



Research Article

EXPORT PERFORMANCE OF INDIAN TEA

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Abstract: The Indian Tea industry is nearly 200 years old and acts as the major source of export earnings for India. Having favourable geographical and climatic condition for growing tea, India enjoys the position of being one of the largest producers and export of tea in the world. But there occur various obstacles for both rising global tea trade and Indian tea export. With increased competitiveness in global tea markets due to exports from other nations and raised domestic demand for tea Indian tea export has not increased although there is a rising trend in tea production. To assess the competitiveness of global tea trade, study the growth rate of the area, production and productivity of Indian Tea and assess the sustainability/stability of Indian tea export among the major tea importing countries the following study is conducted using two analyzes say, compound growth rate analysis and Markov Chain Analysis. It is observed from the study that India has the probability of retaining 23.5 percent of its export share of tea in the world market. India's tea export to major importing countries and world tea export is forecasted till 2025.

Keywords: Export, Growth Rate Analysis, Markov Chain Analysis, Indian Tea Industry

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Introduction

Being one of the most widespread beverages, tea is doted on by a large group of people regardless of the age factor. Tea contains antioxidants which prevent diseases and promotes good health. India remains in the position of the second-largest tea producer standing only next to china with the largest tea-drinking population. Tea industry provides employment to nearly 3.5 million people across the nation, of which most are women. The tea sector is expected to grow at a compound annual growth rate of 4 to 5.5 % from 2017 to 2024 as per FAO. Kenya, Sri Lanka, and Indonesia are the other major tea producing countries. India's tea production has increased to 1.3 million tonnes and export to 0.254 million tonnes in 2018 that occupies a share of 22.4% and 14.4% of global tea production and export respectively.

The Indian tea industry is well established in the global market in terms of production, consumption and export. The major tea growing regions/states in India are Assam, Dooars and Terai, Nilgiris, Darjeeling, Travancore, Munnar-Hiah Ranaes, Anamallais, Wayanad, Kangra and Karnataka. Export forms an integral part of the decision making for India. The tea industry is playing a crucial role as source of revenue for the country [1].

There is a wide range of diversification in countries of tea export where India remains the second-largest exporter of black tea only next to Kenya followed by Vietnam, Indonesia, Malawi, Uganda and Tanzania. Demand for tea is the main determinant of growth of the global tea sector and the selected market analysis results by the FAO IGG Secretariat (2016) indicates that both black and green tea is price inelastic [12]. The consumption of tea has increased globally mainly due to the rapid growth in per capita income. In the financial year of 2019, Iran has imported the highest worth of Indian tea which is nearly 11 billion Indian Rupees but Russia has imported the highest volume of Indian tea in the same year. Indian Total Tea exports stood at US\$ 830.90 million in 2018-19 and reached US\$ 535.13 million in 2019-20 (till November 2019).

Considering the importance and dynamics of the Indian Tea industry the current study is performed to assess the growth trend in the area, production and

productivity and assess the export prospects for Indian Tea using Markov chain analysis for the major tea markets in the world as well as major importing countries of Indian Tea to understand the trade stability of Indian tea export.

Problem focus and objective

According to Ghosh (2017), a rising trend in tea export is observed. But there also occurs a risk of drop-down in tea consumption due to the introduction of other drinks in the global market and with a drastic increase in price quantum of tea supplied will reduce in the upcoming years [2]. Tea is an important trading commodity having a great impact on the Indian economy, so the falling prices of tea both in the domestic and international markets drastically decline India's share in the world market [3]. In the global scenario, Indian tea is losing its position due to its high price and poor quality.

To meet the competition a new market orientation is needed. Tea industry's main input is labour hence with the problem of labour constraint production cost has been increasing where around 80 percent of the total cost of production goes to fuel, power and labour [4]. With the emergence of new tea growers in the international market Indian tea is facing a tough competition [1]. Kusuma (2016) in his work stated that, there is an urge to explore and exploit the market potential of other countries due to their increasing share. Besides, Indian tea sector is also facing problem in the areas of marketing [5].

The market leaders of tea are those big companies which have very few gardens of their own or most of them don't have, so they are not the actual producers, mostly tea producers who are the caretakers of tea do not have an active role in auction system/marketing [1]. Hence, the industry must overcome those challenges and should face the future with confidence.

To explore the performance of Indian tea sector and to identify various means to overcome those mentioned challenges the present study focuses on the following objectives:

To study the growth rate of the area, production and productivity of Indian Tea

To assess the competitiveness of global tea trade and dynamic changes of share among the major tea exporting countries of the world
 To assess the sustainability/stability of Indian tea export among the major tea importing countries
 To formulate trade response model

Materials and methods

The present for the analysis of the current study primarily rely on, secondary data are collected from Tea Board of India, The Agricultural and Processed Food Products Export Development Authority (APEDA), The Food and Agriculture Organization of the United Nations (FAO), Director General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce.

To analyze structural changes in the direction of tea trade and dynamic changes in the share of tea exporting countries in global market data are selected over the study period of 2000 to 2016 taken from FAO (www.faostat.com) and for analyzing the sustainability of Indian tea trade among the major importing countries the data are selected from 2009-10 to 2018-19 obtained from APEDA

Growth Rate Analysis

Gemtessa (1991) in the study compared the export performance of Ethiopian coffee during pre-revolution and post-revolution periods using the exponential growth model $y_t = ab_t$. The result indicated that the export growth in the pre-revolution period was lower (1.51%) when compared to the post-revolution period (1.77%) [6]. The growth of Indian coffee exports was analysed by Veena(1992) by employing the exponential function $y_t = ab_t$. It was found that the compound growth rate of export of plantation type coffee and Arabica was 3.6 percent per annum and 3.0 percent per annum respectively while that of Robusta was about 10 percent [7].

The production performance of the India tea was analyzed by evaluating the trend in the area, production, productivity of Tea in India, compound growth rate is computed

$$y = ab_t u_t \quad (1)$$

where y = area/yield/production of tea in year t

t = year (1, 2, 3....n)

u_t = disturbance term

a, b are parameters in equation (1) is estimated using the equation (2)

$$\ln y_t = \ln a + t \ln b + \ln u_t \quad (2)$$

We can have the estimate form of $Y_t = A + Bt + C$ (3)

The compound growth rate is estimated by

Where $Y_t = \ln y_t$

$A = \ln a$

$B = \ln b$

$g = \text{Exp}(B-1)100$

g = estimated compound growth rate in percent per year

B = coefficient in the model (3)

Here, the data is summarized with the aid of statistical tools like average, standard deviation, CV etc. to obtain meaningful results.

Markov Chain Analysis

Global Scenario of Tea Trade

Markov Chain is a potentially useful model of analysis whenever the phenomena under investigation change from one state to another over time. Markov chain analysis is used to quantify the structural changes in the direction of the tea trade. To assess trade share movement of major tea trading country in the world trade, Markov chain analysis is used to estimate the transitional probabilities of the trading countries for major tea trading countries.

To assess the global scenario of the tea market, data of tea export from major exporting countries are collected for the study period of 2000 to 2016. Markov chain analysis is employed to analyze the dynamic nature of trade patterns of tea that is how the share of major tea exporting countries changes over time in the global trade and the projected the tea trade in 2025 using the estimated transition probabilities.

Sustainability of Indian Tea Trade

Annual export data for the period of 2009-10 to 2018-19 are used to analyze the direction of trade and changing pattern of tea export using Markov chain analysis Russia, UK, Iran, UAE, Pakistan, USA, Kazakhstan, Germany, Egypt, and Poland are the major Indian tea importing countries based on the Indian Tea export to the countries.

Dent (1967) in his work explained the use of Markov Chain Analysis as to analyze the structural change in the system and the progress of such system through time can be measured in terms of the single outcome variable [8].

In the present study, the dynamic nature of trade patterns that is the gains and losses in the export of Indian Tea in major importing countries was examined using the Markov chain model [5].

Markov chain analysis involves developing a transitional probability matrix 'P', Whose elements, P_{ij} indicate the probability of exports switching from the country 'i' to country 'j' over time. The diagonal element P_{ii} where $i=j$, measures the probability of a country retaining its market share or in other words, the loyalty of an importing country to a particular country's exports [5].

In this study, the structural change is regarded as a random process having ten tea importing countries and here there is an assumption that the average export of tea from India amongst importing countries in any period depends only on the export in the previous period. Further, it is assumed that the dependence is the same among all the periods.

This was algebraically expressed as

$$E_{jt} = \sum (E_{it-1}) P_{ij} + e_{jt}$$

Where,

E_{jt} = exports from India to the j^{th} country in the year t

E_{it-1} = exports of i^{th} country during the year $t-1$

P_{ij} = the probability that exports will shift from i^{th} Country to j^{th} country

e_{jt} = the error term which is statistically independent of E_{it-1}

n = the number of importing countries

t = trading year (April -March of 2009-10 to 2018-19)

The transitional probabilities P_{ij} , which can be arranged in a $(c \times n)$ matrix, have the following properties.

$$\sum_{j=1}^n P_{ij} = 1$$

and $0 < P_{ij} < 1$

Thus, the expected export share of each country during the period 't' is obtained by multiplying the exports to these countries in the previous period (t-1) with the transitional probability matrix. The probability matrix was estimated using the export data period 2009-10 to 2018-19 and projected the tea export for another 6 years (up to 2024-25).

Results and Discussion

Tea Industry-an outlook

Introduction of tea dates back to 2700 BC, the credit goes to China. Tea-a dried leaf infused beverage is one of the oldest beverages in the world and also the most consumed one. Tea (*Camellia sinensis*) is the evergreen shrub which is a native of Southern China, North India, and Myanmar. Among several varieties of this species of the plant, Indian Assam tea (*C. sinensis* var *assamica* kitamura) is well known. Essentially three main types of tea include Green, Oolong and Black teas, the main difference lies in the fermentation of tea during processing (fermentation is nothing but the oxidative and enzymatic changes that takes place within tea leaves). Green tea is unfermented, Oolong tea is partially fermented and black tea is fully fermented [9]. In International markets, Black tea occupies the major portion followed by green tea. India is the second-largest in Black tea export globally only next to Kenya and followed by Vietnam, Indonesia, Malawi, Uganda and Tanzania. The global tea market was valued USD 13.85 billion (b) in 2018 and reached USD 14.45 b in 2016 with the annual growth of 4%. By 2024, the global tea market expected to reach a value of USD 21.23 b with an expected growth of 5% per annum, during the forecasting period (2012-24).

The global tea market is divided into four major geographies viz., Asia Pacific, Europe, North America and Rest of the World due to its specific agro-climatic requirements that are only available in tropical and subtropical climates. Hence it is highly sensitive to changes in growing conditions and also the quality of tea is greatly affected by seasonal monsoon. The total geographical area under tea production globally is 4.19 million hectares in 2018. Tea is grown in 48 countries in all the 5 continents with Asia being the highest share followed by Africa. India produced 1.34 million tonnes under 0.63 million hectares (2.14 tonnes per hectare) in 2018 (FAOSTAT). Unlike most other exporting countries, India has a dual tea base. Both CTC and Orthodox tea is produced in India. CTC is a method of processing (crush, tear, curl) often used for black tea, one of the common types of CTC tea is Assam tea which has a deep ruby red colour having a rich and slightly bitter flavour. Orthodox tea types are processed using the traditional method of plucking, withering, rolling, oxidizing and then finally drying which is mainly focused on preserving the particular intrinsic taste of tea leaves. The tea industry is agro-based and labour intensive. It provides direct employment to over one million persons. In a report, Indian Institute of Foreign Trade (IIFT) stated that over 10 million people derive their livelihood from tea industry through both forward and backward linkage and further women constitute 50% of the workforce.

Indian Tea Plantation

Due to specific agro-climatic and geographical requirements, tea is not grown throughout the country as a result tea plantation in India are restricted only to certain say in North India majority of tea plantations are found in Assam, West Bengal and a case of South India it is Tamil Nadu (Nilgiris), Kerala and Karnataka. As a whole, the total tea plantations in India accounts for about 6.37 million ha. [Table-1] shows that major tea growers are of small growers with a share of 99.26% of total tea plantations while only the remaining 0.74% is of big growers (baseline survey, 2018). Smallholders are attracted to tea cultivation because it provides work and income throughout the year and only requires relatively little investment and risk of crop failure is very small. But low farm gate prices, limited market access and credit availability act as constraints to small farmers (FAO report). When compared, maximum numbers of growers are found in North India with 74.27% of total tea growers and South India holds a share of 25.73%. But comparatively speaking in North India major shareholders of tea growers are big farmers who hold an average size holding of 268 ha per person, that in case of South India small growers holding an average size of 1.03 ha per person are relatively more than big growers. [Table-2] indicates that in North India the tea-growing/tea plantations are more with a share of 84.14% when compared to South India which has only 15.86% of the share of the total tea plantations. During the financial year of 2015-16, India has recorded the highest tea production which was mainly contributed by North India. Increase in production in North Indian tea plantations is of 5.52% (52.74 million kgs) whereas South India's production has declined by 16.78 million kgs (-6.95%) that is due to adverse climatic conditions and labour issues in Kerala.

Table-1 Big and Small growers of tea in North India and South India

	North India		South India	
	Number	Share%	Number	Share%
Big Growers	1327	84.58	242	15.42
Small Growers	155963	74.19	54262	25.81
Total share%		74.27		25.73

Table-2 Area share of North India and South Indian growers

	North India		South India	
	Area (ha)	Share%	Area (ha)	Share%
Big Growers	358595	85.24	62076	14.76
Small Growers	177034	82	38853	18.00
Total share%		84.14		15.86

Table-3 Tea plantation details of North India and South India

	North India		South India	
	Total	share%	Total	share%
N.of.G*	157290	74.27	54504	25.73
Area (ha)	535629	84.14	100928	15.86
Avg. size holding (ha)	3.41		1.85	

Uniqueness of Indian tea

Among tea producing states, Assam accounts for 38% of production from half of the Indian tea plantation area (0.312mha out of 0.628 mha). Considering the productivity, Wayanad and Karnataka region plantation had higher tea productivity of 2925 and 2804 kg/ha against the country average productivity of tea plantation of 2141 kg/ha. In India tea is grown in 10 major states [Table-4], each has uniqueness due to the variation in climate, altitude of tea production and processing methods.

Indian tea has a unique feature. Indian tea industry was born in the heart of Assam. In other words, the history of Assam tea is also the early history of the Indian tea industry. Assam tea is processed both by CTC and orthodox methods where the orthodox method of preparing Assam tea is protected under Geographical Indication (GI) which has a deep ruby red colour having a rich and slightly bitter flavour.

Darjeeling tea is famous worldwide for its unique "Muscatel flavour" and "Exquisite Banquet". The combination of natural factors gives Darjeeling tea its unique characteristics and is protected under Geographical Indication (GI). About 80% of its total production is exported every year mostly in Western and Japanese markets. The "orthodox method" is still used in its manufacturing. The Darjeeling logo which was launched in 1986 is a hallmark of excellence and acts as a significant landmark in the history of the Indian tea industry.

The Nilgiri tea is the Indian black tea with balanced fruity, floral and bold flavour. It is processed both by orthodox and CTC methods. Tea processed using the orthodox method are often known as orange pekoe-a medium grade tea, or pekoe black - a premium grade fine tea made with only the youngest buds and tea leaves while those made from CTC method with the use of machinery are lower quality Nilgiri teas that typically end up in the form of teabags.

Kangra tea is a little milder than Darjeeling tea in terms of flavour and loaded with antioxidants, catechins and polyphenols hence it is famous among the people with more health-conscious. Kangra tea was given the Geographical Indication status in 2005. It produces very pale liquor so that's the reason CTC method is not carried out in Kangra tea.

In India, tea is grown in 10 major states each having unique flavour and importance in the world market. State-wise area, production and productivity of tea during 2018-19 are presented in [Table-4]. The results indicated that about two-thirds of Indian Tea production has come from three major tea growing regions viz., Assam (37.7%), Dooars and Terai of North Eastern states (15.47%) and the Nilgiris (10.53%) in Tamil Nadu which accounts three fourth of country's tea plantation area. However, tea productivity was the highest in Wayanad (2925 kg/ha) followed by Karnataka. The production pattern indicates the major technology intervention is needed to increase the productivity in Assam having larger tea plantation with low productivity.

Table-4 State/Region-wise area, production of tea in India in 2018-19

Region/State	Area		Production		Yield kg/ha
	ha	% Share	('000 t)	% Share	
Assam	312210	49.70	507	37.70	1624
Dooars and Terai	97200	15.47	216	16.06	2222
Nilgiris	66175	10.53	135	10.04	2040
Darjeeling	17820	2.84	9.8	0.73	550
Travancore	14000	2.23	20	1.49	1429
Munnar-Hiah Ranaes	13000	2.07	27	2.01	2077
Anamallais	12625	2.01	30	2.23	2376
Wayanad	5470	0.87	16	1.19	2925
Kangra	2340	0.37	0.8	0.06	342
Karnataka	2140	0.34	6	0.45	2804
Others	85213	13.56	377	28.05	2141
India	628193	100.00	1345	100.00	2141

Analysis and interpretation

Section I: Growth rate analysis

From the [Fig-1], it can be seen that both area and production of tea tends to increase continuously. Increase in production is tremendous over the years when compared to area and yield. Further increase in area is not applicable so the only way to meet the increasing demand for tea in the world market is to increase the production and yield with the help of new technologies.

It is being cultivated in an area of about 6.3 lakh hectares with a production of about 13.4 lakh tones in India. The national average productivity was 2.4 MT per ha. The compound growth rate of the area, production and productivity of tea for 3 different periods is presented in [Table-5]. The periods are chosen based on the export trend of tea over the period of 1961-2017 shown in [Fig-1], there is a tremendous increase in total export of tea in the range of 1977-1997 while from 1997 to 2017 the export had drastically decreased and then shown an increasing trend.

It can be observed that highly positive and significant growth in terms of area, while in terms of production although growth rate shows a positive result, it has decreased compared to the previous periods. Yield shows a slight increase in growth rate from 1.162% to 1.185%.

The area under tea is growing at a rate of 1.433 percent per annum, production at a rate of 2.636 percent per annum and yield at the rate of 1.185 percent per annum. From 1978 to 1998, the export performance of Indian tea was downhill with a negative growth rate and in the next two decades, India pulled itself together and showed a dramatic increase in its quantum of export and export value. Export of Indian tea in the world market increases at the rate of 2.029 percent per annum and its export value increases at the rate of 4.375 percent per annum. The study indicated that both production and export bring better returns for the producers.

Export of Indian tea remains more or less stable over years although there is an increase in its area and production. This indicates that the major portion of tea produced in the country is consumed in the domestic market itself due to its increased domestic demand that is about three-fourths of the country's total produce consumed domestically.

Table-5 Average of area, production and yield and export of tea in India over 3 different periods

Year	Area (lha)	Prod (lt)	yield (kg/ha)	Export (lt)	% exported
TE1963-64	3.33	3.49	1050	2.14	61.15
TE1977-78	3.67	5.18	1414	2.14	41.35
TE1997-98	4.29	7.63	1781	1.77	23.22
TE2017-18	5.89	12.70	2158	2.42	19.09

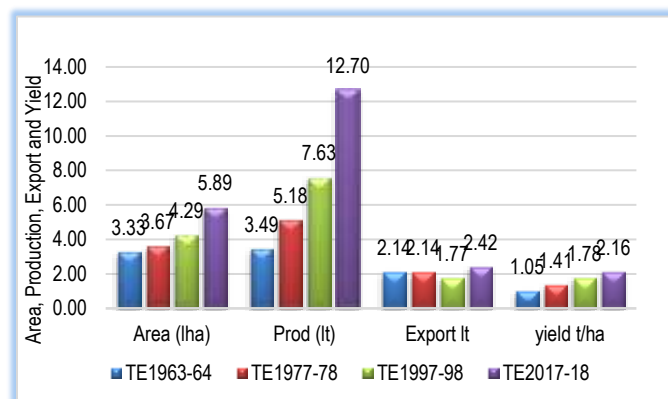


Fig-1 Area, Production, Yield and Export of Tea in India

Table-6 Compound growth rate Area, production, Yield and Export of tea in India over 3 time periods

Periods	Area	Production	Yield	Export qty	Export value
1963-64 to 1977-78	0.609	3.143	2.519	0.601	2.527
1978-79 to 1997-98	0.817	1.989	1.162	-1.294	-1.467
1998-99 to 2017-18	1.433	2.636	1.185	2.029	4.375

Section II: Global scenario of tea trade

The transitional probability matrix presented in [Table-6] indicates the changes in the direction of export of tea for the study period (2000 to 2016). The major Tea exporting countries are China, Kenya, India, UAE, Germany, Poland, Japan, UK, USA, Indonesia and all other exporting countries are grouped under the category of the others. The transitional probability matrix was obtained for the study period by using the actual proportion of exports to different importing countries.

The matrix explains the changing direction of tea trade among exporting countries.

The extent of loss in trade and the probability of gains from other competing countries in terms of volume of trade are explained by the row and column elements in the transitional probability matrix respectively. Also, the diagonal element in the probability matrix explains a particular country's probability of retention of the previous year's trade volume [5].

It is evident from [Table-6], that none of the countries retains their 100 percent share of export in the world tea market. Poland and Indonesia are comparatively stable with more than 50 percent of retention of their share that is, they retain 80.1 percent and 62.1 percent of their respective export shares.

India with the probability of retention at 0.2348 retains 23.5 percent of its export share of tea in the world market. India can acquire the market share of other countries. The probability of acquiring the export share from UAE is 58.8 percent and from the USA it is 15.73 percent, while the probability of losing India's share to other exporting countries is 76.5 percent.

The projections of export values from the [Table-7] show that Kenya tops the world export followed by china and India as second and third with expected shares of 18.62%, 17.24% and 11.60% respectively of the world tea export.

Section III: Sustainability of Indian Tea Trade

In 1999, Sreenivasa Murthy and Subrahmanyam measured the dynamics of change in the onion export from India to different countries using Markov chain Model in which transitional probabilities and the future forecast was estimated. The results indicated that Malaysia, United Arab Emirates (UAE) and Singapore were having a high probability of retention with the ability to continue as the major importers in future also, while Saudi Arabia and others were unstable importers of Indian markets [10].

Using Markov Chain Analysis Ananthi (2000) analyzed the direction of trade of Basmati and Non-Basmati rice in India during the study period 1987-88 to 1998-99. The result showed that Saudi Arabia, UAE and UK have the probability of getting more share of import at the cost of other countries such as Bahrain, Kuwait and USA while all the major countries which import Indian non-basmati will lose their share and the probability of minor countries importing may be dominant over the other countries [11].

The transitional probability matrix presented in [Table-9] indicates the changes in the direction of the export of tea from India for the study period (2009-10 to 2018-19). The major Indian tea importing countries are Russia, UK, Iran, UAE, Pakistan, USA, Kazakhstan, Germany, Egypt, Poland and all other importing countries are grouped under the category of the other countries. The transitional probability matrix was obtained for the study period by using the actual proportion of exports to different importing countries. This matrix explained the changing direction of Indian tea trade among importing countries which is necessary for taking the proper decision given their expected changes [3,5].

The extent of loss in trade and the probability of gains from other competing countries in terms of volume of trade are explained by the row and column elements in the transitional probability matrix respectively. Also, the diagonal element in the probability matrix explains a particular country's probability of retention of the previous year's trade volume [5].

From [Table-10], it is evident that none of the markets among the major importing countries of Indian Tea is stable that is, none of the probability of the market of retention is at 1.00. None of the markets retains its export share over the study period. Comparatively, markets of Iran and UK are moderately stable; they retain 55.4 percent and 43.1percent respectively. Germany, UAE and Egypt are less stable compared to Iran and UK with retention of 32.9 percent, 26 percent and 13.2 percent of their export share respectively and other countries retain their share of 28.1 percent over the study period. Markets of Russia, Pakistan, US, Kazakhstan and Poland have zero retention. Therefore, Iran forms the reliable market for Indian tea as they retain more than 50 percent of their export share that is, 55.4 percent and the UK forms the second reliable market with retention of 43.1 percent. Markets of Russia, Pakistan, US, Kazakhstan and Poland are unstable.

[Table-10] gives the projected/expected quantities of tea to be imported by major importing countries from India. The projections show that Russia stands first with a share of 18.9% followed by Iran with a share of 11.96% of the major importing countries.

Table-7 Transitional Probability Matrix of major exporting countries of Tea in the world market

	China	Kenya	India	UAE	Germany	Poland	Japan	UK	USA	Indonesia	others
China	0.2878	0.6640	0.0000	0.0310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0172
Kenya	0.0686	0.3422	0.0000	0.0131	0.0292	0.0000	0.0000	0.0088	0.0000	0.0238	0.5143
India	0.0000	0.0000	0.2348	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.7651
UAE	0.3323	0.0000	0.5889	0.0000	0.0502	0.0000	0.0143	0.0000	0.0142	0.0000	0.0000
Germany	0.0000	0.0000	0.0000	0.6948	0.1139	0.0310	0.0080	0.0000	0.1522	0.0000	0.0000
Poland	0.0000	0.0000	0.0000	0.0000	0.0000	0.8011	0.0676	0.0000	0.1313	0.0000	0.0000
Japan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4375	0.0000	0.5625	0.0000	0.0000
UK	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2087	0.0000	0.7913	0.0000
USA	0.1303	0.0000	0.1573	0.0000	0.1538	0.1652	0.0000	0.0000	0.3935	0.0000	0.0000
Indonesia	0.0000	0.2197	0.0000	0.0000	0.0000	0.0000	0.0000	0.1595	0.0000	0.6207	0.0000
Others	0.2416	0.0000	0.1808	0.0000	0.0118	0.0000	0.0000	0.0038	0.0000	0.0017	0.5603

Table-8 Projected tea export for the period of 2017 to 2025

	China	Kenya	India	UAE	Germany	Poland	Japan	UK	USA	Indonesia	others
2017	308437	334304	207975	31331	25718	19085	3662	18241	15419	57258	764097
2018	308775	331765	207876	31821	25662	18633	3546	18762	15020	59192	764476
2019	308900	331545	208147	31759	25549	18203	3472	19158	14737	60744	763313
2020	308583	331894	207920	31682	25470	17808	3408	19482	14509	62015	762757
2021	308326	332082	207684	31621	25425	17452	3352	19753	14318	63067	762446
2022	308144	332207	207507	31585	25390	17133	3302	19978	14157	63938	762184
2023	308004	332321	207372	31556	25360	16851	3258	20164	14018	64660	761963
2024	307891	332426	207261	31533	25334	16600	3219	20319	13896	65258	761792
2025	307800	332517	207171	31513	25312	16379	3184	20446	13789	65753	761663

Table-9 Transitional Probability Matrix- major importing countries of Indian Tea

	Russia	U K	Iran	UAE	Pakistan	U S A	Kazakhstan	Germany	Egypt	Poland	others
Russia	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0436	0.0000	0.0562	0.9002
U K	0.0000	0.4314	0.0000	0.3315	0.2371	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Iran	0.2480	0.0000	0.5540	0.0000	0.0000	0.0000	0.0000	0.1099	0.0000	0.0503	0.0378
UAE	0.0000	0.3354	0.0000	0.2603	0.0000	0.0317	0.2912	0.0000	0.0000	0.0000	0.0814
Pakistan	0.2053	0.0000	0.0000	0.1765	0.0000	0.2832	0.1002	0.0516	0.1832	0.0000	0.0000
U S A	0.9382	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0477	0.0000	0.0142	0.0000
Kazakhstan	0.0000	0.3209	0.0000	0.0000	0.4776	0.0000	0.0000	0.0127	0.0000	0.0000	0.1889
Germany	0.0000	0.0000	0.5994	0.0000	0.0000	0.0000	0.0000	0.3295	0.0712	0.0000	0.0000
Egypt	0.0000	0.0000	0.7110	0.0000	0.0000	0.0000	0.0000	0.0000	0.1322	0.0625	0.0943
Poland	0.8250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1750
Others	0.2334	0.0000	0.0319	0.0659	0.0794	0.1728	0.0955	0.0000	0.0284	0.0120	0.2808

Table-10 Projected tea import for the major Indian tea importing countries for the period of 2019-20 to 2024-25

	Russia	U K	Iran	U A E	Pakistan	U S A	Kazakhstan	Germany	Egypt	Poland	others
2019-20	52606.94	17974.85	35303.41	17670.07	16768.19	17421.57	13720.80	12113.92	6610.48	6349.22	73733.93
2020-21	50993.24	18082.65	33870.06	18377.09	16668.90	18048.02	13869.55	12033.41	6899.55	6272.91	75158.01
2021-22	51474.51	18414.00	33278.71	18673.18	16878.56	18288.37	14201.50	11805.64	6954.25	6154.17	74150.52
2022-23	51263.21	18762.75	32821.36	18830.72	17035.68	18183.06	14212.48	11713.04	6955.08	6146.28	74349.74
2023-24	51123.24	18969.55	32519.43	19028.21	17139.43	18266.98	14293.13	11626.27	6983.03	6112.36	74211.78
2024-25	51088.18	19150.87	32315.64	19157.40	17216.03	18278.78	14347.86	11568.77	6995.64	6090.60	74063.64

Section IV: Trade response model

Export model

Numbers of empirical studies are being carried out in the field of agriculture using various time series data. This is mainly to grasp the detail on the responsiveness of the area under crop to the changes in the prices in a lagged year, which is well known as Supply or Acreage response function. In this study, an Export Response Model is formulated with the basis of Nerlovian Supply Response Model.

Export Nerlovian response equation

Specification of a model that explains export behaviour are formed based on differences between actual, past exports, prices of self and competitive countries and change in exchange rate assumes:

$$INDex_t = \alpha + \beta_1 INDex_{t-1} + \beta_2 INDexp_{t-1} + \beta_3 chKENex_t + \beta_4 chLKAex_t + \beta_5 chWLDex_t + \beta_6 chCHlex_t + ch \text{ exchange rate}$$

Factors determining the current year's Indian tea export are last year's Indian tea export quantity, last year's Indian tea export price, change in Kenya, Sri Lanka, China and world tea export quantities and exchange rate growth over the previous year. Thus, regression is carried out keeping the current year's Indian tea export as the dependent variable and the remaining variables as the independent variables.

The impact of independent variables on India's Tea export is exhibited in the [Table-11] three variables say last year Indian tea Export, change in world tea export, have a significantly positive impact on India's current tea export, whereas a change in Kenya tea export and change in China tea export have a significantly negative impact. This Export model is more reliable with R square 0.5451

Table-11 Factors determining the export behaviour of Indian tea

Variables	Co eff.	Std. Err.
lexIND L1 ¹	0.7791***	0.109
lexINP L1 ²	0.0136	0.0419
chKENex ³	-0.2643***	0.0888
chLKAex ⁴	-0.1732	0.1145
chWLDex ⁵	1.6842***	0.3436
chCHlex ⁶	-0.2860*	0.1581
chixch ⁷	-0.1425	0.2495
cons	2.6877**	1.338
R square	0.5451	
Adjusted R square	0.4788	

*Significant at 10 percent level, ** Significant at 5 percent level, *** Significant at 1 percent level

Note: ¹In of lagged Indian export, ²In of lagged Indian export price, ³change in Kenya export, ⁴change in Sri Lankan export, ⁵change in China export, ⁶change in world export, ⁷Exchange rate growth over the previous year

Import Model

Similar to the export model created an import model which explains the effect of Indian tea export growth in the previous year, Exchange rate growth over the previous year, deflated GDP growth over the previous year, India's tea yield and India's tea growing area over the current year's Indian tea export. Import model equation is expressed as:

$$\ln p_{tea} = \alpha + \beta_1 \text{chINDex} + \beta_2 \text{chixch} + \beta_3 \text{chdflr} + \beta_4 \text{pcgdp} + \beta_5 \ln \text{INDy} + \beta_6 \ln \text{INDa}$$

Note: p_{tea} = per capita, chINDex =Indian tea export change over the previous year, chixch = Exchange rate growth over previous year, chdflr pcgdp = deflated gdp growth over the previous year, $\ln \text{INDy}$ = $\ln$ of India's tea yield, $\ln \text{INDa}$ = $\ln$ of India's tea growing area

Table-12 Factors determining the import behaviour of Indian tea

Variables	Coef.
chINDex ¹	-0.2947***
chixch ²	-0.3470***
chdflr_pcgdp ³	-1.2234***
INDy ⁴	1.1743***
INDa ⁵	0.2858***
Cons	-12.8953***
R square	0.9629
Adjusted R square	0.9592

*Significant at 10 percent level, ** Significant at 5 percent level, *** Significant at 1 percent level

Note: ¹growth over previous year in Indian tea export, ²Exchange rate growth over previous year, ³growth over deflated GDP, ⁴ $\ln$ of tea yield in India, ⁵ $\ln$ of tea growing area in India.

The impact of independent variables on India's tea import is exhibited in [Table-12]. All the variables are highly significant and have greater influence over India's tea import. Variables say tea yield in India and tea growing area in India have significantly positive impact while growth over previous year in Indian tea export, Exchange rate growth over previous year and growth over deflated GDP have significantly negative impact on import quantities of tea by India. This model is more suitable having R square value as 0.9629

Application of research: This study will be informative providing some worthwhile details regarding the Indian tea sector/ industry and their contribution towards India's economy through its export potential. Further, the changing scenario of tea export worldwide is provided in detail which will be useful in predicting the future performance of Indian tea in the global market. Problems faced by the tea growers are emphasized to give an overall view of the Indian Tea Industry.

Research Category: Agricultural Economics

Abbreviations:

APEDA-The Agricultural and Processed Food Products Export Development Authority

CTC- Crush, Tear, Curl- a method of processing

DGCI&S- Director General of Commercial Intelligence and Statistics

FAO- The Food and Agriculture Organization of the United Nations

GDP - Gross Domestic Product, GI- Geographical Indication

IIFT- Indian Institute of Foreign Trade

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Study area / Sample Collection: India

Cultivar / Variety / Breed name: Tea (*Camellia sinensis*)

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