related to how well the future can be anticipated so that the appropriate strategy can be developed. It is important to know the trend for production and export of tea in India so that the future can be predicted. Here, the trend projection method is applicable because there is a consistent increase and decrease of production of tea and exports over time (see Figure 1 and Figure 2).

In order to fit a time series model for production and exports, the trend projection model was calculated. It shows that exports remain constant with time. The time series model predicts the growth to be constant. Production of tea is continuously increasing with time. The time series model predicts a continuous growth in production but slow.

To find out how the production of tea and exports vary, the graph is used for the data calculated by the trend projection model of time series. It is observed from the graph that there is a huge gap exists between production and exports of tea in India. This reveals that the exports are less compared to huge production of tea (see Figure 8).



3.3. Cluster analysis for production and exports

This section presents the results of cluster analysis using K-Means cluster. This analysis was performed for monthly production and auction prices. It was considered seven clusters as presented in Table 1. It was found that north India region produces highest tea in the country. The constitution of cluster 4, which gives the highest average tea production of 89683.4 thousand Kgs., is from North

region. The other cluster, which consists of north India grown tea, namely, cluster 1, reflects second highest average production. The third highest average production is found in cluster 7. It can be observed that north India grown tea is the main contributor to the production of tea in India. The pattern in clustering of price is different from the production. The highest average price is found in cluster 1, followed by cluster 5 and cluster 4. The most significant contributor to the price of tea is north India grown tea.

	Cluster						
	1	2	3	4	5	6	7
Region	North	North	South	North	North	South	North
Month	August	February	August	August	May	June	November
Production (Th. Kgs)	75915.9	3457.6	21746.7	89683.4	44457.7	15170.4	61762.3
Auction Price (Rs./Kg)	65.606	60.008	49.341	64.263	64.621	46.654	62.093

Table 1: Final Cluster Centers

4. Conclusions

The study conducted to look into some key aspects on trend of tea industry in India. The initial findings of this study are highlighted the trend of tea industry in India. India is the largest producer of tea in the world and the largest consumer with an increasing domestic consumption from 73 M. Kgs in 1951 to 771 M. Kgs in 2006. The industry has been making continuing efforts to play a significant role as a major player in the Indian economy. The different parameters such as production, prices, exports, new technology implementation and others can assist in generating high profit, growth and gaining competitive advantage for the sector.

The weak correlation between production and exports of tea makes to believe that India could not able to export more quantity tea that it produces. It shows only 5.4% of the variation in exports is explained by production. This also shows that the auction price is somewhat dependent on the amount of production.

It shows that north India grown tea is produced than that of south India grown tea. The auction price of tea is high in the month of January and February. From August to December prices for tea remains constant. Figure 7 shows that North India grown tea prices are averagely higher compared to south India grown tea.

It is also interesting to note that in the month of May, June, July and August, the production of north India grown tea is high and there is a sharp decline in the production in the month of September, October, November and December. In May, September and October, the production of south India grown tea is high and it remains constant in November and December. It can be stated that the industry is unable to generate cash and sufficient resources to undertake long-term developmental investments to meet the challenges posed by competitors and new technology. In consequence, Indian tea is slowly losing ground in the international market. In order to gain the competitive advantage, Indian tea industry needs improvement in research facility, introduction of modern technology etc.

Further research in data analysis with respect to the tea industry can result in significant insights and knowledge, which can be used in India for better growth in the sector contributing to the economy.

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