

AN ECONOMIC ANALYSIS OF EXPORT OF SOUTH INDIAN TEA

*Thesis submitted in part fulfilment of the requirements for the degree of
Doctor of Philosophy (Agriculture) in Agricultural Economics
to the Tamil Nadu Agricultural University, Coimbatore - 3.*

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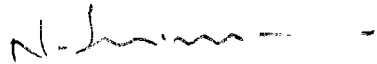
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CERTIFICATE

This is to certify that the thesis entitled "AN ECONOMIC ANALYSIS OF EXPORT OF SOUTH INDIAN TEA" submitted in part fulfilment of the requirements for the Degree of **Doctor of Philosophy (Agriculture)** in **Agricultural Economics** to the Tamil Nadu Agricultural University, Coimbatore is a record of *bonafide* research work carried out by **A. ROHINI** under my supervision and guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journal or magazine.

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ABSTRACT

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India has the pride of being the biggest producer and the largest consumer of tea in the world. Till eighties, India was also the largest exporter, a position which is now occupied by Sri Lanka, closely followed by Kenya. Due to world-wide slump in tea prices and import of tea into our country, the tea industry faces a grave crisis in its history especially South India has been suffering a lot. In this context, the present study has been conducted with the objectives to, (1) analyse the growth and instability of South Indian tea exports; (2) examine the direction of South Indian tea exports and project the future exports of the same; (3) estimate the extent of market integration of various regional and international auction markets; (4) study the price behaviour of South Indian tea and forecast for the future period; (5) assess the export competitiveness of South Indian tea; and (6) perceive the response of exporters in the present liberalised era and suggest suitable measures to overcome their constraints in order to enhance tea exports.

The growth pattern of tea exports from South India registered a rising trend in the export quantity, value and unit value for the past two and a half decades. The variation in the export quantity of tea formed the major source of instability in export value of tea in addition to the variation in export unit value, interaction terms and co-variance effects. The estimation of export shares of various countries revealed that the major destination of South Indian tea was Russia in the past and it continues to occupy its prime position in

the recent years as well. In the projection for future period, U.S.A., Poland, A.R.E. and 'other countries' accounted for three, twelve, five and fifteen per cent share in export from South India, while Russia accounted for 60 per cent share during 2004-05. Efforts to popularise South Indian tea in new countries will help to diversify our trade and expand our export basket, since, depending on a single source will be riskier when those countries face serious financial problems. The market integration tests when estimated for the integration of regional auction markets namely, Kolkata, Guwahati, Cochin and Coonoor provided significant estimates for stationary test, co-integration test and for error correction mechanism. Thus, the four regional auction markets in India were found to be integrated and any price change in one market will be reflected in other markets. The international auction market, London was found to be integrated with the four regional auction markets in India. Thus, any price change at international level would be transmitted to the regional markets, simultaneously.

The CTC leaf tea prices of Coonoor auction market for 26 years were analysed for the presence of cyclical variation after removing the general effect of rise in price levels and trend factor. The occurrence of five year cycle was identified and confirmed by harmonic analysis. The tea producers thus would be getting maximum profit once in a period of five years and this might be affected by the government policy of importing tea into our country since, the supply rises more than the demand, creating downward pressure on prices. The price series was subjected to forecast analysis using the Box Jenkins' ARMA model. The ARMA (5, 2) model was found to be a best fit with significant estimates and satisfied the residual test. These estimates were used for forecasting up to the year 2010. The export competitiveness of South Indian tea was assessed by means of NPC and DRC estimations. Under both importable and exportable hypotheses, the NPC and DRC coefficients were found to be lesser than one. This showed that tea was an efficient exportable commodity, efficient import substitute and it worths to produce tea domestically as the producers spend lesser than Re. 1 to earn one rupee equivalent of foreign exchange. So, it is profitable to produce and export tea from our country. This situation might tend to reverse as the cost of cultivation increases due to higher input and labour costs on one side and the tea prices continuously decline in the auction market on the other.

The exporters response to the current, liberalised, world trade organisation era and the strategies they could follow in order to gain maximum profit in their exports were analysed. The exporters who did not respond to the changing scenarios would be loosing about 10 per cent of their export value realisation and if they opted for any single strategy or a combination, would gain at least some per cent in their export value realisation. The strategies include exporters activities and also the Government Policy and the action along with the Tea Board. The exporters' strategies were, improvement in the quality of tea to be exported by them, undertaking promotional activities like use of brand name, symbol, logo mark, attractive packing and advertising. The Government strategies were of imposing maximum import duty permissible under world trade organisation rules and popularising South Indian tea in other countries along with Tea Board by conducting promotional campaigns. When all these strategies were followed under increasing quality conscious environment, the exporters realised maximum benefit in their export value. With regard to the constraints faced by them, the increasing competition for tea at world level with other countries supplying tea at lower prices was found to be the most important one. The other constraints the exporters came across were, increasing tea imports of cheaper quality tea, demand for quality tea at cheaper rates by most of the importing nations, absence of export market incentives for the tea exporters, inadequate promotional measures to popularise South Indian tea abroad and discriminatory policy of some importing countries towards South Indian tea.

Improving production technology, managing labour costs, producing quality tea, undertaking replanting and rejuvenation activities since most of the plantations were in old age, implementing vigorous promotional measures to promote consumption of tea, concentrating on value-added tea exports and developing new products, imposing higher import duty to prevent cheap quality tea entering into our country, conducting quality tests for tea at all levels and providing export credit facilities are some of the measures to enhance tea exports in the years to come so that the share of India in world tea exports could be enhanced.

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

*The author expresses her profound sense of gratitude to the Chairman of the Advisory Committee **Dr.N. Srinivasan**, Professor of Agricultural Economics, Directorate of Research for his valuable guidance, constant encouragement and sustained interest which enabled to complete this study successfully.*

*The author takes the privilege of expressing her sincere gratitude to **Dr.N. Raveendaran**, Professor and Head, Department of Agricultural and Rural Management for his keen interest, untiring help, timely and critical suggestions during each stage of the study.*

*The author wishes to acknowledge the useful suggestions made by the members of the Advisory Committee **Dr.C. Kailasam**, Professor and Head, Department of Mathematics and **Dr.D. Malathi**, Associate Professor, Department of Fruit Crops.*

*Special appreciation is also due to **Dr.N. Ajjan**, Associate Professor, Department of Agricultural and Rural Management for his expedient suggestions and help during the course of the study.*

The author would like to express her gratitude to the officials of the UPASI, Tea Board, Coonoor for their help in supplying the needful data for this study.

The author also wishes to thank her classmates and friends who were always beside her during the study.

Words will not suffice to thank her Appa, Brothers and Aunt to whom she is greatly indebted for the love and affection showered and whose prayers have been her moral support.

Finally the author wishes her thanks to M/s. Sree Kumaran Computers, Coimbatore for their patient and neat execution of the thesis:

A. Rohini
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INTRODUCTION

CHAPTER I

INTRODUCTION

India has only 2.3 per cent of the land area of the world, while the share of the arable land is 11.8 per cent and it has the largest share (23.6 per cent) of irrigated area. This has enabled the country to be a major producer of agricultural commodities. In the production of many commodities such as wheat, rice, pulses, groundnut, tobacco, rapeseed, sugarcane, tea, jute, vegetables, fruits and milk, India ranks within the top three in the world. Though the contribution of agriculture to the Gross Domestic Product at factor cost has declined from 34.7 per cent in 1980-81 to 24.7 per cent in 1998-99 at 1993-94 prices, it still supports about 60 per cent of the population (Naik, 2001). While the share of agricultural exports in the total exports is eroding to half of total exports from 36.8 per cent in 1970-71 to 18.2 per cent in 1998-99, the net value of the export has improved from a deficit of Rs.39 crores in 1970-71 to a surplus of Rs.14,768 crores in 1998-99 (Table I). As there is a continuously increasing trade deficit for the country as a whole, the increasing net exports of agriculture is a significant contribution to the country's economy. However in terms of exports India is not a major player in the world agricultural commodity market, except in the case of a few commodities such as rice, spices, soymeal, cashew, tea and coffee. In the coming years, India has to focus on its agriculture not only to meet the domestic demand but also to increase its export, to help the rest of the economy.

Growth in both the population and income is expected to increase the demand for food and other agricultural produce in the coming years. Domestic demand for most of the agricultural products is expected to increase at an annual rate of 2.75 per cent of which 1.75 per cent on account of population growth and one per cent on account of increase in per capita income (Naik, 2001). Therefore, increase in agricultural production

TABLE I.

VALUE AND SHARE OF AGRICULTURAL EXPORTS AND IMPORTS, AND NET EXPORTS

(Value in crores of Rs.; Share in Percentage)

Year	Exports			Imports				Net exports (Exports - Imports)	
	Agrl. & allied products	Total exports	Share of agrl. exports in total exports	Agrl. products	Total imports	Share of agrl. imports in total imports	Agriculture		Total
							Agriculture	Total	
1970-71	565	1535	36.80	604	1634	37	-39	-99	
1987-88	3320	15674	21.18	1479	22244	6.65	1841	-6570	
1990-91	6019	32558	18.49	999	43193	2.31	5020	-10635	
1991-92	7895	44042	17.93	677	47851	1.41	7218	-3809	
1992-93	9082	53688	16.92	1468	63375	2.32	7614	-9687	
1993-94	12633	69751	18.11	1025	73101	1.40	11608	-3350	
1994-95	13269	82674	16.05	3592	89971	3.99	9677	-7297	
1995-96	20344	106353	19.13	3244	122678	2.64	10025	-16325	
1996-97	24363	118817	20.50	4310	138920	3.10	20053	-20103	
1997-98	24626	130101	18.93	5513	154176	3.58	19113	-24075	
1998-99	25387	139753	18.17	10619	178332	5.95	14768	-38579	
1999-2000	23824	162925	14.62	9942	204583	4.86	13882	-41658	

Source : Hand Book of Statistics on Indian Economy, Reserve Bank of India, 2000.

should match the growing demand in order to prevent large-scale imports. The required growth rate in output should take place in a cost effective manner so as to compete effectively with the imports.

With the signing of World Trade Organisation (WTO) Agreement on Agriculture (AOA), India along with 119 other member countries will have to implement the agreements and the international trade opportunities are expected to change. Trade barriers are expected to reduce and more free trade is likely to take place for many commodities. Competitiveness of the countries in individual products is expected to play a major role in the international trade.

Agricultural exports from India consist mainly of traditional items like tea, jute, coffee, cashew, spices, etc., and recently rice has become a major export commodity. However, India's export accounts for only about two per cent of the total agricultural exports of the world (Naik, 2001). Among the major items of exports of India, world trade is high in vegetables and fruits, meat and meat preparations and fish and cereals. In the traditional export items such as tea, coffee, tobacco and spices, India is losing its share. Having considerable experience in these markets sustaining its share is more important for India.

The country's export basket in the past was heavily depending on items such as tea and coffee and now has widened to include other commodities also. Research on the future agro-export basket of the country also reveals that it is likely to be dominated by fish and fish preparations, rice, wheat, tea, tobacco, fruits and vegetables and their processed items (Gulati and Sharma, 1994).

Importance of Tea

Tea industry is one of the most organised industries employing more than a million and a half people, of whom 50 per cent are women and generating a revenue of

about Rs.6000 crores in India. Apart from the workers employed directly the industry also supports many more in the ancillary activities of distribution, warehousing, retailing tea outlets etc. The industry also plays a vital role in the economic and social upliftment of the country and provides a non-polluting atmosphere through miles and miles of lush green plantations. With 31 per cent of total tea produced in the world, India continues to maintain its leadership in the International market. Since the country's independence, the production of tea has increased from 251 million kg (1951) to about 800 million kg (1999), an increase of 300 per cent with the additional land availability of only 40 per cent (Jhawar, 2000).

Tea Status of India

India has the credit of being the biggest producer and largest consumer of tea in the world. Till eighties, India was also the largest exporter – a position which is now occupied by Sri Lanka followed closely by Kenya and China. Tea exports from India have been hovering around 200 million kg per annum during the last four decades and the entire increase in production has been consumed by the domestic market. During 1960, India accounted for a share of 35 per cent of world tea exports, which declined to 26 per cent in 1980 and slipped further to 16 per cent in 1999. It could be observed from Table II that, India was pushed to fourth position with 16 per cent of total export and lost its share to other major exporters. Among them, Sri Lanka has emerged as the largest tea exporter accounting for 21.7 per cent, followed by Kenya (19.9 per cent), China (16.4 per cent) and Indonesia (7 per cent) during 1999. The above five countries together share 81 per cent of the global tea exports. India exported 192 million kg of tea in 1999 of which 97 million kg were from South India and 95 million kg were from North India.

The tea production in India was about 800 million kg in 1999 which constituted 28 per cent of the global tea output, of which South Indian crop was 195 million kg which exceeded that of Indonesia and Turkey's production. In fact China, Kenya, Sri Lanka

TABLE II.
TEA EXPORTS OF VARIOUS COUNTRIES IN THE WORLD (1999)

Sl. No.	Country	Export (million kg)	Export as per cent to total
	North India	95.0	7.81
	South India	96.5	7.93
1.	All India	192	15.80
2.	China	200	16.40
3.	Sri Lanka	264	21.70
4.	Kenya	242	19.90
5.	Indonesia	85	7.00
6.	Turkey	5	0.41
7.	Japan	1	0.08
8.	Bangladesh	15	1.20
9.	Iran	3	0.25
10.	Argentina	52	4.30
11.	Malawi	40	3.30
12.	Vietnam	28	2.30
	World	1217	100.00

Source: Tea Statistics – 1999, Published by Tea Board, Kolkata

and North India were the only countries / regions which produce more than South India. South India thus occupies a prominent place in the world tea map. Based on the manufacturing technique, black tea, green tea and other types of tea are produced from green leaf. About 71 per cent of the global output is black tea and 29 per cent is green and other tea. Most of the green and other types of tea were consumed in the producing countries themselves. It is therefore, black tea that is of prime importance as far as international tea trade is concerned. Again, there are two manufacturing processes of black tea namely, CTC (crush, turn and curl) and orthodox tea. Sri Lanka, Indonesia, Turkey, Argentina and Iran are the major orthodox tea producers while Kenya, Bangladesh, Malawi, Tanzania, Uganda, Zimbabwe and South Africa manufactures CTC tea. However, India manufactures both types but more than 85 per cent is CTC tea production both in North and South India. China, Japan and Taiwan produce mainly green tea (Table III).

Assam and West Bengal in the North, Tamil Nadu and Kerala in the South, are the major tea producing states in the country together accounting for 98 per cent of the total output (Table IV). Small quantities are also produced in Karnataka, Tripura, Himachal Pradesh, Uttar Pradesh, Sikkim, Bihar, Manipur, Nagaland and Andhra Pradesh. North India produces 76 per cent of tea from 80 per cent of area in India, whereas South India produces 24 per cent of tea from 21 per cent of area in India. Regarding productivity of tea, Karnataka records the maximum yield in the world (2577 kg per hectare) when compared to other major producing countries like Kenya (1881 kg per hectare), Sri Lanka (1430 kg per hectare), Indonesia (1005 kg per hectare) and China (570 kg per hectare) during 1999.

TABLE III.
PRODUCTION OF MAJOR CATEGORIES OF TEA IN MAJOR
COUNTRIES IN THE WORLD DURING 1999

(Million kg.)

Sl. No.	Country	Black Tea		Green Tea & others	Total	Per cent share of Black Tea to World Production
		CTC	Orthodox			
	North India	557	41	6	604	21.02
	South India	164	29	2	195	6.78
1.	All India	721	70	8	799	27.80
2.	China	-	57	619	676	2.00
3.	Sri Lanka	18	265	1	284	9.95
4.	Kenya	247	2	-	249	8.75
5.	Turkey	-	171	-	171	6.01
6.	Indonesia	13	115	37	165	4.50
7.	Japan	-	-	89	89	-
8.	Iran	-	60	-	60	2.11
9.	Argentina	-	50	-	50	1.76
10.	Bangladesh	46	1	Neg.	47	1.65
11.	Vietnam	-	12	34	46	0.42
12.	Malawi	38	-	-	38	1.34
13.	Uganda	25	-	-	25	0.88
14.	Taiwan	-	1	22	23	-
15.	Tanzania	23	-	-	23	0.81
16.	Zimbabwe	17	-	-	17	0.60
17.	Rwanda	13	-	-	13	0.46
18.	Russian Fed/CIS	-	10	2	12	0.35
19.	South Africa	11	-	-	11	0.39
20.	Brazil	-	8	-	8	0.28
21.	Others	22	17	-	39	1.37
	Grand Total	1194	839	812	2845	100.00

Source: Tea Statistics – 1999, published by Tea Board, Kolkata.

TABLE IV.
AREA, PRODUCTION AND PRODUCTIVITY OF TEA IN MAJOR TEA
PRODUCING COUNTRIES DURING 1999

State	Area (ha)	Production (m kg)	Yield (kg/ha)
Assam	231940 (52.97)	414 (51.8)	1786
West Bengal	103150 (23.56)	180 (22.5)	1747
Others	12911 (2.95)	10 (1.25)	771
North India	348001 (79.48)	604 (75.59)	1736
Tamil Nadu	50875 (11.62)	122 (15.3)	2398
Kerala	36877 (8.42)	67 (8.4)	1823
Karnataka	2104 (0.48)	5 (0.6)	2577
South India	89856 (20.52)	195 (24.41)	2166
All India	437857 (100.00)	799 (100.00)	1825
Sri Lanka	198601	284	1430
Kenya	132376	249	1881
China	1185965	676	570
Indonesia	164179	165	1005

(Figures in parentheses indicate percentages to All India total)

Source: Tea Statistics – 1999, Published by Tea Board, Kolkata.

Present Crisis

Tea is an important natural beverage consumed throughout the world. Though tea has competed effectively with other beverages in the market, it has lost its significance especially since early mid-nineties and resulted in sluggish demand and lost its share in some of its traditional markets. Tea prices have fallen due to existence of imbalance between production and consumption. India is not exempted from this and especially South India has been suffering a lot due to the decline in prices.

The South Indian Tea industry at the dawn of the new millennium is facing perhaps a grave crisis in its history. Apart from world-wide slump in tea prices and fall in the growth rate of consumption, the crisis that had enveloped the South Indian tea industry is on two counts, failure of Russia to import tea from India as per the agreement between the two countries and the import of tea without any quality test (Anonymous, 2000). A total volume of 15.2 million kg of tea worth Rs.95.5 crores was being imported during 1999-2000, against the previous fiscal year of 10.36 million kg worth Rs.62 crores. The country has to siphon out Rs.100 crores of foreign exchange in tea imports when all the required grades are available at home (Anonymous, 2001).

Russia has been for decades, and continues to be so even now, the largest single tea importer from India. In 1960 our total exports to Russia was 10 million kg. The bilateral trade agreement between India and Union of Soviet Socialist Republic in early sixties led to changes in the India's export destination for tea. By 1990 India was exporting 129 million kg into the erstwhile USSR. This had its own ramifications in India. The Indian producer attuned its production, from plucking to manufacturing and marketing to suit this large market. Tea was modified to suit the Russian tastes. Over the last two decades especially the South Indian producers, concentrated all their resources to suit this market thus rendering their produce not very suitable for other

markets. But the disintegration of USSR coupled with the economic recession that followed had led to dramatic changes in the market scenario in Russia and the Commonwealth of Independent States. Russia has now, therefore, turned from a quality-led to a price-led import market. Notwithstanding these developments, the Russia-CIS combine even today, continues to be the largest tea import market in the world. Economic turmoil in Russia, following the rouble devaluation in August 1998 left importers in a situation where they were unable to sustain the high priced devaluation and were forced to look at cheaper tea. As a result, average unit import value declined by almost 20 per cent in 1999 as compared to 1998. The CTC tea segment in the Russian market has grown at the cost of all other varieties of tea during this period (Ashraff, 2000).

Another major reason for our set back in tea trade is the rising cost of production of tea with the increasing input cost and higher labour costs (Sarronwala, 2000). The yield per hectare has remained far too inadequate to meet the target since tea bushes provide optimum yields upto 50 years of their life and then the yield declines thereafter. More than two-fifths of the total tea bushes in our country were above 50 years old (Anonymous, 1995). In such a situation the increase in yield per hectare has to be caused at the expense of quality. As per the WTO agreement, removal of quantitative restrictions on imports and under the free trade agreement among SAARC countries, a large volume of tea imports is entering into the country. Under the SAARC free trade agreement, Sri Lanka is permitted to export 15 million kg of tea into India annually at an import duty of 15 per cent only since 1998.

The major competitors to India in tea exports are Sri Lanka, Kenya, Indonesia and China. Their increasing shares in world tea production and exports have also caused concern for India. The new suppliers in the international tea market enjoy cost advantages in production over the established nations like India (Sharma, 1969).

To add to the predicament, the export demand is also on the decline because certain countries are either following discriminatory policy like imposing heavy import duty to make Indian tea less competitive. Egypt is imposing 30 per cent levy on tea imported from India, while it is levying just three per cent on tea from Kenya (Anonymous, 1999).

In the present scenario of liberalised free trade environment, India has to learn to manage imports and come up with a concrete policy to regain its export share and realisation of higher prices in the tea export trade with better quality tea.

The above background and problem focus have led to hypothesise the following

- i. There is a positive growth in South Indian tea export.
- ii. The destination of South Indian tea exports has widened to a large number of countries.
- iii. There exists market integration between the various tea auction markets.
- iv. Tea is an export competitive commodity.

In this context, the present study has been undertaken with a broad objective of analysing the various aspects of South Indian tea trade including the present crisis in a comprehensive manner. The specific objectives of the study however are to:

- i. analyse the growth and instability of South Indian tea exports;
- ii. examine the direction of South India tea exports and project the future exports of the same;
- iii. estimate the extent of market integration of various regional and international auction markets;
- iv. study the price behaviour of South Indian tea and forecast for the future period;
- v. assess the export competitiveness of South Indian tea; and
- vi. perceive the response of exporters in the present liberalised era and suggest suitable measures to overcome their constraints in order to enhance tea exports.

Scope of the study

Due to the crisis in South Indian tea market, this particular study has been undertaken and the results of the present study would indicate areas for policy considerations.

Limitations of the study

An economic analysis of this nature has a few limitations relating to the quality of data that are collected for different purposes. The results of this study are of course subject to these riders.

The presentation of the study results is organised in six chapters as follows:

- Chapter I : Introduction-deals with the background, problem focus, specific objectives, scope and limitations.
- Chapter II : Concepts and Review - review of the past related studies and the conceptualisation of the same for the study on hand.
- Chapter III : Methodology - The sampling design, the method of data collection and the various methods of analyses employed to explore the study are discussed here.
- Chapter IV : A profile of Tea Industry in India - Brief description of the various components of tea Industry with particular reference to the study area has been attempted.
- Chapter V : Results and Discussion - The results of the analysis undertaken are presented, discussed and interpreted.
- Chapter VI : Summary and Conclusions- Findings of the study are summarised, conclusions are drawn and the policy implications have been indicated.

CONCEPTS AND REVIEW

CHAPTER II

CONCEPTS AND REVIEW

In any research, it is important to look into the past studies conducted on the related problems in order to find out the present status of research in that area and identify the gaps if any in these studies. Further the knowledge of these studies would inturn help the investigator to give an appropriate direction to the study on hand. Keeping these things in view, the concepts and past research work related to the present problem is briefly reviewed in this chapter under eight sections.

Export Growth Pattern

Growth is the nature of change of the economic variables in the long run. Growth rates are used to measure the past performance of the economic variables and describe the trends in the variables over time.

George (1976) used the linear, semilog, log inverse, and double log functional forms to estimate the trend in area and yield under the oil seeds in different states of India.

Bandyopadhyay (1982) found that the growth rates of India's share in world tea exports declined constantly during the period 1964 to 1978. The reasons attributed were low productivity, high demand for tea in the domestic market and high cost of production.

Raveendaran and Aiyasamy (1982) analysed the export growth of turmeric in India and found that the production export price and promotional efforts had a significant influence on the export of turmeric.

Kavoussi (1984) argued that in a large and heterogenous sample of developing countries, higher rates of economic growth were associated with higher rates of export growth and growth rates of exports and Gross National Product are positively correlated in these economies.

According to Dayal (1986) agricultural growth rates could be simple or geometric. The arithmetic growth rate could be expressed in absolute terms, whereas the compound growth rates could be expressed in percentage terms.

Das (1990) found that, an increase in domestic demand and absence of substantial increase in domestic production to meet the demand at home and exports were the factors retarding the growth of tea exports.

Reddy (1991) analysed the growth rate of tea exports for various countries during the period 1974 to 1998. He concluded that the tea exports in India and Sri Lanka were stagnant, whereas in China and Kenya it increased sharply to the extent of 8.66 and 6.97 per cent per annum respectively.

Sahoo (1991) found that export of fresh mangoes and fresh vegetables recorded a growth rate of 15.70 and 13.70 per cent respectively, while the export of fresh potatoes witnessed a negative growth of -25.48 per cent during the period 1980-81 to 1989-90.

Ratna and Narayanan (1992) attempted to examine the performance of India's agricultural exports during the past two and a half decades (1960-85) and found that even though the share of agricultural exports had been declining over the period, our trade policies made us to depend on traditional export crops like tea and tobacco mainly due to internal factors like production and per capita availability rather than external factors like prices and foreign exchange rate which appeared to be less important.

Sharath (1992) analysed the growth in exports of Cardamom from India for two periods 1970-71 to 1979-80 and 1980-81 to 1989-90. In the first period, the quantity of Indian exports registered a growth rate of 4.63 per cent, while the value of exports grew at a rate of 27.9 per cent. These were mainly attributed to a 23 per cent increase in unit value realisation in contrast to a 17.05 per cent decline during the second period.

Veena (1994) analysed the growth of Indian Coffee exports during 1965-90 and found that Robusta exports registered a marked compound growth rate of 10.7 per cent and exports of plantation type coffee exhibited a compound growth rate of 3.6 per cent per annum, while Arabica grew at a growth rate of three per cent.

Ahmed (1994) in his study on vegetable exports indicated that higher production of export related varieties, efficient-handling, grading, sorting adequate transport system, improved packing system, availability of chemical treatment facilities and reasonable freight rules for vegetables were the main determinants for improving the vegetable export system.

According to Prabirjit (1995), the growth in exports in the liberalisation period was actually a continuation of that of the earlier period. There was nothing in the exports behaviour in the earlier period that called for a change of regime. There was no direct evidence that the exchange rate behaviour exerted any influence on the dollar value of exports and imports during the period of liberalisation.

Sivakumar (1996) attempted a linear trend analysis to identify the trend in export of onion from India over years and the results showed that the export of onion was growing by 5.67 tonnes annually.

Nilanjan (1998) in his study of Indian exports to Sri Lanka found that cotton yarn fabric made up, transport equipment and machinery and instrument made an impressive growth rate of 45.6 per cent, 39 per cent and 36.3 per cent respectively during the initial three years of liberalisation mainly because the exports were made cheaper due to devaluation of currency and world market looked bullish during the initial years of liberalisation.

Dattatreyyulu (2000) found that agricultural exports over the years increased in value terms, but their share in total exports declined since 1960-61. Exports over the years had grown but the growth in exports had shown a very modest trend.

Kumar (2000) found that in general overall agriculture and allied products has shown 14 per cent growth rate, while rice and coffee came up as the most promising exportable commodities with compound growth rates of 27.72 per cent and 26.55 per cent respectively for the period 1990-91 to 1997-98.

Instability in Exports:

Hazell (1982) analysed the instability in Indian foodgrains production and found that the coefficient of variation of total cereal production was 5.85 per cent during 1967/68 to 1977/78 when measured around the trend. This was nearly 50 per cent more than the coefficient of variation during 1954/55 to 1964/65. Even though it was quite modest by international standards, but because of the high proportion of production retained by farm families, these fluctuations could cause substantial price instability.

Harmans (1984) studied export price instability and producer price instability for the main coffee exporting countries. The method of disaggregating instability based on the variance of income, the terms of trade followed and the results clearly indicated that that export prices were more fluctuating than the producer prices especially for African countries.

Kaur and Singhal (1989) found that traditional exports showed the highest degree of instability followed by non-traditionals and iron-ores and concentrates during the period 1970-71 to 1979-80. In the case of jute manufactures, tea and iron-ore and concentrates, the fluctuations in export earnings were caused primarily by prices while in cashew kernels, the source of instability was found in volume.

According to Pal and Sirohi (1989) the instability in Indian crop production in the period 1967-68 to 1983-84 over the period, 1950-51 to 1964-65 increased in comparatively less irrigated crops. Yield variance contributed largely to variance of production in pulses and oilseeds and their contribution increased over time. But the share of yield variance declined slightly in cereals.

Hazell and others (1990) argued that during recent decades the coefficient of variations of producer prices typically fell in the 10-30 per cent range and agricultural producers in developing countries could face significant increases in the variability of their export prices unless they had any efficient means for diffusing their risks. Many coffee and cocoa exporting countries had even experienced a trend increase in the absolute variability of their export unit values.

Singh (1991) found that the fluctuating trend in the export of cashew kernels was due to the fluctuations in rawnut import. Domestic production and the import of rawnuts had significant positive impact on the export of kernels from India, whereas domestic consumption had negative influence.

Sundaresan and Menon (1994) estimated the variation in prices of tea in four selected markets during the period 1974 to-1990. High coefficient of variation for all the markets revealed that uncertainty in tea prices had increased in recent years and a policy covering both production and marketing of tea was imperative to overcome the crisis.

Veena and others (1994) identified price instability as the single largest source contributing to over 60 per cent of the instability in the total Indian Coffee export earnings. The abolition of International Coffee Agreement was observed as one of the main reasons causing instability in prices, which were expected to increase in future also.

Jesy and Sundaresan (1996) used the coefficient of variation and standard deviation to study the export performance of cardamom in India. The results showed that there was high instability in the quantum of exports with an instability index of 68.5 per cent. The coefficient of variation was also high as 60.47 per cent. The fluctuation in cardamom export was attributed to the influence of production.

Nagaraja (1997) studied the instability in export of mango from India. A comparative performance was attempted splitting the time period into two. The first period from 1970-71 to 1981-82 was termed as pre-development period and the other period from 1982-83 to 1992-93 was considered the development period. The 90.09 per cent increase in the variability during the latter period over the former was attributed to the change in the interaction term in case of mango exports, change in mean quantity exported and the residual component accounting for 2.45 per cent and 2.59 per cent respectively.

Deb and others (1999) found that sugarcane production in Bangladesh increased over time due to increase in sugarcane area, while yield has decreased over time. Decrease in yield in most cases was accompanied by a decrease in yield variability and therefore a mechanism that would increase yield, rather than worrying about variability, would lead to increase sugarcane production in future.

Vyas (1999) studied the sources of instability in export earnings of selected spices of India. It was found that fluctuations in production of these spices in other producing countries and increased value of Indian Spices in the world market had contributed widely to instability in export earnings. The study emphasized that there was a need to maintain this upsurge because of the emerging threat from other producing countries.

Structural Change in Export:

Lee and others (1965) used first order Markov process for structural estimation and prediction. The major conclusion derived by them were that the quadratic programming

techniques appeared to offer an efficient basis for obtaining restricted least square of the traditional probability matrix of a finite market process, when only aggregated data relating to the proportion of the sample in each state over a sequence of trials were known.

Dent (1967) observed that the possibility of improving the predicted future share patterns for any exporter existed simply by altering the appropriate transition probabilities. He concluded that the ability of the model to explain the buying pattern rested heavily on the assumption that the transition probabilities were constant over time and that the quadratic programming technique used yielded accurate estimates of probabilities.

Atkin and Blandford (1982) studied structural changes in import market shares for apples in UK during 1963-74 and indicated that changes in the market share had been systematic, stable and of long duration. The estimated transitional probability matrix could explain the nature of change by indicating the relative competitive strength of different exporters.

Srivastava and Ahmed (1986) analysed the direction of exports from India for the period 1960-61 to 1983-84. India's exports to U.K., USSR, USA, Japan and Germany declined over the period of study. The UK no more remained as the principal destination of Indian trade as it was in the pre-independence period. In 1983-84, USA emerged as one of our major trading partners.

Gemtesa (1991) analysed the direction of trade using Markov model. The share of Ethiopian coffee exports in USA drastically declined during 1979 to 1989. West Germany was indicated as the potential market for Ethiopian coffee. It was also projected that the market share of Ethiopian coffee export to West Germany would increase to 32 per cent by 2000.

Jeromi and Ramanathan (1993) analysed the changes in the direction of pepper exports from India during the period of 1975-90. They observed that 44 per cent of pepper exports from India were directed to former U.S.S.R, while exports to USA were declining over years indicating that U.S.A was an unstable market for pepper exports.

Veena and others (1994) analysed the direction of trade of Indian coffee exports using Markov chain model. It was observed that India could not retain its previous market shares to USA, Netherlands, Yugoslavia and other importers. However, the actual quantity exported to all these countries had increased, which was due to increased quantity of Indian coffee exports. India retained its market share in former West Germany, erstwhile USSR and Italy.

Vaseeharan (1997) studied the direction of export of Senna and Periwinkle from India to Germany, Belgium, USA, Japan, Italy, Hongkong and other countries being grouped as others. He found that Germany was the major importer of both Senna and Periwinkle. He concluded that necessary promotional activities were required to capture the emerging markets and to strengthen the exports of failing markets (more specifically USA) in terms of improving the quality to meet their specifications as it held reasonable share of total exports (about 10 per cent).

Sreenivasamurthy and Subramanyam (1999) analysed the direction of onion trade by using Markov chain model during the period 1980-81 to 1994-95. UAE, Malaysia were the stable importers of Indian onion with high probability of retention, while Saudi Arabia and 'other countries' were the unstable importers. Sri Lanka and Bangladesh would increase their import share of Onion from India at the cost of UAE.

Market Integration:

Cummings (1967) opined that integration implied the association of prices between markets. Association of prices over time show seasonal integration of prices and association of prices between markets show spatial integration of prices.

According to Lele (1971), market integration was the interrelationship between price movements in the two markets. The degree of correlation can be taken as an indicator of the extent to which the markets were integrated.

Rao and Subbarao (1976) considered that the markets were integrated over space when the territorial price difference do not exceed the transport costs plus the remuneration for the services of the trader.

Brorsen and others (1984) illustrated the use of univariate and multivariate time series analyses in the integration of dynamic relationship among selected weekly import prices of rice of the European community from the USA, Thailand and Argentina. The results revealed that Argentinean and USA prices moved together and reacted quickly to changes in Thailand prices.

Narasimhan, and others (1988) investigated the short-run inter-relationships between prices of oils and oilseeds in India by applying Koyck's distributed lag model. The analysis of prices of oils and oilseeds in Bombay market revealed the existence of integration between these markets. However, price integration in many cases were found to be unidirectional, indicating that substitution was possible only in one direction and not both ways. This was due to the technology and cost constraints involved in substituting one oil for other apart from consumer preference.

Arshad (1990) studied the applicability of the Ravallion method and causality tests in measuring market integration and ascertaining the nature of price relationships in the Malaysian crude palm oil market and found a highly integrated market in short-run. Local factors were proved statistically insignificant. Pierce causality tests indicated an instantaneous or feedback relationship. This suggested that each region absorbed new

information as and when it became available. The reason for this attributed was the setting up of palm oil futures market in Kuala Lumpur, which had increased the accessibility of market information.

Gemtessa (1991) analysed the integration of Ethiopian coffee prices with world prices using the correlation coefficient. The bivariate correlation coefficient between the two market prices of coffee revealed that they moved together in the same direction. The lagged cross-correlations of domestic prices and world prices of coffee for the period 1979-80 to 1987-88 indicated that the world prices of coffee had a stronger influence on the domestic prices than that of domestic price influence on world prices.

According to Taddesse (1992), market integration was the inter-relation between the prices of the concerned commodities over time and it mostly relied on the nature and extent of competition in the market.

Anitha (1994) in her study on groundnut marketing in Gujarat concluded that the groundnut oil prices at terminal market influenced the groundnut prices in the lower level market structure and thus groundnut markets were integrated vertically.

Schimmelfennig and Thirtle (1994) explored the relationship between agricultural research and development and productivity suggested that even the total factor productivity and the research and development were co-integrated, instead of the traditional single equation approach, the error correction model was found to be the logical alternative for the existing techniques.

Goletti and Babu (1994) studied the extent of market integration of maize markets in Malawi in order to understand how the markets had been affected by market liberalisation. Several measures of integration were introduced to study the problem and it was indicated that liberalisation had increased market integration.

Baharumshah and Habibullah (1994) tried to determine as to whether the prices of black and white pepper in a market were in parity with prices in a reference market. The results proved that regional pepper markets in Malaysia were highly integrated. They found that the distance between the markets was not an impediment to efficient adjustment of prices to new information.

Silvapulle and Jayasuriya (1994) demonstrated the use of multiple co-integration technique as a test for spatial market integration. They argued that this technique would overcome many of the limitations of previous methods. An application of the technique to Philippines rice markets indicated that, the markets were generally well integrated in the longrun with Manila as the dominant market.

Sinharoy and Nair (1994) used the co-integration analysis to estimate the long-run equilibrium relationships between international pepper prices. The results pointed out the fact that, due to the open trade status for pepper, prices had moved synchronously indicating integration of world pepper market. The integration process also implies that domestic-supply variables were responsive to international market conditions.

Dittok and Breth (1994) used the Ravallion type model to test the market integration of dry season vegetables in Nigeria. Weekly price data were examined. The results indicated that there were little and a low degree of integration of markets in the study area. Some market integration however existed between major producing and consuming areas. The results also indicated that good access to roads were more important for markets to be integrated than the distance between the markets.

Mendoza and Rosegrant (1995) examined the dynamics and efficiency of Philippines maize markets through the application of autoregressive conditional heteroscedasticity model (ARCH), to time series data. The findings of the study revealed

that there existed imperfect market integration for Philippine maize markets and indicated that there may be substantial benefits (1) in developing better infrastructural facilities to effectively link production and market centres and (2) in improving market knowledge by providing more relevant, accurate and timely public market information.

Amanulla and Kamaiah (1995) examined the Indian stock market efficiency using two approaches, namely, the Ravallion and co-integration and error correction approaches. The results showed that there was no evidence in favour of market efficiency of Mumbai, Chennai and Kolkata stock exchanges, while contrary evidence was found in case of Delhi and Hyderabad.

Diakosauvas (1995) examined the market integration between Australian and United States beef prices at the farm gate level using the co-integration analysis. He used the monthly data over the period 1972-1993. The results indicated that the Australian and United States beef prices were co-integrated, albeit not fully, and that the degree of convergence between the various price pairs had not substantially increased over time.

Nasurudeen and Subramanian (1995) attempted to estimate the extent of vertical and horizontal integration of oil and oilseed prices using the Koyck's distributed lag model. The analysis revealed that the assumption of complete oil price integration could not be fully accepted. The results of vertical integration confirmed the hypothesis that changes in oilseed price was linked to changes in its oil and cake prices. The Mumbai oilseed market showed the characteristics of perfect market condition by its quick adjustment to price changes.

Baharumshah (1995) studied the market integration on the prices of wet cocoa beans in different major regional markets with a non-parametric observation known as Phillips-perron test. The results suggested that region-wise markets were segmented or

less than fully integrated. This lack of market integration in intra-regional trade was not specific to particular commodity but rather a market specific problem. Integration could be enhanced, focussing on transport and communication linkages.

Adilakshmi and others (1995) analysed the marketing efficiency of chillies in Andhra Pradesh and found that there existed a close uniform price movements between each pair of selected regulated markets indicating that all the selected markets were well integrated.

Taylor (1996) used the co-integration analysis to address the pricing and informational efficiency of United States and Thai rice markets for the period 1987-91. The findings of the study indicated that the long-run equilibrium in the international rice markets was influenced by the Thai, Texas and future markets.

Mohanty and others (1996) used the fractional co-integration analysis for nine pairs of international commodity price series. The results showed that these series were fractionally co-integrated even when the hypothesis of co-integration has been rejected. Of the nine cases, fractional cointegration supported the existence of the law of one price in eight cases, compared with three cases in the standard co-integration process.

Mallick (1996) applied co-integration and error correlation models to examine the nature of causation between exports and economic growth in India. The results revealed the existence of strong co-integration and Granger feedback between income and exports growth. Further the error correction models provided consistent evidence of unidirectional causation running from income growth to exports growth. Expansion of productive capacity through income growth could raise exports and the increased profitability of exporting could induce increased saving and thereby capital emplacement, which gave rise to high economic growth.

According to Baharumshah and others (1997) there existed a stable equilibrium relationship between the price series whose linear combination are stationary even though they may be individually non-stationary. But the non-cointegrated time series did not move together in the long-run and were inconsistent with the law of one price.

Behura and Pradhan (1998) analysed the relationship between prices of marine fish for six markets in Orissa by using the co-integration model. The results revealed that out of all the six markets, the prices between the Cuttack and Paradip markets were found to be integrated due to good communication facilities.

Ghosh (2000) had investigated intra-state and inter-state spatial integration of rice markets in India using the maximum likelihood method of co-integration. The results indicated that there was no evidence in favour of the Law of one Price for the coarse / common variety of rice, marketed in Bihar, Orissa and West Bengal, even though the regional rice markets were found to be integrated. Integration of markets ensured regional food security, that is regional balance among food-deficit, food surplus and non-food cash crop producing regions.

Price Forecasting

Beenstock and Bhansali (1980) employed autoregressive model fitting techniques in analysing the monthly cocoa prices. The study compared the AR model with that of the simple random walk model and concluded that the former was the more satisfactory model in forecasting cocoa prices.

Sapsford and Varoufakis (1987) found that a general seasonal autoregressive integrated moving average modelling technique was appropriate for forecasting of monthly tea prices than a simple random walk or second order autoregressive model. The mean square error of prediction for the sample period was less in case of tea.

Paul and Ashtekar (1990) forecasted some major exchange rates using structural and time series models and found that ARIMA models were able to capture the turning points better than the other structural regression models.

Gil and Albisu (1993) suggested that composite forecasting methods were an alternative for selecting the best single forecast when data availability was limited and there was short sample period. In order to improve forecasting tools, additional comparisons among different individuals and composite models could be performed.

Sarkar and Kartikeyan (1993) suggested subset AR models for forecasting seasonal series when identifying multiplicative model was not an easy task. Using this model one could go for tract non-linear models for highly accurate forecasts.

Steen and Gjolberg (1999) used ARIMA model for forecasting prices of Dutch flower auctions. Based on 35 weeks, out of sample experiment, it was observed that the recursive estimation as well as standard chow tests gave stable parameters. The study concluded that the use of such time series model was very useful even for the agents operating in flower auction houses for improving their profitability.

Amin and Razzaque (2000) used ARIMA model for forecasting monthly potato prices in Bangladesh. They found that only during December, January and February months the forecast errors were little high as the yields were not even optimum during these months. The overall root mean square forecast error indicated that price variation of potato was not so vast, though the low price during the harvest season badly affected the producers.

Gill and others (2000) attempted forecasting of macro-economic time series data and concluded that in general, overall forecasting results confirmed that the univariate ARIMA model could not be better than multivariate Vector autoregressive and Bivariate Vector autoregressive time series models which allowed multivariate interaction among the variables.

Export Competitiveness

Herrmann and others (1991) investigated how measurement issues were important when agricultural protection was analysed. They found that the computed protection levels were strongly affected by using normal rather than actual world prices in the nominal protection coefficient calculations and also argued that if the more realistic framework of imperfect substitution was considered, welfare gains of liberalisation became less.

Masters (1993) argued that, there was a systematic bias in measuring Producer Subsidy Equivalent by placing market prices, rather than reference prices in the denominator which led to incorrect Producer Subsidy Equivalent (PSE) rankings when comparing one crop or country with another. This measure could be improved by dividing the PSE into product price and input cost effects and subtracting the product price effects from the denominator to obtain an estimate of reference-cost values which gave more accurate results.

Gulati and others (1994) analysed the export competitiveness of selected agricultural commodities using Nominal Protection Coefficient and found that some commodities like rice, grapes, banana, sapota, lyches, onion, tomato and mushrooms were highly export competitive and suggested that long term investments in research and extension for improvements in yield, quality and packaging of processed items must be encouraged in order to enhance the export of agricultural and allied commodities.

Uppal (1974) remarked that the slow progress of the country in the export front could be attributed to lack of infrastructural facilities. Further, low productivity and high price of raw materials made our export commodities non-competitive in the international markets.

Umapathi and others (1995) studied the export competitiveness of cotton and estimated the nominal protection coefficients under both importable and exportable hypotheses and found that they were much below unity implying that DCH-32 seed cotton would be an efficient export crop as well as an efficient import substitute.

Gulati and Sharma (1997) argued that most oilseeds were getting much high level of incentives than what they were likely to get under a free trade scenario indicating that these crops might have to face deceleration in their further expansion or even contracted at the margin, as trade was opened up in agriculture at zero import or export duties. This would help to achieve higher level of resource-use efficiency by importing commodities that have high resource cost in domestic economy and exporting those in which India had comparative advantage.

Constraints in Exports

Bandopadhyay (1982), studied the crucial problems hindering tea export. These were the proximate effect of rapid growth of population in India and the progressive impact of keen competition in the world market upon India's share. Both these problems were significantly affecting the Indian tea exports.

Devi (1992) found that price instability was the most important problem faced by the growers while marketing tea.

Singh and Pandey (1993), found that quality products for the foreign markets and reasonable price to produces were the factors determining the exports of vegetables and were to be followed in export promotion of vegetables.

Sundaresan and Menon (1994) argued that the inability of Indian tea to compete on price and quality fronts in international market was due to the major constraints in the export of Indian tea namely, dependence on realising high unit value, lack of export promotion measures and inadequate development of international market intelligence.

Kainth (1996) in his study on export of Indian tea opined that the failure of finding new markets, increased per capita domestic consumption, lack of development of unique brands in the exporting countries, presence of chemical residues and employing child labour were the major problems.

Review of Past Studies

Sarkar (1968) used the Hirschman index to measure the concentration of tea export markets and observed that there was a high degree of concentration of world tea exports. However he felt that the concentration decreased over the period owing to increased diversification of tea markets.

In a study on the export promotion of tea, Goswami (1969) concluded that several factors like cost of cultivation, manufacturing and marketing, central and State government taxes, commission to marketing agents and the profit to share holders will have to be taken into account in fixing tea prices in the market.

Sharma (1969) has found that the world import demand for Indian tea was uncertain as it had not shown consistent and significant response to the changes in price due to the role of non price factors such as quality and promotional efforts.

Awasthi (1975) found that in tea industry under the given technology, the cost of production tended to increase with steady increase in the prices of factors of production. The challenge of rising cost would be more severe to smaller units as compared to larger ones.

Achoth (1980) estimated the cost of production for different size groups based on the area under tea situated in two elevations, high and low. It was found that the large estates in both the elevations had high cost of production, since they manufactured the leaf into tea. The returns per acre was lower in smaller groups in both the elevations despite that the return per rupee of investment was high.

Lingan (1981) noted that high cost of fertilizers, non-availability of fertilizers round the year, supply of inputs by the Industrial Co-operative factory based on the savings by farmers in the factory, high cost of plant protection chemicals, non-availability of financial help, lack of technical assistance, non-remunerative price and non-existence of support price were the main problems faced by the tea farmers.

Kailasam and Hirian (1987) and Rangaih (1987) found that facilities like supply of high quality clones, shade and fruit plants, fertilizers, plant protection chemicals and equipments and sub-soil injectors were provided to small farmers at 50 per cent subsidised cost towards crop diversification in the Nilgiris tract under Hill Area Development Programme.

According to Ajjan (1987), the price of green tea leaf as fixed by the bought leaf factories was the major determinant of the economic viability of small tea gardens. Green tea leaf price had steadily declined since 1977 in sympathy with the auction prices of 'made tea' which had adversely affected the economy of small growers.

Roberts (1989) analysed tea production based on duality and separability theories and suggested that reducing tea export taxes and thereby increasing estate prices would be a strong impetus to increased tea production and a policy of higher worker wages would alternatively decrease the production. The ideal organisation would be the estates with 300 to 400 hectares producing green leaf for large central factories.

Khanna and others (1990) noted that the tea sector had vital role in the development of national economy from the angle of its contribution to foreign exchange earning and employment generation. But the small tea gardens did not perform well mainly because of non-availability of required financial support.

Sharma and Moorthi (1990) concluded that lack of skilled labour and lack of extension services were the main constraints in the tea gardens of Himachal tea farms.

According to Pai (1990), tea exports from India faced intense competition from Sri Lanka and Kenya and so in order to augment its share in the export market, cash compensatory support and duty drawback benefits must be allowed for the exporters.

Mohanasundaram (1990) found that in tea cultivation, the input-output relationship revealed sub-optimal level of resource use in general and their further use would enhance production except in the case of manures and fertilizers on large farms which were over utilising this resource.

A study by National Bank of Agricultural and Rural Development (1990) stated that the development efforts of various Government agencies and financial institutions encouraged a large number of small farmers to undertake capital intensive tea cultivation. However the overall rate of financial return from the investment on tea crop provided a barely adequate return. The low rate of return was due to low plant density, high mortality and low productivity caused by improper maintenance.

Singh (1991) found that at the aggregate tea consumption level, population was the significant variable and price variable did not appear to be of much significance attributing to the fact that tea was cheaper compared to other beverages and its consumption was a necessary. Therefore, the author concluded that increasing domestic production of tea would serve the twin objectives of catering to the requirements of domestic demand and strengthening the country's capacity to increase the exports of tea.

Mitra (1991) argued that the absolute yield of large farms was much higher than that of small farms due to better package of practices adopted in large farms sector in tea cultivation.

According to Bhushan and Garg (1992), even though the world production of tea had increased during the thirty year period ending 1989, there had been a gradual decline in the share of India in world production. This was mainly due to low productivity, yield gap in estates, regional disparity in the tea productivity and area.

Misra (1993) argued that small planters because of paucity of working capital and sometimes lack of knowledge pertaining to biological innovations couldn't adopt intermediate material inputs of biological innovations which increased tea productivity.

Misra (1994) argued that the failure of Indian salesmanship was responsible for the stagnation of tea export and adoption of uninational promotional scheme would be more appropriate in the present circumstance. He also suggested rationalisation in different estates should be adopted which might increase productivity and reduce average cost of production.

Moorti and Pathania (1995) estimated the resource-use efficiency of tea cultivation in Kangra district and suggested that the tea planters would use more of the required variable inputs, the response of which towards output was found to be significant and that inputs might be made available to them in time and in required quantity.

Thakur and others (1995) analysed that the demand for tea by the consuming countries had increased continuously; but supply was not proportionate to their demand, which indicated the shortage of tea. Efforts were to be made to improve the quality of the product and should identify the potential tea consuming markets in order to arrest the decreasing trend of tea prices.

Perera (1995) used an econometric model to evaluate the impact of change in international tea price on the Sri Lankan tea sector and found that favourable international prices enhanced the long-term prospects of the tea industry in Sri Lanka.

In order to increase the tea exports, Damodaran (1999) suggested a new marketing approach of creating a new classification scheme of global tea. It would tackle the changing global scenario and form as the basis for Indian tea in international tea markets taking into consideration the changing preferences for tea in the beverage segment of the global market.

Kutty (1999) found that it was the shift in the consumer's preferences or habits, which decreased tea consumption in UK, Ireland, Australia and New Zealand during 1987-97 and therefore it was imperative for the tea exporting countries in the world to launch an intensive, generic promotion in these markets.

According to Sundar (2000), an increase in tea exports could take place only through an aggressive marketing of quality tea, mostly in new centres.

METHODOLOGY

CHAPTER III

METHODOLOGY

Consistent with the hypotheses and objectives set forth, the methodology is being designed in any research study. In this chapter, the sampling design, methods of collection of data and analytical techniques employed in the present study are outlined.

Source of Data

The present study was carried out based on both primary and secondary sources of data. The primary data was collected from the tea exporters. The secondary data were collected from the regional office of Tea Board, Coonoor, United Planters Association of Southern India (UPASI), Coonoor and UPASI-Krishi Vigyan Kendra, Coonoor. The data relating to tea production, exports and auction market prices over the years (1975 to 2000) were collected from the Tea Statistics and Tea Digest published by the Tea Board, Kolkata.

Sampling Method

Tamil Nadu was considered as the universe for the study as it ranked first in tea production among the southern states. Coimbatore and Coonoor were selected in the next stage as they served as auction centres for tea marketing in the State. From the list of exporters collected from Tea Trade Association, Coimbatore, totally 30 exporters were selected randomly from the two centres and they were contacted personally and the required information were collected through personal interview method with the pre-tested interview schedules.

Analytical Frame work

The collected data were subjected to various statistical analyses to draw meaningful inferences. The descriptive statistics namely percentage analysis was adopted in addition to various models to study the export trade of South Indian Tea. The methods of analyses employed are described below.

Growth Pattern of South Indian Tea Exports

An attempt was made to understand growth in terms of quantity, value and unit of exports of South Indian tea using an exponential growth model. The simple exponential growth curve is given as:

$$GR_t = A (1 + r)^t v_t \quad \dots \quad (1)$$

When linearised the equation (1) becomes

$$\log GR_t = \alpha + t\beta + u_t \quad \dots \quad (2)$$

where, GR_t = the dependent variable (export quantity, value, unit value)

t = time in discrete years

α = $\log A$ – constant term

β = $\log (1+r)$

r = annual compound growth rate

u_t = $\log v_t$ was error term

The compound growth rate (r) was computed from the estimated β coefficient,

$$r = (\text{Antilog of } \beta - 1) \times 100 \quad \dots \quad (3)$$

The 't' test was applied to test the significance of r ,

Standard error of r was given as,

$$SE(r) = \frac{100\beta}{\log^e} \times SE(\log \beta) \quad \dots \quad (4)$$

According to log base rule, \log^e works out to 0.4343.

The 't' test was given as,

$$t = \frac{r}{SE(r)} \text{ with } (n-2) \text{ df} \quad \dots \quad (5)$$

Instability in South Indian Tea Export Value

Export earnings from tea has been growing over years and if the growth has occurred with high level of instability that is, violent fluctuations in quantity and price, it has a serious impact on the export performance of tea. In order to find out the source of growth and variability in South Indian tea exports the Hazell's (1982) decomposition model was employed. The export quantity and export unit value were first detrended using linear relations of the form:

$$Z_t = a + bt + e_t$$

Where Z_t denoted the dependent variable (export quantity and export unit price)

t = the time variable and

e_t = the random residual with zero mean and variance σ^2

After detrending the data, the residuals were centered on the mean export quantity or export unit value resulting in detrended time series data of the form:

$$\hat{z}_t = e_t + \bar{z}$$

where \bar{z} = mean of export quantity / unit value

\hat{z}_t = detrended export quantity or unit value

The detrended data were then subjected to the decomposition analysis.

$$EV = EQ \cdot EUV \quad \dots \quad (1)$$

Where EV = the export value of tea and

EQ = the export quantity of tea and

EUUV = the export unit value of tea.

The variance of export value $V[EV]$ will be expressed as,

$$V[EV] = \overline{EQ}^2 V[EUV] + \overline{EUV}^2 V[EQ] + 2 \overline{EQ} \overline{EUV} \text{Cov}[EQ, EUV] - \text{COV}[EQ, EUV]^2 + R \quad \dots(2)$$

where \overline{EQ} and \overline{EUV} = the mean export quantity and mean unit value

R = the residual term which was expected to be small.

It is apparent from this expression that $V(EV)$ was not only a function of the variances of export quantity and unit value but also of the mean export quantity and unit value and of the covariance between quantity and unit value. Clearly a change in any one of these components would lead to a change in $V(EV)$ between two periods in time. Similarly, average export value $E(EV)$ can be expressed as

$$E[EV] = \overline{EQ} \overline{EUV} + \text{COV}[EQ, EUV] \quad \dots \quad (3)$$

It was affected by changes in the covariance between export quantity and unit value and by the changes in mean export quantity and export unit value. The objective of the decomposition analysis was to partition the changes in $V[EV]$ and $E[EV]$ between the two periods into constituent parts, which could be attributed separately to changes in the mean, variance and covariances of export quantity and export unit value, that is,

$$E[EV_1] = \overline{EQ}_1 \overline{EUV}_1 + \text{COV}[EQ_1, EUV_1] \quad \dots \quad (4)$$

$$E[EV_{11}] = \overline{EQ}_{11} \overline{EUV}_{11} + \text{COV}[EQ_{11}, EUV_{11}] \quad \dots \quad (5)$$

Each variable in the second period could be expressed as its counterpart in the first plus the change in the variable between the two. For example,

$$\begin{aligned} \overline{EQ}_{11} &= \overline{EQ}_1 + \Delta \overline{EQ} \\ \Delta \overline{EQ}_{11} &= \overline{EQ}_{11} - \overline{EQ}_1 \\ \therefore E[EV_{11}] &= (\overline{EQ}_1 + \Delta \overline{EQ})(\overline{EUV}_1 + \Delta \overline{EUV}) \\ &\quad + \text{COV}(EQ_1, EUV_1) + \Delta \text{COV}(EQ, EUV) \quad \dots \quad (6) \end{aligned}$$

The change in average export value [$\Delta E(EV)$] was then obtained by subtracting equation (4) from (6). This was reduced to

$$\begin{aligned}\Delta E(EV) &= E(EV_{11}) - E(EV_1) \\ &= \overline{EQ}_1 \Delta \overline{EUV} + \overline{EUV}_1 \Delta \overline{EQ} \\ &\quad + \Delta \overline{EQ} \Delta \overline{EUV} + \Delta \text{COV}(EQ, EUV)\end{aligned}$$

There were four sources of change in average export value as it could be observed from Table V. Two parts $\overline{EQ}_1 \Delta \overline{EUV}$ and $\overline{EUV}_1 \Delta \overline{EQ}$ arose from the changes in mean export unit value and mean export quantity. These were called pure effects as they arose even if there were no other sources of change. The term $\Delta \overline{EQ} \Delta \overline{EUV}$ was an interaction effect which arose from the simultaneous occurrence of changes in mean export unit value and mean export quantity. Obviously, this term would be zero if either the mean export unit value or the mean export quantity remained unchanged. The last term $\Delta \text{COV}(EQ, EUV)$ arose from changes in the variability of export quantity and export unit value. Since,

$$\text{COV}(EQ, EUP) = \rho [V(EQ) V(EUV)]^{1/2}$$

Where ρ is the correlation coefficient, then it could be seen that $\Delta \text{Cov}(EQ, EUV)$ arose from changes in the variances of export quantity and unit value and from changes in the correlation between the two.

TABLE V.
COMPONENTS OF CHANGE IN AVERAGE EXPORT VALUE

Source of change		Components of change
Description	Symbol	
Change in mean export unit value	$\Delta \overline{EUV}$	$\overline{EQ} \Delta \overline{EUV}$
Change in mean export quantity	$\Delta \overline{EQ}$	$\overline{EUV}_1 \Delta \overline{EQ}$
Interaction between changes in mean export quantity and mean EUV	$\Delta \overline{EUV}, \Delta \overline{EQ}$	$\Delta \overline{EQ} \Delta \overline{EUV}$
Change in EQ – EUV covariance	$\Delta \text{Cov}(EQ, EUV)$	$\Delta \text{Cov}(EQ, EUV)$

The changes in the variance of export value ΔV [EV] can be decomposed in an analogous way. The components of change in the variance of export value were shown in the Table VI. These results also measured the changes considering the first period as the base.

TABLE VI.
COMPONENTS OF CHANGE IN THE VARIANCE OF EXPORT VALUE

Source of change		Components of change
Description	Symbol	
Change in mean EUV	$\Delta \overline{EUV}$	$2\overline{EQ}_1 \Delta \overline{EUV} \text{Cov}(EQ_1, EUV_1) + 2\overline{EUV}_1 \Delta \overline{EUV} + (\Delta \overline{EUV})^2] V(EQ_1)$
Change in mean EQ	$\Delta \overline{EQ}$	$2\overline{EUV}_1 \Delta \overline{EQ} \text{Cov}(EUV_1, EQ_1) + [2\overline{EQ}_1 \Delta \overline{EQ} + (\Delta \overline{EQ})^2] V(EUV_1)$
Change in EUV variance	$\Delta V(EUV)$	$(\overline{EQ}_1)^2 \Delta V(EUV)$
Change in EQ variance	$\Delta V(EQ)$	$(\overline{EUV}_1)^2 \Delta V(EQ)$
Interaction between changes in mean EUV and mean EQ	$\Delta \overline{EUV} \cdot \Delta \overline{EQ}$	$2 \Delta \overline{EUV} \Delta \overline{EQ} \text{Cov}(EUV_1, EQ_1)$
Change in export quantity – unit value covariance	$\Delta \text{Cov}(EUV, EQ)$	$[2\overline{EQ}_1 \overline{EUV}_1 - 2 \text{Cov}(EUV_1, EQ_1)] \Delta \text{Cov}(EUV, EQ) - [\Delta \text{Cov}(EUV, EQ)]^2$
Interaction between changes in mean EQ and EUV variance	$\Delta \overline{EQ} \Delta V(EUV)$	$[2\overline{EQ} \Delta \overline{EQ} - (\Delta \overline{EQ})^2] \Delta V(EUV)$
Interaction between changes in mean EUV and EQ variance	$\Delta \overline{EUV} \Delta V(EQ)$	$[2\overline{EUV} \Delta \overline{EUV} - (\Delta \overline{EUV})^2] \Delta V(EQ)$
Interaction between changes in mean EQ and EUV and changes in EQ – EUV covariance	$\Delta \overline{EUV} \cdot \Delta \overline{EQ} \cdot \Delta \text{COV}(EUV, EQ)$	$[2\overline{EUV}_1 \Delta \overline{EQ} + 2(\overline{EQ}_1 \Delta \overline{EUV} + 2\Delta \overline{EQ} \Delta \overline{EUV}) \Delta \text{COV}(EUV, EQ)$
Change in Residual	ΔR	$\Delta V(EQ, EUV) - \text{Sum of the other components}$

It could be identified from Table VI, that there were ten sources of change in export value variance. Four of these – changes in mean export unit value, changes in mean export quantity, interaction between changes in mean export quantity and mean export unit value and changes in export quantity – unit value covariance, parallel the sources of change in average export value in the Table V. But changes in the export value variance also occurred through changes in the variances of export quantity and unit value and from changes in interaction terms between all these components.

Structural Change in Share of Exports:

This is an effort to understand the dynamics of changes in composition of South Indian tea exports to various destinations. The Markov chain analysis not only helps to know the trend in sustaining existing market over the past years but also to know the shift in shares from one country to another over a period of time. Therefore, an attempt was made to study the dynamics of changes in export of South Indian tea by estimating the probability of retention / losing markets by developing a suitable one step Markov chain model, to project future export share of different importing countries in South Indian tea exports and the total tea exports from South India.

The structural change in the share of exports of tea could be analysed through a first order Markov model (Dent, 1967). The model was a stochastic process which described the finite number of possible outcomes S_i ($i = 1, 2, \dots, R$), which was a discrete random variable X_t ($t = 1, 2, \dots, T$) and which assumed that (a) the probability of an outcome on the t^{th} trial depended only on the outcome of the preceding trial, and (b) this probability was constant for all time periods (Lee *et al.*, 1970).

In the current study, the average export to a particular country was considered to be a random variable where the exports to the particular country in period 't' depended

only on its previous year exports to that country and following a first order Markov model, it could be denoted as:

$$E_{jt} = \sum_{i=1}^r E_{it-1} P_{ij} + e_{jt}$$

where,

E_{jt} = exports from South India during the year 't' to j^{th} country,

E_{it-1} = exports to 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} = error term which is statistically independent of E_{it-1} and

r = the number of importing countries.

The transitional probabilities P_{ij} which could be arranged in a $(c \times r)$ matrix had the following properties,

$$0 \leq P_{ij} \leq 1$$

$$\sum_{i=1}^r P_{ij} = 1, \text{ for all } i$$

Thus, the expected share of each country during period 't' can be obtained by multiplying the exports of these countries in the previous period (t-1) with the transitional probability matrix. Similarly, the future export shares of each of the importing countries can also be estimated.

The transitional probability matrix was estimated in the linear programming framework by a method referred to as minimisation of Mean Absolute Deviation. The formulation of Linear Programming which could be solved to estimate the transition probabilities (for each i) $P_{ij}, j=1, 2, \dots, r$ which minimised,

$$Z = \sum_{j=1}^r O.P_{ij} + \sum_{K=1}^T \theta_K + \sum_{K=1}^T \rho_K$$

Subject to,

$$\sum_{j=1}^r X_{ij} P_{ij} + \theta_K - \rho_K = Y_i$$

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

$$P_{ij} \geq 0, j = 1, 2 \dots r$$

$$\theta_K, \rho_K \geq 0, K = 1, 2, \dots T$$

where,

X_{ij} = share of export from i^{th} country to j^{th} country during year t .

Y_i = export from India to country i during year t .

θ_K, ρ_K = Variables denoting absolute errors

This was repeated for each country to estimate the entire transition probability matrix P . The expected shares of each country in period ' t ' was obtained by multiplying the exports to these countries in previous period ($t-1$) with the transitional probability matrix.

The Market Integration

The market integration concept explains the relationship between the prices in the two markets that are spatially separated. When markets are integrated, it implies that the markets in the system operate in unison, as a single market system.

Traditionally, the concept of market integration had been approached using simple correlation analysis and bivariate models. Lele (1971) and Blyn (1973) used the one to one correlation analysis to test for spatial market integration. But there are a number of limitations to infer anything about the extent of market integration in using simple price correlations and they are unequivocal indicators of market conditions. The basic problem is that the prices in two markets may appear to be moving together

when these two markets are isolated functionally, as a third market or a common factor can affect the prices in the first two markets. Absence of information on causality is the main drawback of correlation techniques. Another drawback is that the dynamic properties of the series are overlooked by the simple correlation analysis. These serious shortcomings of the correlation methods gave way to a number of methodological improvements like the regression models that would analyze the dynamic price adjustment patterns (Heytens, 1986).

Ravallion (1986) proposed a dynamic model of spatial differentials to test market integration. The main advantage of this method was that one could distinguish between the concepts of short-run market integration and a long-run adjustment process. Besides, the hypothesis of market integration could be tested within a more general model as restricted forms. However, this method was also not free from limitations. It was pointed out that there existed a strong presence of collinearity among the explanatory variables, which would result in obtaining biased estimators which are used to test the hypotheses. Tests that are based on biased estimators would naturally be misleading. Further, the conventional methods discussed above have also ignored the major properties of time series variables like non-stationarity, which might have resulted in yielding unreliable results.

In the present study, the concept of co-integration developed by Engle and Granger (1987) has been made use of in testing market integration. Most market commodity prices, whether international or domestic, are basically non-stationary. A stochastic process is said to be stationary, if its mean and variance between any two time periods depend only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed (Gujarati, 1995). If time series data like prices which are non-stationary are used, it usually would yield a high R^2 and t ratios which are biased towards rejecting the null hypothesis of no relationship even when there is no relationship between the variables concerned (Granger and New Bold, 1977).

The underlying principle of co-integration analysis is that, although many economic time series may tend to trend upward or downward over time in a non-stationary fashion, group of variables may drift together. Co-integration tests start with the premise that for a long-run equilibrium relationship to exist between two variables it is necessary that they should have the same inter-temporal characteristics. Thus, the first step involves testing for stationarity of the variables. Economic interest in the theory of testing the unit roots have led to the development of a variety of tests to test for the order of integration and the presence of unit roots in time series data. In econometrics, a time series that has a unit root is known as a random walk, which is an example of a non-stationary time series. If the original series is found to be non-stationary, the first differences of the series are tested for stationarity. Thus, the number of times a series must be differenced, before it becomes stationary is referred to as the 'order of integration' that is; if the series attains stationarity after differencing 'd' times, then it is said to be integrated of the order 'd' represented as I(d).

The most widely used tests for unit roots are the Dickey-Fuller test (DF), and the Augmented Dickey-Fuller test (ADF). Both would test the null hypothesis that the series has a unit root or in other words, it is not stationary. The DF test is applied by running the regression of the following form.

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + U_t$$

where, $\Delta Y_t = (Y_t - Y_{t-1})$; $Y_t = \ln Y_t$

The ADF test is run with the equation,

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \alpha_i \sum_{i=1} \Delta Y_{t-i} + e_t$$

where, $\Delta Y_t = (Y_t - Y_{t-1})$; $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$

The critical values of the 't' statistic of the lagged term have been tabulated by Dickey and Fuller (1979). They have also been considerably extended by Mackinnon (1991) through Monte Carlo simulations. Once it has been established that the order of integration is the same for each variables of interest, the second stage of testing for co-integration can be undertaken. Only those variables of the same order of integration would qualify for the pair-wise co-integrating relationships. The specific linear combinations tested are the residuals from a static 'co-integrating regression' in the levels of variables concerned. The same test statistics are used as in testing for order of integration of individual series. The regression equation would then be as indicated below :

$$Y_t = \beta_1 + \beta_2 X_t + Z_t$$

Where, Y_t and X_t = the two price series and

$$Z_t = \text{random error.}$$

The difference here lies in the critical values compared for the test statistics. The DF test in the present context is known as Engle-Granger (EG) test whose critical values are provided by Engle and Granger (1987). For the CRDW test, the DW 'd' statistic obtained from the co-integrating regression can be used. But here, the null hypothesis is that $d = 0$ rather than $d = 2$. A significant CRDW 'd' would indicate the presence of co-integration between the concerned variables (Sargan and Bhargava, 1983).

Now, if two time series are co-integrated, then it could be said that there is long run equilibrium between the two series. But there can be disequilibriums in the short run. The Granger Representation Theorem states that if two variables are co-integrated, then there exists an error correction representation of the variables, where the error tends to correct in the long-run. The error correction model is of the following dynamic form :

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 Z_{t-1} + \varepsilon_t$$

The speed at which the prices tend to approach the equilibrium in each period (month) depends on the magnitude of α_2 whose expected sign is negative. This negative sign would confirm that the error corrects in the long-run.

Analysis of Time Series Data – Tea Prices

Changes in prices were associated with passage of time, and price changes were the net result of various forces acting in different directions. Understanding the nature and causes of price movements was facilitated by a systemic analysis of the time element in prices. A time series was a set of observations taken at specified times usually at equal intervals (Acharya and Agarwal, 1994). In the present study, annual tea prices were considered for analysis.

To understand and analyse the nature and behaviour of annual tea prices, annual tea price data for CTC categories of tea at Coonoor auction, as this auction transacted more than 50 per cent of CTC Tea in South India for the period 1975 to 2000, were used for analysis. The annual price data were first deflated using the index number of wholesale prices of all commodities of Tamil Nadu in order to remove the inflation effect. The deflated price data were detrended to remove the trend effect. Then the detrended price data were made use of to understand the cyclical variations. The cyclical variations would refer to swings around a trend line. Regularly occurring upswings and downswings or oscillations in prices were reckoned as cyclical variations in prices. In addition, harmonic analysis was attempted to observe the cyclical variations in tea prices.

Harmonic Model: The harmonic model was applied to the annual price data in order to detect the presence of any long term cycles in the tea prices.

In order to test the length of the cycle, Fourier coefficients need to be computed. Given a time series $X_1, X_2, X_3, \dots, X_n$ with a period of length T , the deviations of the actual value from the trend value could be represented as

$$Y_t = 1/2A_0 + \sum_{j=1} (A_j \cos(360j/T) + B_j \sin(360j/T))$$

where Y_t = the price series;

T = time,

A_0 , A_j and B_j = constants given by,

$$A_0 = \sum_{t=1}^N X_t / N$$

$$A_j = 2(\sum_{t=1} X_t \cos(360j/T)) / N$$

$$B_j = 2(\sum_{t=1} X_t \sin(360j/T)) / N$$

In practice, it was found more convenient to group the data as shown below for investigating a given period P , where mp was equal to N or the nearest integer below N .

X_1	X_2	.....	X_p
X_{p+1}	X_{p+2}	.....	X_{2p}
$X_{(m-1)(p+1)}$	$X_{(m-1)(p+2)}$	.....	X_{mp}
Sums U_1	U_2	.....	U_p

If a term of period P was present in the series, the column total (U_p) would indicate the periodic effects, but if the remaining element was random, the effect of summing 'm' rows would be to reduce the relative contribution of that element to the column totals.

Similarly, if there are other elements with different periods, they will be out of phase in successive rows and tended to cancel out in the totals. Hence, if there were

enough rows, the total (U_p) would reveal the periodic effects and would reduce marking effects, if any, resulting from random components or oscillatory components of different periods, which would prevent discernment of the periodic effect in the primary series. The Fourier coefficients A_p and B_p were computed from the formulae.

$$A_p = (2 \sum_{j=1}^{mp} (U_p \cos(360j/p))) / mp$$

$$B_p = (2 \sum_{j=1}^{mp} (U_p \sin(360j/p))) / mp$$

The squares of the amplitude R_p^2 was obtained by adding Fourier coefficients A_p^2 and B_p^2 . Hidden periodicities were found out by periodogram analysis. The Fourier analysis helped to compute the square of amplitude for each specified period by assuming several periods. The significance of the amplitudes were tested by periodogram. The procedure for testing involves first to compute the square of the amplitude (R_p^2). If no periodic fluctuations were observed, then mean square amplitude for a random series without periodic fluctuations would be arrived at by,

$$R_m^2 = \sigma^2 / N \dots \dots \dots \text{Length of the cycle.}$$

Then the indicator of the cycle, k was calculated as follows,

$$K = R_p^2 / R_m^2$$

Price Forecasting Using Box Jenkin's Mixed Autoregressive Moving Average model

A mixed autoregressive moving average (ARMA) model is a way of describing how a time series variable is related to its own past value and it is used to produce the best forecasts for a single time series.

Standard ARMA analysis rests on the assumption that the process that generated the time series is stationary. Thus, the time series data are first tested for stationarity.

The series is stationary when the sample auto correlation coefficients drops off to zero as k , the number of lags become large. Even if the series is not stationary, it can be converted into stationary series by differencing the series. Then the mixed ARMA model could be constructed based on Box-Jenkin's (1970) method. Before employing the model, the series is tested for white noise. If the time series is white noise, that is, the autocorrelation function for K lag displacement is zero for all $K > 0$, there is no value in using a model to forecast the series. It follows a random walk process and only AR1 order is suited to forecast the series as the error variance increases along with the forecast period. To test the joint hypothesis that all autocorrelation coefficients are zero, Q statistics introduced by Box and Pierce will be used.

$Q = n \sum_{k=1}^K \rho_k^2$ is distributed as chi-square with k -degrees of freedom. If calculated Q is greater than critical level then we can be 90 per cent sure that the these autocorrelation coefficients are not all zero and a forecasting model can be fitted to the series. Box and Jenkin's ARMA involves three important phases namely, identification, estimation and diagnostic checking, and forecasting the future value.

Identification: By observing the autocorrelation and partial autocorrelation coefficients of the series an ARMA model of order p and q could be fixed tentatively as it is a trial and error process. It requires human judgement and does not always result in correct identification of single model due to (1) the autos and partials may not clearly indicate a specific model and (2) they may indicate more than one model. ARMA (p, q) model is:

$$(1 - \phi_1 B - \dots - \phi_p B^p) Y_t = (1 - \theta_1 B - \dots - \theta_q B^q) \epsilon_t$$

where $\phi_i =$ AR parameters (1, 2, ... p), $\theta_i =$ MA parameters (1, 2 ... q) and B is the backward shift operator and it imposes a one period time lag each time it is applied to the variable.

Estimation and Checking : The ARMA (p, q) model is estimated using OLS or maximum likelihood method. The residuals of the model must be white noise (uncorrelated) if the initial specification of the model is correct. It can be tested using Q statistics with k-p-q degrees of freedom. The stationarity of the series must be satisfied based on the condition that all the autoregressive parameters must be less than one.

$$\phi_1 + \phi_2 + \dots + \phi_p < 1$$

As in the case of regression model, the parameter values that will minimise the sum of squared errors must be chosen.

Forecasting: Once the identified model satisfies the diagnostic checking it can be used for forecasting the future periods. The optimum forecast would be the forecast of future values which has the minimum mean square forecast error.

One period forecast of the series would be,

$$Y_{T+1} = \phi_1 y_T + \dots + \phi_p y_{T-p+1} + \varepsilon_{T+1} - \theta_1 \varepsilon_T - \dots - \theta_p \varepsilon_{T-q+1} + \delta$$

From this two period, three period and so on, until 'λ' period forecasts can be produced.

$$\hat{y}_T(\lambda) = \phi_1 \hat{y}_T(\lambda-1) + \dots + \phi_p \hat{y}_T(\lambda-p)$$

where the moving average parameters are not included if forecasting period 'λ' exceeds the order p and q of the ARMA model, since they have the memory of one period only.

Export Competitiveness of Tea

Efforts have been on since several decades to arrive at a standard measure for export competitiveness. Conventionally price has been considered to be an important indicator of competitiveness. Price is a direct reflection of consumer appreciation of quality and hence an indirect indicator of the relative efficiency of the production process. Hence, as long as the international price is higher than the domestic price, firms found it advantageous to export the produce. Hence, a price based measure such as

Nominal Protection Coefficient (NPC) which is estimated as a ratio of international reference price to domestic market price adjusted for transfer costs, has been accepted as a standard measure of export competitiveness. Although accepted as a standard measure of competitiveness, NPC suffers the criticism, that, it is a static measure and is highly dependent on the exchange rate. Further, the fact that the measure does not take into account the sacrifices and the opportunity costs of inputs foregone in retaining the inputs at the present use has often been pointed out to be a major limitation of this measure.

The realisation of this limitation has led to the identification of Domestic Resource Cost (DRC) measure. It is an adaptation of project evaluation methodology for country-wide policy evaluation. DRC estimates the value of domestic resources that are needed to save or earn a rupee worth of foreign exchange by producing the relevant commodity as an import substitute or as an exportable one. According to Bruno (1972), the originator of the DRC, the cost of foreign exchange criterion clearly measured the comparative advantage. The measure used shadow prices for evaluating inputs, thus accounts for the opportunity costs foregone in retaining an input at its present use.

Nominal Protection Coefficient was helpful to determine the extent to which the domestic prices have deviated for the commodity from the international prices. This would shed light on whether a country has comparative advantage in the production of the commodity in a free trade scenario. The NPC of tea is defined as the ratio of the domestic price of tea to the comparable world reference price of tea. Formally;

$$\text{NPC} = D_p / R_p$$

Where,

NPC = Nominal protection coefficient

D_p = Domestic price of tea

R_p = World Reference price of the tea that is, what the farmer would receive in free trade.

NPC of tea was calculated under two alternative hypotheses namely (a) when foreign tea was a substitute for domestic tea and the two were expected to compete within the country (Importable hypothesis) and (b) when domestic tea was an exportable commodity and competed with foreign tea in some foreign country (Exportable hypothesis).

The domestic price was the auction price of tea prevailing in selected market of the country. The reference price was the international auction price adjusted for transfer costs, marketing and trading margins including any processing to make the domestic commodity equivalent to the internationally traded commodity.

The Domestic Resource Cost was traditionally used for measuring comparative advantage, conceptually

$$\text{DRC} = \frac{\text{Value added domestically in terms of opportunity cost or scarcity price or shadow price}}{\text{Value added in border price}}$$

To construct DRC, the cost of cultivation data from Krishi Vigyan Kendra Training Centre, UPASI, Coonoor was used which included both tradable and non-tradable inputs. Since the non-traded goods can be treated as inputs with zero tariffs and also could be subtracted from the final good's value, Apple Yard (1987) suggested 'Corden' method where inputs are multiplied by the ratio of border prices to domestic prices. Thus the numerator consisted domestic value added to the economy under distortions, in the denominator, the measure was of the value added to the economy in border prices.

The multiplication of ratio of border price to domestic price of the output brings the tradable inputs in terms of border price per unit of output. In the present study the Coonoor auction market price was used for domestic price in the estimation and the London auction price was used as border price.

These coefficients are estimated under two scenarios namely importable scenario and exportable scenario. Under importable scenario, the competition is deemed to take place at the domestic port and therefore international and domestic transportation costs accorded a natural protection to the domestic commodity.

The international reference price in case of importable hypothesis was calculated as given in Table VII.

TABLE VII.
INTERNATIONAL REFERENCE PRICE
(IMPORTABLE HYPOTHESIS)

Sl.No.	Particulars	
1.	FOB (free on Board) price at outside port	US \$/qtl
2.	Insurance	US \$/qtl 1% FOB
3.	Freight charges upto domestic port	US \$/qtl
4.	Exchange Rate	1 \$/Rs
5.	CIF (Cost Insurance Freight) price at port	Rs./qtl (1+2+3) x 4
6.	Port clearance charges	Rs./qtl
7.	Landed cost at domestic port	Rs./qtl (5+6)
8.	Transportation cost upto local market	Rs/qtl
9.	Marketing margin	Rs./qtl 5% of domestic price
10.	Reference price	7+8+9

Under exportable scenario, the competition was assumed to take place at foreign port and therefore domestic commodity had to be extra efficient to the tune of international transportation costs at least. These two hypotheses therefore yielded different estimates of protection. Under exportable hypothesis, the pre-assumption was that Indian tea would compete with foreign market tea. Therefore, Indian tea price must be low enough to make it competitively in the foreign market. The reference price in case of exportable hypothesis was calculated as given in Table VIII.

TABLE VIII.
INTERNATIONAL REFERENCE PRICE
(EXPORTABLE HYPOTHESIS)

Sl.No.	Particulars	
1.	FOB price at outside market	US \$/qtl
2.	Exchange Rate	1 \$ = Rs.
3.	FOB price at domestic port	Rs./qtl 1 x 2
4.	Domestic reference price	Rs./qtl. (9+8+7+6+5)
5.	Freight charges to outside port	Rs./qtl.
6.	Port clearance charges	Rs./qtl.
7.	Transport cost (local market to port)	Rs./qtl.
8.	Marketing margin	Rs./qtl. 5% of domestic price
9.	Auction market price	Rs./qtl.

The international price of tea published by Tea Statistics was collected. The freight charges, transportation charges and port clearing charges were collected from the tea exporters.

The interpretations of the coefficient were as follows:

NPC < 1 the commodity is an efficient import substitute under importable hypothesis and it is an efficient exportable commodity under exportable hypothesis.

NPC > 1 the commodity is an inefficient import substitute and inefficient exportable commodity.

DRC < 1 comparative advantage of production exists, the commodity has high resource use efficiency and is an import substitute or an exportable one.

DRC > 1 comparative disadvantage exists with low resource use efficiency and the commodity is neither an efficient import substitute nor an exportable one.

Game Theory Model

The mathematical analysis of game theory problems is fundamentally based on the minimax (maximin) criterion. This criterion implies the assumption of rationality from which it is argued that each player will act as to maximize the minimum gain or minimise his maximum loss. The theory of games is defined as the activity between two or more persons involving activities by each person according to set of rules, at the end of which, each person receives some benefit or satisfaction or suffers some loss.

Mathematically, a 'n' person game with activities P_1, P_2, \dots, P_n , whose respective pay-offs at the end of a play game are V_1, V_2, \dots, V_n , then the game will be called zero-sum if;

$$\sum V_i = 0 \text{ at each play of the game.}$$

In a two person zero sum game, if the player A has m activities and the player B has 'n' activities, the pay off matrix will be formulated such that, the game will have an optimal solution at the point where the maximin point of one player is equal to the minimax value of the other player. The game is said to have a saddle point and the corresponding strategies form the optimal strategies for both the players.

$$\text{Max}_j \text{ Min}_j \sum_{i=1}^m V_{ij} \text{ min}_j \text{ max}_i$$

In case where, saddle point doesn't exist, then each player tries to choose a mixed strategy to maximize his minimum gain. This can be solved using the linear programming framework.

$$\text{Max } x_i \text{ min } \sum_{i=1}^m V_{i1} x_i, \sum_{i=1}^m V_{i2} x_i, \dots, \sum_{i=1}^m V_{ij} x_i$$

Subject to the constraints

$$\text{Min } \left[\sum_{i=1}^m V_{i1} x_i, \sum_{i=1}^m V_{i2} x_i, \dots, \sum_{i=1}^m V_{ij} x_i \right] = V$$

Where V = value of the game

$$\sum x_i = 1$$

each $x_i \geq 0$

Garrett's Ranking Technique

In order to rank the constraints faced by the tea exporters, the Garrett's ranking technique (Hendry and Worth, 1969) was employed. The order of merit assigned by the respondents was converted to ranks by using the following formula.

$$\text{Per cent position} = \frac{100(R_j - 0.5)}{N_j}$$

Where,

R_{ij} = rank given to i^{th} factor by the j^{th} individual.

N_j = number of factors ranked by j^{th} individual

By referring to the Garrett table, the per cent positions estimated were converted into scores and then for each factor, the scores of various respondents were added and the mean value calculated. These mean values were arranged in the descending order. The constraint possessing the highest mean value was considered to be the most important.

A PROFILE OF TEA INDUSTRY IN INDIA

CHAPTER IV

A PROFILE OF TEA INDUSTRY IN INDIA

To begin with it is perhaps desirable to define 'Tea'. As per the provision of Tea Act, 1953 'Tea' means the plant *Camellia sinensis* (L) O. Kuntze as well as all varieties of the product known commercially as tea made from the leaves of this plant including green tea" (Dwivedi, 1999). As per the specification of the Prevention of Food Adulteration Act, 1954 (PFA Act), "Tea means, tea other than Kangra tea derived exclusively (from the leaves, buds and tender stems of plants) of the *Camellia* genus and the species (and includes leaf, broken, fannings and dust)" (Ramamoorthy *et al.*, 1997). The natural home of the tea plant is considered to be the parts of India and China. The wild tea plant can grow upto 30 metres. The cultivated tea is kept at about one metre tall for easy plucking. Eventually, from the main centres of its prime distribution in South East Asia, tea is dispersed either naturally or by human agencies into tropical and sub-tropical regions. Tea is currently grown in more than fifty countries around the world. It is cultivated in regions with an annual precipitation from 1150 mm to 8000 mm, ambient temperatures between - 8°C and 35°C and a day length of 9.4 to 15.0 hours and from sea level to 2300 m in a wide range of soil types that are acidic in reaction.

History of Tea in India

The saga of commercial development of tea in India is both awe inspiring and fascinating. The search for tea in Assam was started by the East India company as an alternate source of supply to the United Kingdom which till then was mainly dependent on China. The discovery of tea plants in upper Assam by Major Robert Bruce virtually laid the foundation of the tea industry in India. With the emphasis on indigenous tea in Assam, the first commercial effort in organised tea growing was started by the Assam Tea company in 1839. By the middle of the nineteenth century, corporate tea companies

were organised to operate in Assam and elsewhere. By 1856, major production centres began in Darjeeling and Cachar, in the Terai in 1862 and in the Dooars in 1874. In South India, Dr. Christi was the first to experiment with the cultivation of tea in Nilgiris in 1832. This was followed by rapid growth in Travancore, Wynaad and the Anamalai. From the modest beginning in 1839, tea today has come to occupy a leading role in the economic life of India (Banerjee, 1996).

Growth of Tea in Other Countries

The idea of planting tea originally mooted for India gradually found its way to other parts of Asia and Africa, though in Indonesia tea cultivation was a little older than in India. Planting in Sri Lanka began in 1880 and in the following 15 years vigorous expansion was met with and by the first world war, most of the corporate sector became established. In Indonesia, more precisely in Java, tea was started in 1824, using seeds from China, though commercial planting using Assam plants was taken up from 1878. Japan and Taiwan were also major producing countries with China emerging as an important producer in the world tea trade. Although tea existed as a local plantation in Durban in South Africa, the foundation of commercial plantation of tea in Africa was laid in Malawi during 1878. At the turn of the century, tea was being planted in Kenya, Uganda and Tanzania though commercial exploitation in these countries started only during 1920 to 1930. Tea is also being produced in varying quantities in countries like Burma, Thailand, Mauritius, Congo, St. Helena, Cameron, Peru, Paraguay, Colombia, Bolivia, Mexico, Australia and Corsica for domestic consumption (Banerjee, 1996).

Tea which is available in the market is in fact 'Made tea'. Green leaves plucked from the tea bushes are manufactured into 'Made tea' or 'tea' in the tea factories through a series of manufacturing processes. Green leaves in the process of manufacturing 'Made tea' also generates by-product known as 'tea waste'. Infact, tea waste is unfit for human

consumption and has three uses namely, (i) manufacture of caffeine (ii) manufacture of instant tea and (iii) use as manure in the tea field. In order to prevent tea from any possible adulteration, the PFA Act, 1954 has come into existence (Ramamoorthy *et al.*, 1997). Tea, therefore shall conform to the following specifications (Table IX) as indicated in the PFA Act.

TABLE IX.
SPECIFICATION OF TEA UNDER PFA ACT

Particulars	Percentage content
Total ash determined on tea dried to a constant weight at 100°C	4.0 to 8.0 per cent by weight
Total ash soluble in boiling distilled water	not less than 40.0 per cent of total ash
Ash soluble in HCL	not more than 1.0 per cent by weight on dry basis
Extract obtained boiling dried tea (dried to constant weight at 100°C) with 100 part of distilled water for one hour under reflux	not less than 32 per cent
Alkalinity of soluble ash	not less than 1.0 per cent and not more than 2.2 per cent expressed as K ₂ O on dry basis
Crude fibre determined on tea dried to constant weight at 100°C	not more than 17.0 per cent

Tea Types

'Made tea' or tea manufactured from green tea leaves is generally classified into two types namely, black tea and green tea. Latter is different from former, since fermentation of green leaves is arrested in manufacturing green tea. Again, there are two manufacturing processes namely, black tea, orthodox tea manufactured with the help of orthodox roller in the process of rolling (traditional method) and CTC tea, where the rotervan is used in rolling process of manufacturing to crush, tear and curl the green leaf. CTC stands for crushing, tearing and curling.

Apart from orthodox, CTC and green tea, powder tea which is known as instant tea is also being manufactured in India and in few other tea producing countries of the world like Kenya and Sri Lanka. The procedure for manufacturing instant tea is different from that of black tea or green tea. The raw materials used for manufacturing instant tea are green tea leaves and or tea waste. The manufacture of instant tea in India has started since 1960.

The black tea is further processed with the help of tea bagging machine to manufacture 'tea bags'. This is one of the 'convenience tea' generally preferred by the consumers of the western countries. Filter paper is being used as packaging material for manufacture of tea bags. Instant tea and tea bags are generally known as convenience tea, because they are convenient for consumers to get the liquor with less hazards. Moreover, in order to preserve the quality of tea during its different stages of trading activities particularly in retail trading and also to maintain the uniformity of the quality to the extent possible, black tea or green tea are packeted either in original form or in blended form in small consumer packs (Dwibedi, 1999). These are known as packet tea. India is earning considerable foreign exchange through the exports of value-added tea (Table X).

Quality of 'Made Tea' or 'Tea'

The term quality in its broadest sense is used as a description of all the characters of tea by which it is judged on its market value. So, quality means the summation of the desirable attributes comprising internal and external characters like aroma / flavour, strength, colour, briskness and character of infused leaf. The characteristics of tea is determined by the major components of the leaf that is polyphenols, the peptic substances, the flavouring constituents and caffeine. The caffeine is known for its stimulating effect. The green tea leaves of the plant has its natural 'aroma' and efforts of the tea manufacturer is generally aimed at to maintain the natural aroma in the 'made tea' as far as possible.

TABLE X.
EXPORT OF VALUE ADDED TEA FROM INDIA (1985-1999)

Year	(Quantity in 000' kgs and value in 000' Rs.)									
	Packet tea		Tea bags		Instant tea		Total value-added tea			
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
1985	28886	1166219	588	37533	916	82908	30390	1286660		
1986	15661	551173	453	30302	1143	91621	17257	673096		
1987	19853	717003	497	32574	862	73108	21212	822685		
1988	23976	802283	648	44701	791	63637	25415	910621		
1989	64022	2855770	504	41568	1040	88857	65566	2986165		
1990	71139	3836831	564	53194	940	92003	72643	3982028		
1991	79148	4497351	419	56034	1198	142397	80765	4695782		
1992	56023	3344462	596	82848	1604	235905	58223	3663215		
1993	74294	5159617	943	100410	1592	287365	76829	5547392		
1994	49642	3549229	1026	137278	1374	239035	52042	3925542		
1995	81699	5725354	723	108031	853	172079	83275	6005464		
1996	78957	5667687	1394	193369	1692	397741	82043	6258797		
1997	89419	7894609	2131	421367	2282	529309	93832	8845286		
1998	81423	9008461	2066	433523	2699	711273	86188	10153257		
1999	73748	7601542	2871	655848	2627	634316	79246	8891706		

Source : Tea Digest - 1999, published by Tea Board, Kolkata.

The quality of tea depends primarily on the nature and chemical composition of the plucked leaf which is again dependent on the type of bush, the growing conditions and the kind of plucked leaf, like coarseness and fineness etc. Only careful and proper processing can bring out the full potential of the green leaf. Each of the characteristics on which tea is assessed by trade is influenced by one or more factor involved both in the field and in the factory. Since a variety of factors plays a role, and the production of a particular character is usually obtained at the expense of another, pre-processing and processing conditions is generally adjusted so as to bring about the most desirable characteristics in a tea made from a given material. The factors affecting tea quality apart from those involved in processing can be distinguished into three groups namely, genetic, environmental and cultural.

The tea quality is primarily determined by the genetic properties of the tea plant and those of the tea bush in particular. Both soil and climate are influencing the quality of tea. Temperature, humidity, duration of sunshine and rainfall are important in determining quality. Field operations like pruning, fertilizing, shading, plucking round and plucking standard plays an important role in determining the quality of tea (Dwibedi, 1999).

Tea Processing

Generally, two to three leaves and a bud (85 per cent) is recommended as raw material for tea manufacture, because most of the chemicals which contribute to quality are present only in the tender leaves. If coarse and banji leaves are included, it leads to poor quality of 'made tea'. In the tea manufacturing process, green tea leaves are first subjected to withering, an operation where the concentration of chemicals in the leaf are increased contributing to better quality, in addition to moisture removal. Then, rolling is done to crush, tear and curl the leaf into small size and to form a thin film of juice. It is then coated on the surface of the leaf particle to enhance the chemical changes for CTC

tea. For orthodox tea, the tea leaves are twisted and rolled to produce a stylish product which contains a high percentage of leaf. This tea produces lesser cups with high aroma, lighter colour and thin liquor, while CTC tea produces more number of cups with poor aroma, stronger colour and taste. The description and characteristics of CTC tea is given in Appendix 1. Fermentation is done to bring about the chemical changes necessary to make tea liquor palatable. It is in fact, an oxidation process by which the rolled leaf loses its green colour and acquires coppery colour. Then, drying is done to arrest fermentation, to remove moisture and to produce tea with good keeping qualities (Ramamoorthy *et al.*, 1997). The various processing stages of tea are shown in Fig. 1, below :

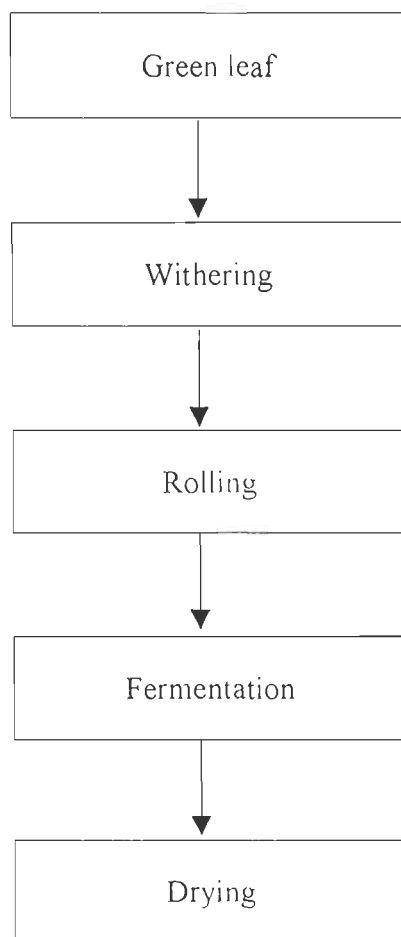


Fig. 1 Processing Stages in Tea

Tea processing is done in the bought leaf factories and co-operative factories in India. Of late, there are 31 co-operative factories for tea manufacturing in India spread over the various tea producing areas (Table XI). The bought leaf factories dominate the production of 'made tea' and especially in Tamil Nadu due to the preponderance of small growers, the bought leaf factories existed in large number (146) and there are 214 bought leaf factories in India.

TABLE XI.
CO-OPERATIVE AND BOUGHT LEAF FACTORIES IN INDIA

(Production in million kg)

State / Districts	Co-op/ bought Leaf factory	1997		1998		1999	
		Number	Production	Number	Production	Number	Production
Tripura	Co-op	9	0.56	9	0.60	9	0.58
Himachal Pradesh	Co-op	4	0.78	4	0.95	4	0.71
Tamil Nadu	Co-op	16	16.02	17	14.16	17	13.52
Nilgiris	Bought leaf factory	140	48.48	140	45.50	146	47.00
Kerala	Co-op	1	0.14	1	0.20	1	0.28
Idukki	Bought leaf factory	8	1.25	9	1.26	9	1.25
Kottayam	Bought leaf factory	3	0.02	3	0.02	3	0.02
West Bengal							
Dooars	Bought leaf factory	5	1.00	8	1.27	11	1.95
Terai	Bought leaf factory	9	0.83	13	4.77	16	9.92
Assam							
Assam valley	Bought leaf factory	18	3.26	20	8.50	29	9.5
Total	Co-op	30	17.50	31	15.91	31	15.09
	Bought leaf factory	183	54.84	193	61.32	214	69.64

Source : Tea Digest - 1999, published by Teaboard, Kolkata.

The green leaf harvested from the field are processed in the bought leaf and co-operative tea factories. The price of green leaf is fixed based on the price realisation for the 'made tea' in auction. The factories producing better quality tea expectedly get a higher profit margin. The cost of production for different categories - high, medium and low has been given in Table XII, below :

TABLE XII.
PROCESSING COST OF 'TEA' IN SMALL SECTOR

Sl.No.	Particulars	Per cent distribution of the cost
1.	Cost of raw material (green leaf)	70.0
2.	Labour charge	7.5
3.	Fuel & electricity	13.38
4.	Packing material	2.0
5.	Warehouse charges	0.5
6.	Cess	0.8
7.	Maintenance charges	1.0
8.	Marketing charges	1.25
9.	Miscellaneous	1.13
	Total processing cost	100.00

Source : UPASI, Krishi Vigyan Kendra, Coonoor.

The co-operative factories were set up based on the recommendation of the Plantation Enquiry Committee, 1956, and the Agriculture Refinance Corporation (Ramamoorthy *et al.*, 1999).

Tea Marketing

The tea planters have the following options to dispose of the output :

- i. Sales through auctions
- ii. Sales as direct-export by the producer to the importer of importing countries.
- iii. Ex-factory sales

Public auctions have been the most popular channel of marketing for more than 165 years. Direct export by the producer is only minimal, while ex-factory sales is gaining momentum during recent years (vide Table XIII). The system of marketing of Indian tea is best explained by the flow chart in Fig. 2.

Guwahati, Kolkata and Siliguri are the most important auction centres in North India and they account for about 43 per cent of total sales in North India. Amritsar auction centre is of minimal importance and handles less than one per cent of the total sales. Ex-factory sales and direct exports by producer account for about 41 and 6 per cent respectively. In South India Coonoor and Cochin auction markets are the most important ones and about 70 per cent sales has occurred in these two auction markets. Coimbatore auction market is of less important, handling only 10 per cent of the South Indian sales. Ex-factory and direct exports account for 16 and 4 per cent of total sales.

Auctions are organised under the auspices of Tea Trade Associations formed at each centre which has its members; the Sellers (producers), Brokers (auctioners) and Buyers (traders). There are elaborate rules for conducting the auctions. Tea prices have shown a fluctuating trend with more years of depression than prosperity as can be seen from the Table XIV.

TABLE XIII.
PRIMARY MARKETING OF INDIAN TEA (1999)

Mode of sale	Quantity in '000 kg	Per cent to total sales
North India		
Kolkata Auction	87801	14.53
Guwahati Auction	145068	24.01
Siliguri Auction	86793	14.36
Amritisar Auction	556	0.09
Total Auction	320218	52.99
Direct Export	39000	6.45
Ex-factory sale	245083	40.56
Total sale	604301	100.00
South India		
Cochin Auction	59574	30.61
Coonoor Auction	79285	40.74
Coimbatore Auction	20262	10.41
Kolkata Auction	1172	0.06
Total Auction	160492	82.46
Direct Export	8000	4.11
Ex-factory sale	26136	13.43
Total sale	194628	100.00
All India		
Auction sale	480710	60.17
Direct Export	47000	5.88
Ex-factory sale	271219	33.95
Total sale	798929	100.00

Source : Tea Digest (1999), published by Tea Board, Kolkata.

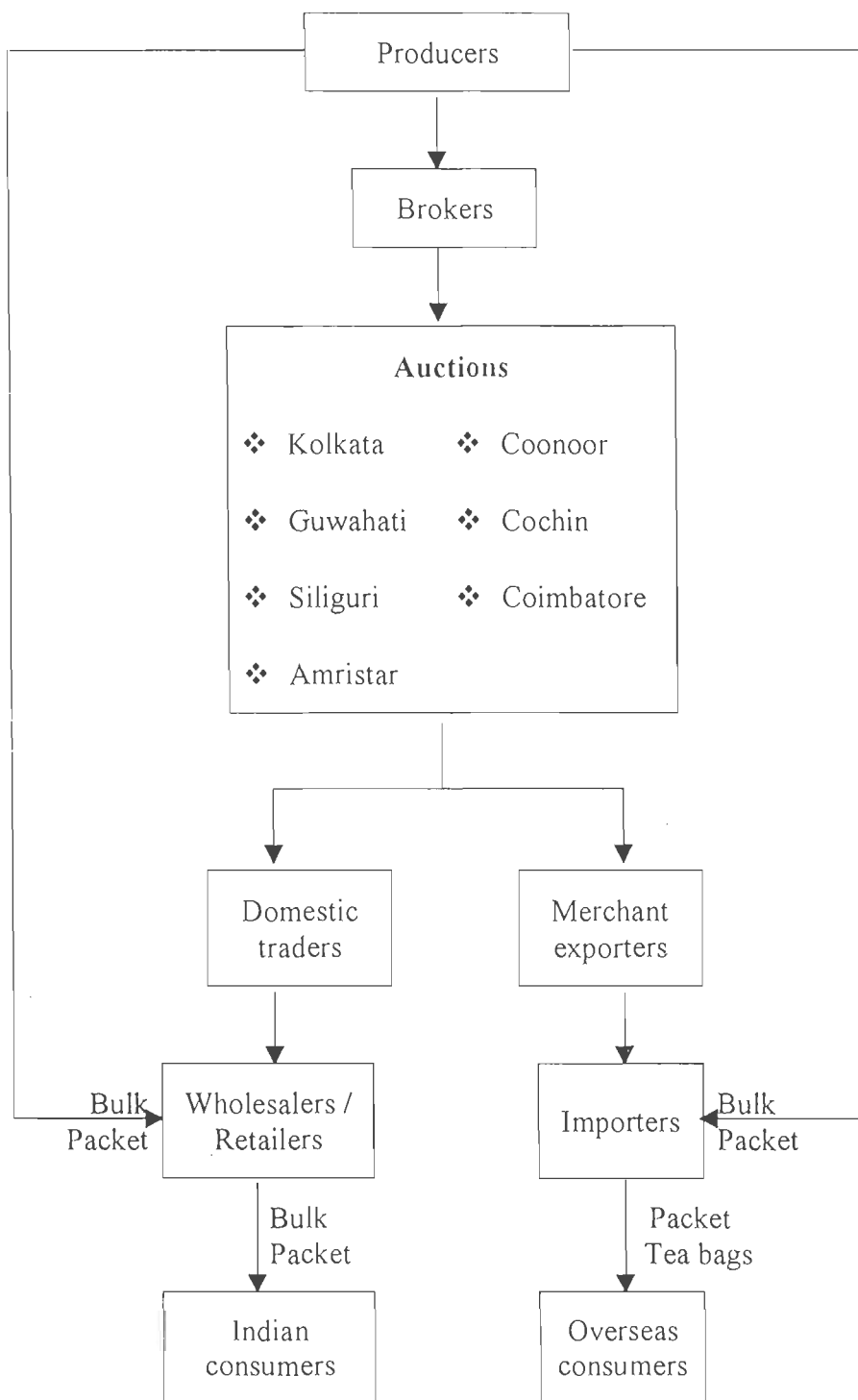


Fig. 2. Marketing of Indian Tea

TABLE XIV.
AVERAGE AUCTION PRICE

(Rs. / kg)

Year	North India	South India	South Vs. North	
			Rs./kg (lower by)	percentage
1980	14.02	12.66	1.36	9.7
1981	14.30	12.82	1.48	10.3
1982	15.66	15.39	0.27	1.7
1983	24.26	22.88	1.38	5.7
1984	29.18	26.97	2.21	7.6
1985	23.93	21.44	2.49	10.4
1986	24.86	19.22	5.64	22.7
1987	26.07	22.08	3.98	15.3
1988	25.69	20.42	5.27	20.5
1989	37.63	33.31	4.32	11.5
1990	44.79	38.62	6.18	13.8
1991	42.88	33.07	9.81	22.9
1992	40.60	33.09	7.51	18.5
1993	51.04	42.69	8.35	16.4
1994	43.88	31.38	12.90	28.5
1995	50.92	41.25	9.67	19.0
1996	51.82	41.42	10.40	20.1
1997	70.69	59.31	11.38	16.1
1998	80.22	68.78	11.44	14.3
1999	80.60	57.22	23.38	29.0

Source : Tea Statistics, various issues published by Tea Board, Kolkata.

Government Controls

Under the Tea Act, 1953, the Union Government taken under its control the development of tea industry. The Tea Board was formed under the Act for executing the functions envisaged. Chairman and 30 other members representing producers, labour, traders, consumers state governments and parliament, constituted the Board.

Under the Tea Act,

- i. no one can plant tea on an area earlier not planted with tea without prior permission of the Tea Board.
- ii. although there is no provision under the Tea Act requiring registration of tea estate owner with the Tea Board, it is advisable to register as and when there is change in ownership, since the benefit of Board's development schemes are available only for the registered owners.
- iii. the central government has got the power under the Act to take over the management of sick tea plantations.

Tea (Distribution and Export) Control Order, 1957

The order requires every exporter of tea to obtain a licence from the Tea Board which should be renewed once in three years. However, established exporters can obtain a permanent licence.

Tea Waste (Control) Order, 1959

Under the order any producer intending to stock or sell tea waste has to obtain an annual license from the Tea board, which should be renewed periodically. Such licence is not required if the tea waste is destroyed by approved methods and used as compost in estate itself. Producers selling tea waste under licence should ensure that the buyer also has the licence from the Board. Licences are not issued to merchants for the purpose of buying and selling tea waste. Only producers can get the licence and sell them to end

users like caffeine manufactures or instant tea manufacturers, who must also have licence for purchase. Tea waste is presently not allowed to be exported. Here 'Tea waste' means tea sweepings, tea fluff, tea fibre or tea stalks or any article purporting to be tea which does not confirm to the specifications for tea laid down under the PFA Act, but does not include green tea or green tea stalks (Ramadurai, 2001).

The Tea Board

The Tea Board was formed by the Government under the Tea Act, 1953. The Tea Board works for the development of tea industry and trade in the sphere of production, extension of area under tea cultivation, improvement in the quality of tea, promotion of co-operative efforts, promotion among growers and manufacturers, Research and Development inputs, undertaking promotional campaign for increasing exports, of tea to foreign countries, issue of exporter's licence, shipment licence, tea waste license , tea warehousing licence, collection of tea statistics and adoption of welfare measures for the workers. The Tea Board development schemes are given in Appendix. 2 .

Planters Associations

The urge to unite for a common cause gave birth to the Indian Tea Association (ITA), representing the planters' interests in the north in 1881 and United Planters' Association of Southern India (UPASI) in 1893. Affiliated to these two associations are the State Planters' Associations and many District Planting Associations. The principal function of these two associations is to represent the interests of the planters in all effective forums at national and international arenae. They also undertake commodity research and serve as the nucleus of industrial relations. The UPASI scientific department was founded more than 70 years ago and is supported by the acreage subscription from the member growers. The first tea research centre was started at Peermade in the Idukki district of Kerala. Later in 1926, a tea research station was set up in Devarashola in Nilgiris. In 1965, a new full fledged research station was started in Anamalais with

capital grant from the Tea Board. All the Tea Research Institutes (TRI) receive funds from the National Tea Research Foundation. Krishi Vigyan Kendra (KVK), an affiliated body of UPASI was established in 1982 in order to reach the poorest of poor among the farmers with lab-to-land programmes. Improved agricultural practices were not either reaching the small farmers or they were not getting the proper guidance. KVKs were to fill this void. In campus and offcampus training programmes for small farmers, demonstration farms etc. are the other activities of UPASI-KVK. It also has a tea plant nursery where annually over four lakh plants are grown scientifically which are given to small growers free of cost and others at a nominal charge on funding made by the Tea Board. UPASI-KVK has also set up a mini tea factory to give training to tea makers (UPASI, 1997).

World Scenario

Tea is one of the worlds' most important crop. It is consumed as a beverage throughout the world and grown widely in countries of Asia, Africa and to a small extent in Europe, South America and Australia. It has widespread implications for the earnings and food security of farm communities, particularly small holders in these countries. Historically, it has competed effectively in an increasingly crowded beverages market but indications are that, it has lost ground, particularly in the early to mid-nineties. Demand has become sluggish and even declined in some of its traditional markets. Consequently, prices have fallen in real terms as the imbalance between production and consumption has grown. During the last one and a half decades, the tea industry has witnessed an increase in production world-wide, exceeding the increase in demand during that period. This disproportionate increase in demand and supply has lowered the prices. The production to consumption ratio needs to be rationalized in order to attain remunerative prices and ensure the viability of the global tea economy (Chang, 2000). Among the countries growing tea, a few could be regarded as major producers. The production of tea in the major producing countries were furnished in Table XV.

TABLE XV.
PRODUCTION OF TEA IN VARIOUS COUNTRIES

(million kg)

Year	India	Sri Lanka	Kenya	China	Indonesia	Argentina	World
1970	419	212	41	-	31	27	1108
1975	487	214	57	211	71	28	1527
1980	570	191	90	304	99	21	1836
1985	656	215	147	432	132	29	2289
1990	720	234	197	540	160	43	2584
1991	754	242	204	542	153	44	2635
1992	732	179	188	560	145	44	2509
1993	761	233	211	600	137	46	2613
1994	753	244	209	588	128	42	2573
1995	756	246	245	588	144	32	2584
1996	780	259	257	593	166	43	2702
1997	811	277	221	613	153	55	2790
1998	870	284	249	625	165	50	2922
1999	799	306	236	676	85	50	2845

Source: Tea Statistics, Various Issues, published by Tea Board, Kolkata.

World production has been dominated by India where output peaked to nearly 800 million kg during 1999, next by China with 675 million kg, the highest output achieved by that country in the past decades, Sri Lanka follows at a distant third at 283 million kg, Kenya 248 million kg and Indonesia 165 million kg. World tea production in the last decade has grown at an yearly rate of 1.81 per cent until 1999. Among the major tea varieties produced in the world, the output of black tea accounts for more than 70 per cent. The green and other types of tea produced are mostly consumed in the producing countries themselves. More than 80 per cent of green and other tea produced are consumed in the home countries and the rest are exported. It is therefore, black tea that is of prime importance as far as international tea trade is concerned. Again in black tea, the two manufacturing processes leads to CTC and orthodox tea. Sri Lanka, Indonesia, Turkey, Argentina and Iran produce orthodox tea while Kenya, Bangladesh, Malawi, Tanzania, Uganda, Zimbabwe and South Africa manufacture CTC tea. India manufactures both the varieties. China, Japan and Taiwan produce mainly green tea.

World black tea production is projected to reach 3.1 million tonnes by 2005, an annual average growth rate of three per cent from the 1993-95 base period. Production in India is estimated at 1.15 million tonnes in 2005. Significant growth in production is also projected for other major tea producing countries. China and Indonesia would increase black tea production from 180 million kg and 105 million kg respectively to 280 million kg and 180 million kg. Increase in both yield and planted area are likely to continue to support the strong growth in tea production in African countries. Output in Kenya is expected to increase to 300 million kg in 2005. Malawi, Tanzania and Zimbabwe are also expected to increase production significantly. Production and yield of tea in Africa are likely to continue to increase rapidly. Production expansion programmes initiated by major exporting countries have contributed to previous increases in output of black tea in recent years and the impact of these programmes would continue in the future years.

Out of the total production of 2845 million kg in 1999, the producing countries retained as much as 1628 million kg (57 per cent) for their own consumption and exported 1217 million kg (43 per cent). Also rate of growth in tea consumption is faster in producing countries than in importing countries. In terms of total quantity consumed, India tops the list among global tea consumers followed by China, Russia / C.I.S., U.K., Japan, Pakistan, Turkey and Iran (Table XVI). The consuming countries could be classified into three groups.

- a. Consuming their own production.
- b. Importing for consumption and
- c. Consuming their production and also importing for consumption.

Russia / C.I.S., Iran, Japan and South Africa are deficit producing countries coming in the third category. Although India's total consumption is substantial, the per capita consumption is very small at 652 g during 1999. Among the producing countries, Turkey, Japan, Iran and Sri Lanka have a per capita consumption of more than one kg. Among the major importing countries, U.K., Pakistan, Russia, U.S.A., Egypt, Morocco, Poland and Iran are prominent. The global per capita consumption between 1981 and 1999 has annually increased at the rate of about three per cent compared to about two per cent growth in population indicating that, globally, per capita tea consumption is increasing. World black tea consumption is projected to increase by three per cent per annum to three million tonnes by 2005, with developing countries accounting for the largest part of the prospective increase. Consumption in these countries would reach 2.15 million tonnes, an annual growth rate of more than three per cent. In India the consumption of black tea will be 820 million kg. The reduction of import tariffs and declining prices could have a more pronounced effect on consumption in these countries. The consumption in United States

TABLE XVI.
TEA CONSUMPTION IN VARIOUS COUNTRIES (1999)

Country	Producing countries	Importing countries	Producing and importing	Population million	Per capita consumption (Gms.)
	..... Million Kgs				
Turkey	166	-	-	66	2515
U.K.	-	137	-	59	2322
Iraq	-	35	-	23	1522
Taiwan	-	-	34 (11)	23	1478
Iran	-	-	91 (31)	67	1358
Syria	-	20	-	16	1250
Morocco	-	35	-	29	1207
Egypt	-	73	-	63	1159
Japan	-	-	138 (49)	127	1087
Sri Lanka	20	-	-	19	1053
Saudi Arabia	-	18	-	21	857
Afganistan	-	20	-	26	769
Pakistan	-	108	-	145	745
Australia	-	14	-	19	737
Poland	-	26	-	39	667
Russia/CIS	-	-	194 (182)	294	660
India	650	-	-	997	652
Canada	-	19	-	31	613
South Africa	-	-	24 (13)	40	600
Indonesia	80	-	-	207	386
China	476	-	-	1256	379
U.S.A.	-	93	-	273	341
Germany	-	24	-	83	289
Bangladesh	32	-	-	128	250
Kenya	7	-	-	30	233
Vietnam	18	-	-	80	225
WORLD	..... 2845			5885	483

(Figures in parentheses indicate the share of imported quantities)

is projected to increase at a relatively slow rate of less than one per cent, while in the C.I.S., a stronger growth consumption rate of nearly five per cent is projected to increase consumption to 250 million kg in 2005 (Ramadurai, 2001).

World imports grew yearly at 1.2 per cent over the last decade. The United Kingdom was the largest importer until 1997 when the C.I.S., surpassed its imports. Pakistan is the third largest importing country followed by the United States, Egypt and Japan. Together, these countries would account for 51 per cent of total imports. Import requirements at 2005 are projected at 1.55 million tonnes, an average annual increase of 3.6 per cent from the base period average. Import requirements by developing countries would increase more rapidly to reach 850 million kg, while the import demand in developed countries is projected to increase to 700 million kg (Chang, 2000).

World tea exports have grown by almost two per cent over the last decade. Sri Lanka is the largest exporter followed by Kenya, China and India as second, third and fourth respectively during the recent years (Table XVII). Export availabilities are projected to reach 1.6 million tonnes in 2005, an average annual increase of 3.8 per cent from the actual exports during the base period, 1993-95. China, India, Indonesia, Sri Lanka and Kenya are expected to account for 78 per cent of the total projected export availabilities. The balance would largely be sourced from Bangladesh, Malawi, Tanzania, Turkey and Zimbabwe, where export availabilities are expected to increase significantly over this period. The projected gap between exports and imports could also be further reduced through trade liberalisation and thereby prices can be improved through the rationalisation of production in major exporting countries to relieve the supply pressure on the world tea market.

The prices of black tea declined in all auction markets during 1999, due to higher production in major producing countries and weaker demand in the importing nations. The price expectations for the future period remain uncertain because of the current financial difficulties in traditional and major importing countries like Russian federation.

TABLE XVII.
EXPORT OF TEA BY MAJOR COUNTRIES IN THE WORLD (1990-99)

Year	India	Sri Lanka	China	Kenya	Indonesia	Malawi	Argentina	World
1990	210024	215211	195471	169586	110964	41024	45966	1134734
1991	202918	210823	184872	175557	110218	37054	36029	1078183
1992	174962	189000	168500	171500	101880	35363	36529	1016820
1993	175318	209942	201435	188390	123926	35270	43549	1153655
1994	150691	224235	179679	184211	84916	38672	43230	1032677
1995	167996	235036	168543	237428	79227	32648	41113	1082555
1996	161696	233573	169670	244226	101532	36661	41307	1114865
1997	202995	257273	202462	198552	66843	49223	56409	1179371
1998	210338	265308	217152	263402	67219	41000	59021	1254518
1999	191719	263943	199625	241739	85000	40000	52000	1217000

Source : Tea statistics, Various Issues, published by Tea Board, Kolkata.

Although import demand has increased in the Near Eastern Markets such as Saudi Arabia, Iraq and United Arab Emirates, continued expansion will most likely depend on continued firmness of oil prices. The prospect of downward pressure on prices call for new and market-oriented approaches for tea in the next decade (Chang, 2000).

The trading of 85 per cent of the total world tea production is through auctions, which are spot markets, is the peculiarity of tea industry. Development of forward and future markets will lead to stability in tea prices. Traditionally tea faces stiff competition from coffee and of late from carbonated drinks. Manufactures of carbonated drinks have been able to reach every nook and corner of the globe by their sheer financial might, backed by effective marketing strategy. The entire tea fraternity must go for generic promotional effects as an effective marketing strategy. A market trend in the recent years has been the shift in demand towards the import of quality tea , not only in mature markets such as United Kindom and Russian Federation but also in the rest of Europe and North America. The discovery of anticarcinogenic properties and the rediscovery of extra-ordinary revival and relaxing properties of tea, are bound to give an added advantage to the generic promotion programmes (Maran, 2000).

Indian Scenario

Among all the tea producing countries of the World, India has the largest acreage under the crop. The main regions growing tea in India are Assam, West Bengal and Tripura in North India and Tamil Nadu, Kerala and Karnataka in South India. Besides, it is also grown in comparatively low acreage in Bihar, Uttar Pradesh, Himachal Pradesh, Sikkim, Manipur, Orissa, Nagaland and Arunachal Pradesh. The details of area, production and productivity of tea in India and in various States in India are shown in Table XVIII and XIX. The tea produced in various parts of India cater to the needs of the consumers in a very wide range. Darjeeling in West Bengal produces the 'Darjeeling tea' which is light, aromatic, fine tasting and is considered as the world's most prized tea.

TABLE XVIII.
AREA, PRODUCTION AND PRODUCTIVITY OF TEA IN INDIA (1970-99)

Year	Area (hectare)	Production (th.kg)	Productivity (kg/ha)
1970	354133	418517	1182
1971	356516	435468	1221
1972	358675	455996	1271
1973	360108	471952	1311
1974	361663	489475	1363
1975	363303	487137	1341
1976	364275	511817	1405
1977	366176	556267	1519
1978	369184	563846	1527
1979	372980	543776	1458
1980	281086	589172	1494
1981	383629	560427	1461
1982	394170	560562	1422
1983	396066	581484	1468
1984	398453	639864	1606
1985	398966	656162	1645
1986	407647	620803	1523
1987	411335	665251	1617
1988	144347	700014	169
1989	414953	688105	1658
1990	416269	720338	1731
1991	420470	754192	1794
1992	420289	732322	1742
1993	418363	760826	18198
1994	425966	752895	1768
1995	427065	756016	1770
1996	431245	780227	1809
1997	434294	810031	1865
1998	436337	570405	1995
1999	437857	805612	1840

Source : Tea Digest - 1999, published by Tea Board, Kolkata

TABLE XIX.
AREA, PRODUCTION AND PRODUCTIVITY OF TEA STATEWISE IN INDIA (1990-99)

State	1990			1991			1992			1993		
	Area (ha)	Production ('000 kg)	Yield (kg/ha)	Area (ha)	Production ('000 kg)	Yield (kg/ha)	Area (ha)	Production ('000 kg)	Yield (kg/ha)	Area (ha)	Production ('000 kg)	Yield (kg/ha)
Assam	230375	388181	1685	231977	387866	1672	232223	387813	1670	231979	402.947	1737
West Bengal	101184	149753	1480	101717	161832	1591	101924	150.236	1474	100492	168022	1672
Others	9345	7172	767	11447	13228	1155	10937	32375	2960	10213	10565	1034
North India	340904	545106	1599	345142	562926	1631	345084	570424	1653	342684	581534	1697
Tamil Nadu	38880	110576	2844	38894	113493	2918	38891	99443	2557	38790	408652	2801
Kerala	34606	60665	1753	34628	67110	1930	346111	55136	1593	34681	66691	1923
Karnataka	2073	3991	1925	2073	4443	2143	2073	4032	1945	2060	3999	1941
South India	75271	175232	2328	75272	191266	2541	75196	161898	2153	75587	179292	2372
All India	416140	720338	1731	420397	754192	1794	420392	732322	1742	418266	60826	1819

(Contd...)

TABLE XIX. (Contd...)

State	1994			1995			1996		
	Area (ha)	Production ('000 kg)	Yield (kg/ha)	Area (ha)	Production ('000 kg)	Yield (kg/ha)	Area (ha)	Production ('000 kg)	Yield (kg/ha)
Assam	227172	400732	1764	226280	402617	1779	227200	424864	1870
West Bengal	99953	158825	1589	101190	157522	1557	102526	165375	1613
Others	11145	8398	753	11763	8492	722	13638	7902	579
North India	338270	567955	1679	339233	568631	1676	343365	598141	1742
Tamil Nadu	48845	117520	2406	48958	117915	2408	49054	113755	2319
Kerala	26749	63127	2360	36775	64778	1761	26696	61962	2321
Karnataka	2095	4293	2049	2099	4692	2235	2105	4691	2229
South India	8774	184940	2107	87832	1897385	2133	87837	181999	2072
All India	725846	752895	1768	427065	456016	1770	431303	780227	1809

(Contd...)

TABLE XIX. (Contd...)

State	1997			1998			1999		
	Area (ha)	Production ('000 kg)	Yield (kg/ha)	Area (ha)	Production ('000 kg)	Yield (kg/ha)	Area (ha)	Production ('000 kg)	Yield (kg/ha)
Assam	229843	425115	1850	230829	460783	1996	231940	414129	1786
West Bengal	103008	170158	1652	103100	197704	1918	103150	180212	1747
Others	12851	9424	733	12803	10543	823	12911	10000	771
North India	345702	604697	1749	346732	669030	1930	348001	604301	1736
Tamil Nadu	49671	130179	2621	50675	125086	2468	50875	121998	2398
Kerala	36817	69776	1895	36826	70618	1918	36877	67780	1838
Karnataka	2104	5379	2557	2104	5671	2695	2104	5422	2577
South India	88592	205334	2318	89605	201375	2247	89856	194628	2166
All India	434294	810031	1865	436337	870405	1995	437769	798929	1825

Source : Tea statistics - Various issues, published by Tea Board, Kolkata.

The first and second flush of tea produced in Darjeeling commands a very high premium and sold at more than Rs. 1000 per kg in the world market. The later flushes of this tea are sold at around Rs. 200 to Rs. 400 per kg in the auction centres. Thus, this tea accounting for only a little over of one per cent in terms of volume of tea output in India, accounting for 10 per cent of export earnings from tea. In Tamil Nadu, the tea plantations are located in the Nilgiris, Anamalais, Kanyakumari, Madurai and Tirunelveli. The 'Nilgiri tea' account for about 40 per cent of tea production in South India and nine per cent of all India output. Nilgiris tea grown in Tamil Nadu caters the need of Russian market. Tea industry is normally considered to be a corporate entry in most of the growing areas, but in the Nilgiris, it has the largest conglomeration of small growers. Of the 50600 ha of tea area in the district, the small grower section accounts for about 30,000 ha. About 50,000 small growers contribute to an annual production of more than 50 million kg. The preponderance of small growers has led to the existence of a number of bought leaf factories and the government sponsored co-operative factors for processing tea leaves from the small growers. The economy for the small growers revolve on the price fetched for the green leaf which in turn is influenced by the price realisation for the end product.

More than monetary input, it is the innovative approach that would help in achieving major break through in tea research, which often demands collaborative and interdisciplinary efforts even at one single problem of topical importance. Research has always been an integral part of the tea industry and tea is one of the few organised core sectors to have a sustained and long term interest in research and development activities. With the current emphasis on increasing productivity and quality, relevant areas of priorities in research have to be sorted out. To meet the challenges of the productivity barriers and to make a significant break-through in quality development, stress is being laid on applications of biotechnology, tissue culture technique, integrated energy management etc., in overcoming the hurdles in increasing productivity.

Tea production in India is one of the highest in the world. It has increased from 248 mkg in 1950 to 799 million kg in 1999, approximately three folds of this increase has occurred both due to area expansion and yield. Though, India continues to be the largest producer of tea in the world, it has been fast losing its primacy in the global production (Table XX) (Arunachalam, 1995). South India accounts for 25 per cent of total production and on the yield front, the increase in yield over years has been rapidly occurring in South India than in North India and the South has registered the highest yields among the countries in the world. But, nearly 70 per cent of the plantations in our country are over 30 years old and 45 per cent are over 50 years old. They give poor yields due to old age and also due to low yielding planting materials. For boosting the output of tea, there is a need both to expand the area as well as take up replanting with high yielding variety materials. However, the replanting has long gestation period and is very costly, it is going on at the rate of only one per cent per annum against a desirable rate of minimum two per cent. The area expansion programme is also limited, as no more land is available for expansion under tea in the South and it is very minimal in the North-East.

TABLE XX.

CHANGES IN SHARE OF VARIOUS COUNTRIES IN GLOBAL TEA PRODUCTION

Year	(Per cent)				
	India	China	Sri Lanka	Indonesia	Kenya
1951	41.87	9.54	21.71	7.03	1.02
1961	33.76	14.91	19.67	7.04	1.21
1971	32.70	13.52	16.21	5.39	2.73
1981	30.33	18.55	11.38	4.57	4.92
1991	28.62	20.55	9.16	5.80	7.72
1999	28.10	23.80	10.00	5.80	8.80

Source : Tea Statistics, various issues, published by Tea Board, Kolkata

Indian tea reaches the consumers of around 80 countries in the world. U.K. was the largest importer of Indian tea till the end of sixties. However, since eighties a noticeable shift has been witnessed in the direction of Indian tea exports. Erstwhile U.S.S.R. became the largest importer of Indian tea replacing U.K. After the disintegration of U.S.S.R. the demand for the Indian tea reduced because of the political climate in that country. Also due to absence of any domestic base and comparatively small range of exportable items, Sri Lanka and Kenya have an edge over India to offload tea in the international market at any price and favourable credit terms. India exports only 24 per cent of its production and a larger share was utilised for domestic consumption. In the break up of North and South, the South Exports 50 per cent of its production, while North exports only 15 per cent. The export pattern of tea over years from India is shown in Table XXI.

Import of tea was totally banned in India. In 1996, the Union government for the first time allowed the import of tea by 100 per cent export oriented units for blending and re-export in the form of packet tea, tea bags and instant tea. This tea was not allowed to be sold in the domestic market. In 1998, the government allowed the sales of upto 25 per cent of this tea and or 5 per cent of its reject in the domestic market for a period of six months to ease the price situation. But, due to the World Trade Organisation agreement, tea imports were allowed from various countries as the quantitative restrictions were removed for many items, including tea.

The overall situation in India is quite different from that of other major producing countries and only India and China have got substantial internal market. The other tea producing countries have no option than to pump their tea into the world market. Tea is an important item of domestic consumption and is the major cheapest beverage in India. The domestic consumption of tea which was a meagre of 75 million kg during 1950, has gone upto 633 million kg during 1999 (Table XXII). The domestic market is further

TABLE XXI.

TEA EXPORTS FROM SOUTH INDIA, NORTH INDIA AND ALL INDIA (1980-1999)

Year	South India			North India			All India		
	Production	Export	Export as percentage of production	Production	Export	Export as percentage of production	Production	Export	Export as percentage of production
	(000' kgs)								
1980	131095	56654	43.22	458077	168126	36.70	589172	224780	38.15
1981	122637	58252	47.50	437790	183821	41.99	560427	242073	43.19
1982	123531	41703	33.76	437031	148990	34.09	560562	190693	34.02
1983	115225	42446	36.84	466259	167034	35.82	581484	209480	36.03
1984	148436	67393	45.40	491428	150751	30.68	639864	218144	34.09
1985	141867	63121	44.49	514295	151816	29.52	656162	214937	32.76
1986	139504	44808	32.13	481299	159464	33.13	620803	204293	32.91
1987	146878	362373	24.70	518373	166480	32.12	665251	202753	30.48
1988	175291	48096	27.44	524723	153651	29.28	700014	201747	28.82
1989	158534	43839	27.65	529571	168823	31.88	688105	212662	30.91

(Contd..)

TABLE XXI. (Contd..)

Year	South India			North India			All India		
	Production	Export	Export as percentage of production	Production	Export	Export as percentage of production	Production	Export	Export as percentage of production
1990	175232	39943	22.79	545106	170081	31.20	720338	210024	29.16
1991	191266	49513	25.89	562926	153405	27.25	754192	202918	26.91
1992	161898	44357	27.40	570424	130605	22.90	732322	174962	23.89
1993	179292	50335	28.07	581534	124983	21.49	760826	175318	23.04
1994	184940	55524	30.02	567955	95167	16.76	752895	150691	20.01
1995	187385	71951	38.40	568631	96045	16.89	756016	167996	22.22
1996	181999	66942	36.78	598141	94754	15.84	780227	161696	20.72
1997	205334	100327	48.86	604697	102668	16.98	810031	202995	25.06
1998	201375	109977	54.61	669030	100361	15.00	870405	210338	24.17
1999	194628	96455	49.56	604301	95264	15.76	798929	191719	23.80

Source : Tea statistics, various issues published by Tea Board, Kolkata

TABLE XXII.
DOMESTIC CONSUMPTION OF TEA IN INDIA (1985-1999)

Year	Domestic consumption in India	Per cent in total production
1985	415	63.26
1986	431	69.40
1987	446	67.1
1988	462	66.0
1989	480	69.77
1990	500	69.44
1991	511	67.77
1992	524	71.58
1993	537	70.57
1994	550	73.04
1995	562	74.34
1996	580	74.36
1997	597	73.61
1998	615	70.6
1999	633	79.22

Source : Tea Digest -1999, published by Tea Board, Kolkata.

expanding, necessitating the accelerated growth in tea production. However the per capita consumption of tea in India is still very low and there is a great scope for raising it (Ramadurai, 2000).

The rise in domestic consumption is the industry's greatest strength. It is this demand which is fuelling the industry and compelling it to grow as fast as possible. With the increasing population, improved economic conditions and living standards, demand for domestic consumption continues to grow steadily from 1951 to 1998. The domestic consumption on an average registered a compound growth rate of 4.74 per cent per annum, whereas the production growth rate was only 2.4 per cent. This gap needs to be bridged in order to retain India's pre-eminent position as the largest producer of tea.

Unlike alcohols or even coffee, tea do not have any negative health effects. It effectively shields skin from cancer causing ultra violet rays. Discovery of the anti-oxidants namely flavonoids in both black and green tea, help neutralise 'free radicals' produced in the body as part of the normal functioning and thereby decreasing incidence of heart attack caused by blocked arteries. The antioxidants present in tea deter this process and also help in fighting ageing. Studies conducted by UPASI in Coonoor, reveals that tea seems to help in control of diabetes and hyper chloesterol in humans. Tea brings down the severity of inflammation due to smoking. Tea also reduces headache and depression and strengthens the human immune system. and is a rich source of flavonoids, which improve blood circulation and skin health. It is these new roles of tea, which is going to be of extreme value to the world community, particularly as medical treatment is progressively becoming more and more expensive (Jhawar, 2000).

The Present Crisis

The tea industry in India is stirring a rather bitter brew minus any sweeteners to cheer the planters at the start of the new millenium. While the declining price trend is

being digested, increase in labour wages, additional burden of excise duty, almost static shipments to Russia and free imports of tea are the major factors that have pushed the industry into a quagmire. Besides all these factors, the global supplies are more than the demand in the recent years is sending shivers down the planter's spines. Against this background, the general perception is that the southern tea industry could be heading for difficult days, perhaps the worst in recent years.

The tea prices in the auction centres slipped down to the bottom in the year 1998 and onwards. In reciprocation of fall in tea prices, the price level of green tea leaves also went down to below Rs. 5 per kg. This affected the small grower section dominating the tea production in the south India. To help the small growers, the Tea Board announced a subsidy scheme of Rs. 8 per kg. The government also abolished the excise duty of Rs. 2 per kg. All these measures though helped the growers, would not be a long-term solution. As cost of production is escalating, heavy competition is sensed and the government policy of importing tea into India as per the WTO agreement is gearing up, the tea industry sector has to come out with a concrete plan. No amount of government subsidies and concessions can bale out the producers from this grave situation.

The challenge is to increase production, improve quality and ensure that the tea is available at a price remunerative to the producer and affordable by the domestic consumers. Yet the industry should have sufficient tea to meet the export requirement in order to retain India's share in the world market. It has been estimated that India will require about 1000 million kg of tea by the end of the Ninth plan, to meet the growing internal consumption plus the demand for export, calculated on the basis of retaining India's share of the world tea market.

RESULTS AND DISCUSSION

CHAPTER V

RESULTS AND DISCUSSION

In this chapter, the results obtained from the analysis of the data with reference to the specific objectives of the study are presented and discussed to draw inferences, under the following seven sections.

- i. General characteristics of the sample exporters
- ii. Growth and instability in the South Indian tea exports
- iii. Direction of South Indian tea exports and projection for the future period.
- iv. Market integration - Regional and international tea auction markets.
- v. Price analysis and forecasting
- vi. Export competitiveness
- vii. Exporters' response to the current WTO implementation and constraints faced in tea export

The general characteristics of the sample exporters are discussed in the first section, below

(i). General Characteristics of the Sample Exporters

The general characteristics of the sample exporters namely, their experience in tea trade, types of tea they were exporting, promotional activities they undertook in exporting tea and the quantity and value of the tea exported by them to various countries in the year 1999-2000 were collected and analysed. Experience of traders in tea exports is discussed first.

Experience in Trade

The details on the experience of the sample exporters in tea trade that is, the number of years they had been exporting tea was collected and analysed. The results are presented in Table XXIII.

TABLE XXIII.
EXPERIENCE OF THE SAMPLE EXPORTERS IN TEA TRADE

(Number of Traders)

Sl. No.	Number of years	Coonoor	Coimbatore
1.	< 5 years	1 (6.66)	3 (20.00)
2.	5-10 years	7 (46.66)	8 (53.33)
3.	10-20 years	2 (13.33)	2 (13.33)
4.	> 20 years	5 (33.33)	2 (13.33)

(Figures in parentheses indicate percentages to the respective column total)

It could be seen from the above table, that 33 per cent of the Coonoor tea exporters were having considerable experience in tea trading with more than 20 years, while 13 per cent of the Coimbatore exporters were having this experience in tea trade for more than 20 years. Majority of the exporters in both Coonoor and Coimbatore (46 and 53 per cent respectively) had about five to ten years of experience in tea export trade. Only 13 per cent of the sample exporters in both Coonoor and Coimbatore had ten to twenty years of tea trading experience. The sample exporters were thus, had fairly a long experience and knowledge in the tea export trade.

Types of Tea Exports

The sample exporters both in Coonoor and Coimbatore exported various types of tea, besides the major types like CTC and Orthodox tea. The sample exporters were exporting the value-added tea like tea bags, packet tea in convenient consumer packs in addition to bulk (loose form) tea, as the demand for value-added tea was increasing in the developed countries like U.S.A., Europe, Australia etc.

Promotional Measures

The sample exporters in Coimbatore and Coonoor regions undertook promotional activities like use of their own brand name, symbol, logo mark and attractive consumer packing, on their products especially in value-added tea, while exporting to various countries (Table XXIV).

TABLE XXIV.
PROMOTIONAL ACTIVITIES OF THE SAMPLE EXPORTERS

Sl. No.	Promotional measures	Per cent of exporters	
		Coonoor	Coimbatore
1.	Use of brand name	40.00	46.66
2.	Use of symbol	33.33	26.66
3.	Use of logo mark	6.66	13.33
4.	Attractive consumer packing	20.00	13.33

It could be observed from the table above, that the sample exporters resorted to the use of their own brand name as a major promotional method followed by use of symbol, logo mark and attractive packing in case of Coimbatore region, while the Coonoor exporters used brand name, symbol, attractive packing and logo mark as promotional measures in the order of importance. For bulk tea exports, they normally did not undertake any promotional activities. The sample exporters rather paid major attention to the quality of the tea that they were exporting since quality played a major role in preserving their good will in the importing countries. To survive in the international tea trade, the sample exporters paid much attention to the quality aspect. They purchased from reputed sources, who supplied good quality tea consistently and undertook careful cleaning and blending activities to maintain the aroma, strength, taste and flavour and also to meet the quality standards prescribed by the importing nations.

The sample exporters were of the opinion that even in the circumstance of reducing world prices, the importers were ready to pay good price for best quality products. So quality maintenance was an important criterion for the sample exporters in stabilising their tea trade.

Export Destinations

The sample exporters exported tea to various destinations like Russia, United States of America (U.S.A.), United Kingdom (U.K.), Poland and Arab Republic of Egypt (A.R.E.). The details on the quantity and value of tea exported to these major countries are furnished in the Table XXV, below.

TABLE XXV.
TEA EXPORTS TO VARIOUS COUNTRIES BY SAMPLE EXPORTERS

(Quantity in '000 kg and value in '000 Rs.)

Countries	Coonoor		Coimbatore		Average	
	Quantity	Value	Quantity	Value	Quantity	Value
Russia	160	8320	173	11245	167 (61.17)	9783 (62.26)
Poland	28	1344	37	2035	33 (12.09)	1690 (10.75)
U.K.	17	838	5	245	11 (4.03)	542 (3.45)
A.R.E.	33	1699	4	232	19 (6.96)	967 (6.15)
U.S.A.	77	4620	12	844	45 (16.48)	2732 (17.39)

(Figures in parentheses indicate percentages to the respective column total)

As could be noted from the table above, on an average the sample exporters in Coonoor and Coimbatore exported about 167000 kg (61 per cent) of tea to Russia, the major importer of South Indian tea, to the value of 9.78 crores (62 per cent), the next highest share of export was captured by U.S.A. market where 45000 kg (16 per cent) of the tea worth of 2.73 crores was exported. About 33000 kg of tea, valued at Rs. 1.69 crores

was exported to Poland (12 per cent).. The tea exports to U.K. and A.R.E. accounted for minimal share of exports (4 and 7 per cent), valued at Rs. 0.54 crores and Rs. 0.97 crores respectively. The export quantity and export value of tea varied to a great extent to the various exporting countries.

(ii). Growth and Instability in the South Indian Tea Exports

The tea exports growth and instability that is, sources of export value growth and its variance are discussed in this section.

Tea Exports Growth

The growth performance of South Indian tea exports in terms of quantity, value and unit value were analysed and the results are presented in Table XXVI. The period of analysis was dis-aggregated into pre-liberalisation (1976-77 to 1990-91) and post-liberalisation periods (1991-92 to 1999-00). The compound growth rates and their significance were estimated for export quantity, export value and export unit value employing an exponential growth model for the two periods and for the overall period.

TABLE XXVI.
COMPOUND GROWTH RATES OF SOUTH INDIAN TEA EXPORTS
(Percentage / annum)

Sl.No.	Variable	Period I	Period II	Overall period
1.	Export quantity	-1.70	12.63*	2.37
2.	Export value	5.05	22.88*	11.02*
3.	Export unit value	6.86*	9.10*	8.45*

* Significant at one per cent level of probability.

Period I : 1976-77 to 1990-91

Period II : 1991-92 to 1999-2000

Overall period : 1976-77 to 1999-2000

It could be discerned from the above table, that in the pre-liberalisation period (1976-77 to 1990-91) the export quantity of South Indian tea recorded a negative, but insignificant growth rate of -1.70 per cent per annum. The export quantity of tea did not increase significantly during the period but the export unit value of tea showed a positive and significant growth rate of 6.86 per cent per annum indicating that the tea export prices were on a rising trend during the period. In the same period, the export value showed a positive growth rate of 5.05 per cent per annum, but was not significant as the export quantity did not show any significant increase during this period.

In the post-liberalisation period (1991-92 to 1999-00), the export value registered significant highest compound growth rate of 22.88 per cent, while the export quantity and unit value grew to the extent of 12.63 per cent and 9.10 per cent per annum respectively. The growth in export value during the period was contributed by increase in both export quantity and export unit value of South Indian tea. The growth in export unit value during the period revealed that the South Indian tea export prices were increasing in the world market. The significant growth in export quantity in the post-liberalisation period was partly due to trade openness or free trade occurring among the countries. It could also be attributed to the increase in South Indian tea production of more than 200 million kg during the latter years of the post-liberalisation period. More important in this was a major share of this higher production, nearly 50 per cent, was exported to various countries and the remaining 50 per cent was utilised for domestic consumption. Exports from other producing countries like Sri Lanka, Kenya and China in this period had increased considerably indicating that world supply of tea has been in the rising trend in the last decade.

In the overall period (1976-77 to 1999-00), significant growth was observed in the tea export value and unit value to the tune of 11.02 and 8.45 per cent per annum respectively. The growth in export value was due to the export unit value growth rather

than export quantity. The growth rate of export quantity in the period considered registered a positive growth rate of 2.37 per cent but was not significant, since the export quantity was negative in the former period. The growth in the export unit value was more important as it augmented the foreign exchange earnings to our nation even though it can be argued that this growth was mainly because of the declining rupee value in dollar terms, that is, due to the decline of the average rupee value to about 200 per cent against the dollar values in the latter period over the former period. In sum, the growth momentum of South Indian tea export in terms of quantity unit value and value, as per the statistics was increasing during the post-liberalisation period.

Decomposition of Instability in South Indian Tea Exports

There has been perceptible increase in the South Indian tea exports in terms of export quantity, export value and export unit value during the past decades though its share in the world tea exports declined over the years. To examine quantitatively, the effect of export quantity and export unit value and their variability on the export value over the years, decomposition analysis was done. For better understanding, the variance in export value was measured in two time periods, one preceding the liberalisation phase, that is, from 1976-77 to 1990-91 over the other period following the implementation of free trade, from 1991-92 to 1999-'00. The selection of years could have an effect on the estimation and therefore a normal rainfall year was selected as base year (1976-77) for the first period and for the second period the liberalisation process was taken into account, which started from 1991-92 onwards. The export quantity and export unit value of South Indian tea were first de-trended and used for further decomposition analysis.

Source of Growth in Export Value

The components of change in the export value of the South Indian tea in terms of change in mean export quantity and export unit value and their variability besides the

interaction effect were set out in Table XXVII. The contribution of change in mean export unit value was the highest among the other components of change, that is, the increase in mean export unit value accounted for 46 per cent of the increase in the average export value. This was as expected, since, the export unit value has recorded significant higher growth rates in both the periods. The increase in mean export quantity accounted for 33 per cent of increase in mean export value. This one third increase in the mean export value has occurred due to the significant higher growth of export quantity during the post-liberalisation period. Change in the covariances between the export quantity and export unit value accounted for 17 per cent increase in the mean export value. The changes in the covariance could arise through changes in the variances of export quantity and export unit value. Thus, the variability effect of both export quantity and export unit value contributed upto 17 per cent for the increase in the mean export value. With regard to interaction effect the export value was benefitted to a small extent (3.41 per cent) from both export quantity and export unit value. Among the various components, the contribution of change in mean export unit value of South Indian tea was the dominant source for the change in average export value, followed by the change in mean export quantity.

TABLE XXVII.
CHANGE IN AVERAGE EXPORT VALUE

(in percentage)

Sl.No.	Source of change	1976-77 to 1990-91 over 1991-92 to 1999-2000
1.	Change in mean export unit value	46.17
2.	Change in mean export quantity	33.30
3.	Interaction between changes in mean export quantity and export unit value	3.41
4.	Change in export quantity - export unit value covariance	17.13

Source of Variance in Export Value

The ten components of change that affected the stability of export value are shown in Table XXVIII. The change in variability of export quantity accounted for 32 per cent increase in the variance of export value. It accounted for about one third of the variance of export value and dominated in destabilising the export value. The coefficient of variation of export quantity in the former period was 20.57 per cent, while it increased to 35.11 per cent during the latter period. This wide variability in export quantity had caused the instability of export value. The changes in variance of export unit value was the next source to increase the export value variance to the extent of 11 per cent. The coefficient of variation of export unit value in the former period was 38.13 per cent, while it declined to 26.66 per cent in the latter period. The variability in export unit value has narrowed to some extent in the latter period and had accounted for the instability of export value to 11 per cent. The changes in mean export quantity and mean export unit value accounted for five per cent and nine per cent increase in the export value variance respectively. The change in covariance between export quantity and export unit value was -1.62 per cent showing that the variability effect of both the export quantity and export unit value reduced the instability of export value variance to a small extent, thus having the stabilising effect among all other components of change.

The effect of the interaction terms were also important in determining the stability of the export value and in fact when added together they accounted for 24 per cent of the increase in the variance of total export value. The interaction effects arose in part from the increase in export unit value variability, and had induced a change in the behaviour of exporters which effected the mean or variance of the export quantity and led to the instability of the export value. Finally the residual term contributed for about 21 per cent for increasing the variance of export value, but the elements of this term was difficult to interpret, since it involved high order cross moments than the covariance terms.

Thus, the instability of the South Indian tea export value was mainly caused by the export quantity variance as a dominant source. The interaction term and export unit value variance were the other sources contributed to the increased export value variability in the selected periods of the study.

TABLE XXVIII.
COMPONENTS OF CHANGE IN THE VARIANCE OF EXPORT VALUE

(Percentage)

Sl.No.	Source of change	1976-77 to 1990-91 over 1991-92 to 1999-2000
1.	Change in mean export unit value (EUV)	8.55
2.	Change in mean export quantity (EQ)	5.19
3.	Change in export unit value variance	10.85
4.	Change in export quantity variance	32.10
5.	Interaction between changes in mean EUV and mean EQ	0.21
6.	Change in export quantity - export unit value covariance	-1.62
7.	Interaction between changes in mean EQ and EUV variance	11.20
8.	Interaction between changes in mean EUV and EQ variance	6.90
9.	Interaction between changes in mean EQ and EUV and changes in EQ-EUV covariance	5.61
10.	Change in residual	21.01

(iii). Directions of South Indian Tea Export

The structural change in the share of exports of South Indian tea was analysed through a first order Markov model. Annual exports of tea from South India in the post-liberalisation period (1991-92 to 1999-2000) were used for this analysis. There are

six major countries importing South Indian tea namely Russia, Poland, United Kingdom, United States of America, Arab Republic of Egypt and Tunisia. They accounted for more than 80 per cent of South Indian tea exports. The exports to remaining countries were pooled under the group 'other countries'.

The transitional probability matrix obtained by this procedure is presented in Table XXIX. It was evident from the table that Russia was one of the most stable countries among the importers of South Indian tea as reflected in the high probability of retention of 0.6174, that is, the probability that Russia retained its import share from one period to another was about 61 per cent. Similar interpretation could be made for USA, with a probability retention of 0.4257, and 'other countries' with the probability retention of 0.3371. United Kingdom had a very minimal probability retention of less than one per cent. On the contrary, Poland, A.R.E and Tunisia were having a probability retention of zero, indicating that they were the most unstable importers.

TABLE XXIX.
TRANSITION PROBABILITY MATRIX OF SOUTH INDIAN TEA EXPORTS
(1991-92 to 1999-2000)

Importing countries	Russia	Poland	UK	USA	ARE	Tunisia	Others
Russia	0.6174	0.1210	0.0264	0.0188	0.0792	0.0277	0.1096
Poland	0.9883	0	0	0	0	0	0.0117
UK	0	0.9292	0.0708	0	0	0	0
USA	0.108	0.4663	0	0.4257	0	0	0
ARE	0	0.3653	0.0153	0.1799	0	0	0.4395
Tunisia	0	0	0	0	0	0	1.0
Others	0.6629	0	0	0	0	0	0.3371

The major gainer among importers of South Indian tea over a period of time was Russia which was having a transfer probability of 0.9883 from Poland, 0.6629 from other countries and 0.1080 from USA, that is, the probability that Russia would gain in export share of South Indian tea from one period to another at the cost of Poland was 0.9883, at the cost of USA was 0.108 and at the cost of 'other countries' was 0.6629. U.S.A., in addition to having probability retention of its own share, was likely to gain from A.R.E and Russia with low probability gain of 0.1799 and 0.0188 respectively. 'Other countries' were going to gain from A.R.E., Russia and Poland with the moderate probability gain of 0.4395, 0.1096 and 0.0117 respectively. Though Poland did not have its own share of probability retention, it gained from U.K., U.S.A., A.R.E. and Russia to the extent of 0.9292, 0.4663, 0.3653 and 0.1210 respectively. The A.R.E. and Tunisia were not having their own retention share and were likely to gain some extent from Russia. It showed that both these countries were highly unstable for South Indian tea exports.

South Indian Tea Exports to Major Importing Countries

Using the transitional probability matrix, absolute quantities and market share of tea exports from South India to major importing countries were projected upto 2004-05 and the results are given in Table XXX.

It could be seen from Table XXX, that Russia, the major importer of South Indian tea over the past decades, continued to be the dominant importer accounting for about 60 per cent of export market share during 2004-05. Poland accounted for 12 per cent export share during 2004-05. U.S.A. and A.R.E. accounted for three and five per cent export shares respectively during 2004-05. 'Other countries' also accounted for 16 per cent of export share during 2004-2005. This showed that the export basket of South Indian tea would be diversified in future to include other new countries in addition to stable markets like Russia and U.S.A. The export quantity of tea from South India is likely to

TABLE XXX.
ACTUAL AND PROJECTED SOUTH INDIAN TEA EXPORTS

('000 kg)

Year	Russia		Poland		USA		A.R.E.		Others		Total	
	Actual	Projection	Actual	Projection	Actual	Projection	Actual	Projection	Actual	Projection	Actual	Projection
1995-96	48169 (68.16)	37595.46 (61.77)	9958 (14.09)	8578.47 (14.09)	1098 (1.55)	2543.7 (4.17)	1224 (1.73)	2199.46 (3.61)	9528 (13.48)	8204.3 (13.48)	70667	6085.8
1996-97	36174 52.49	37402.85 (61.46)	11116 (16.13)	7438.29 (12.22)	1554 (2.25)	2185.32 (3.59)	1740 (2.52)	2977.56 (4.89)	16128 (23.4)	8722.40 (14.33)	68918	60862.5
1997-98	69889 (66.79)	36461.87 (59.9)	8440 (8.07)	7649.67 (12.57)	1737 (1.66)	2169.13 (3.56)	2667 (2.55)	2962.31 (4.86)	20021 (19.13)	9476.74 (15.57)	104640	60866.3
1998-99	65101 (61.64)	36588.13 (60.11)	8162 (7.73)	7537.36 (12.38)	2962 (2.8)	2141.8 (3.52)	8752 (8.28)	2887.78 (4.74)	12835 (12.15)	9618.32 (15.80)	105611	60869.9
1999-00	75374 (73.43)	36645.98 (60.20)	9116 (8.88)	7490.4 (12.30)	3940 (3.84)	2119.13 (3.48)	5523 (5.38)	28797.78 (4.76)	5121 (4.99)	9619.75 (15.80)	102649	60873.6
2000-01		59365.48 (57.83)		14780.5 (14.39)		4087.88 (3.98)		5969.62 (5.82)		14153.3 (13.78)		102656.5
2001-02		61083.49 (59.49)		13325.4 (12.97)		3930.22 (13.82)		471.75 (4.58)		16161.97 (15.74)		102662.5
2002-03		62020.71 (60.41)		12627.98 (12.29)		3667.31 (3.57)		4837.81 (4.71)		16009.7 (15.59)		102668.6
2003-04		61780.72 (60.17)		12666.5 (12.34)		3597.48 (3.50)		4912.04 (4.78)		16160.32 (15.73)		102674.8
2004-05		61762.94 (60.15)		12656.8 (12.33)		3576.6 (3.48)		4893.03 (4.76)		16243.82 (15.87)		102681.0

(Figures in parentheses indicate percentages to total)

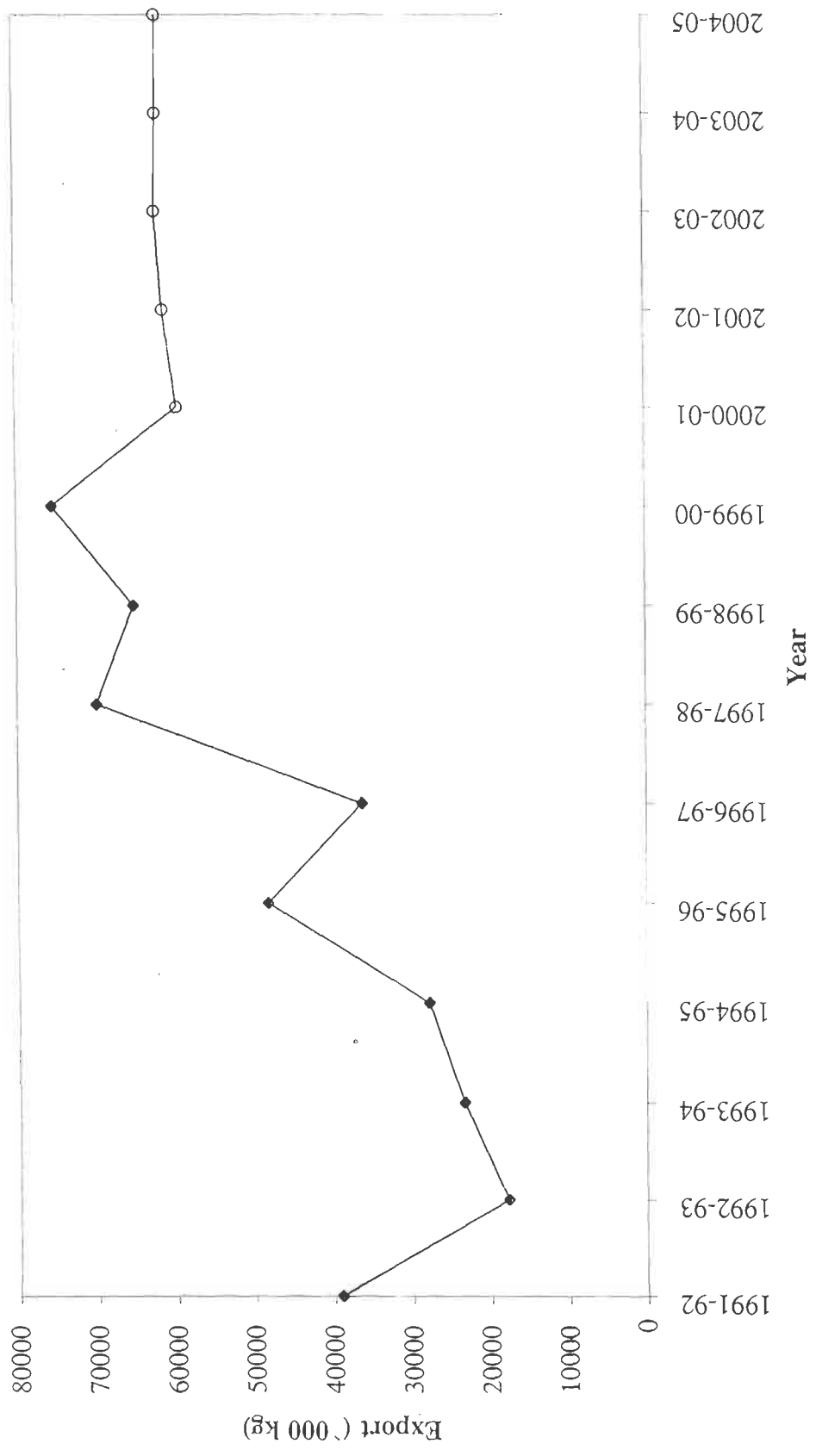


Fig. 3. Export of South Indian Tea to Russia (1991-92 to 2004-2005)

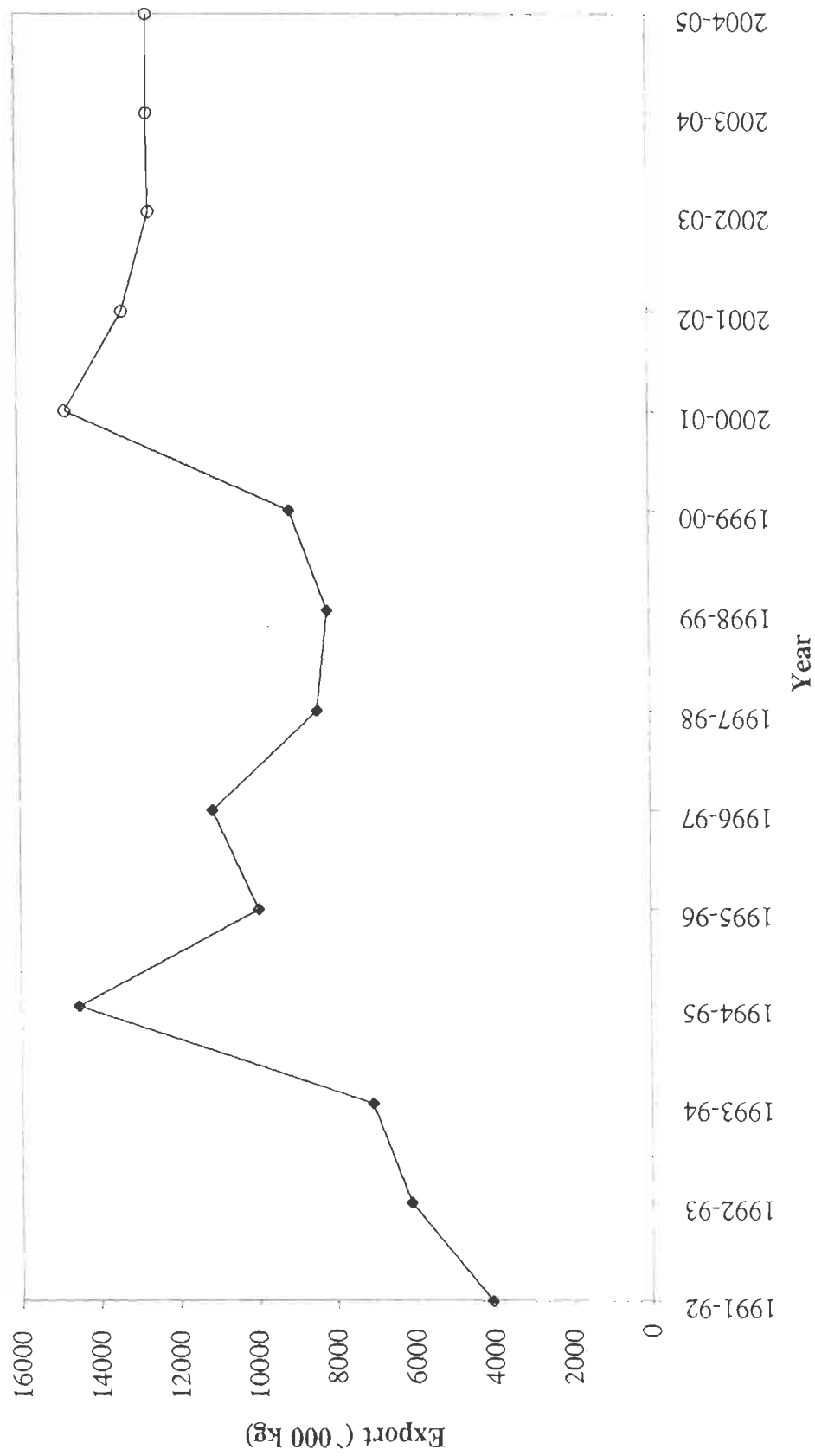


Fig. 4. Export of South Indian Tea to Poland (1991-92 to 2004-2005)

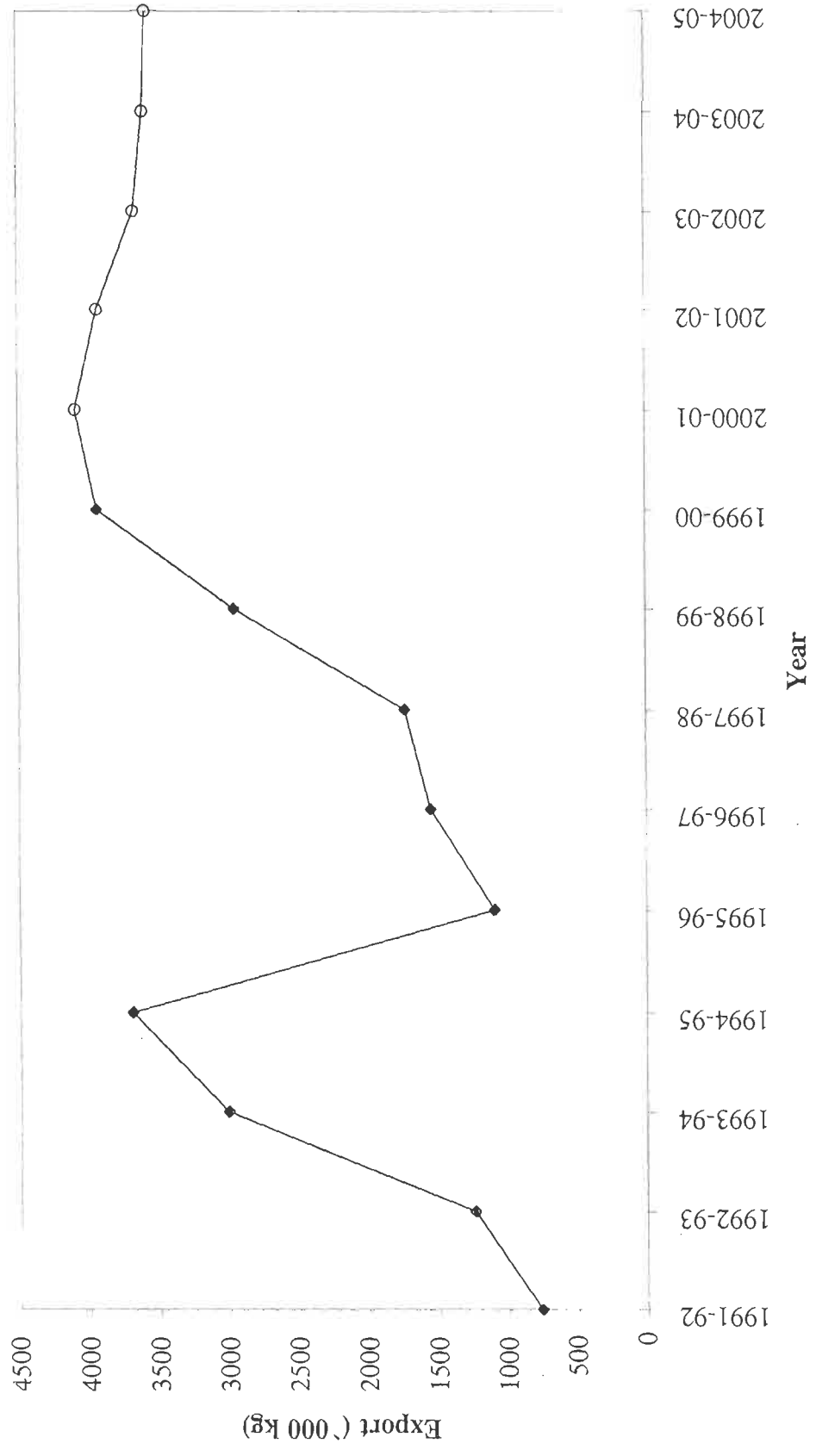


Fig. 5. Export of South Indian Tea to U.S.A. (1991-92 to 2004-2005)

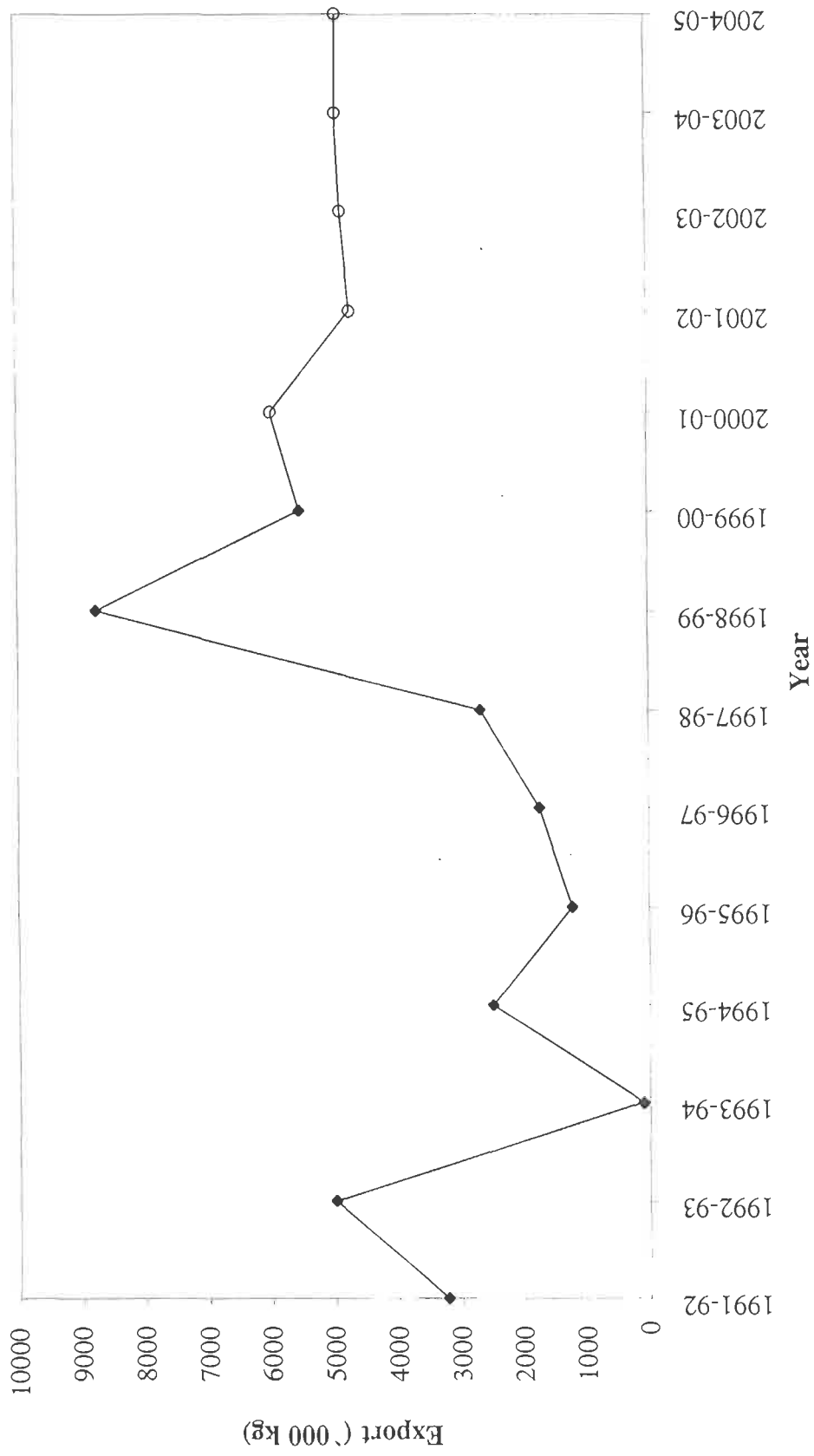


Fig. 6. Export of South Indian Tea to A.R.E. (1991-92 to 2004-2005)

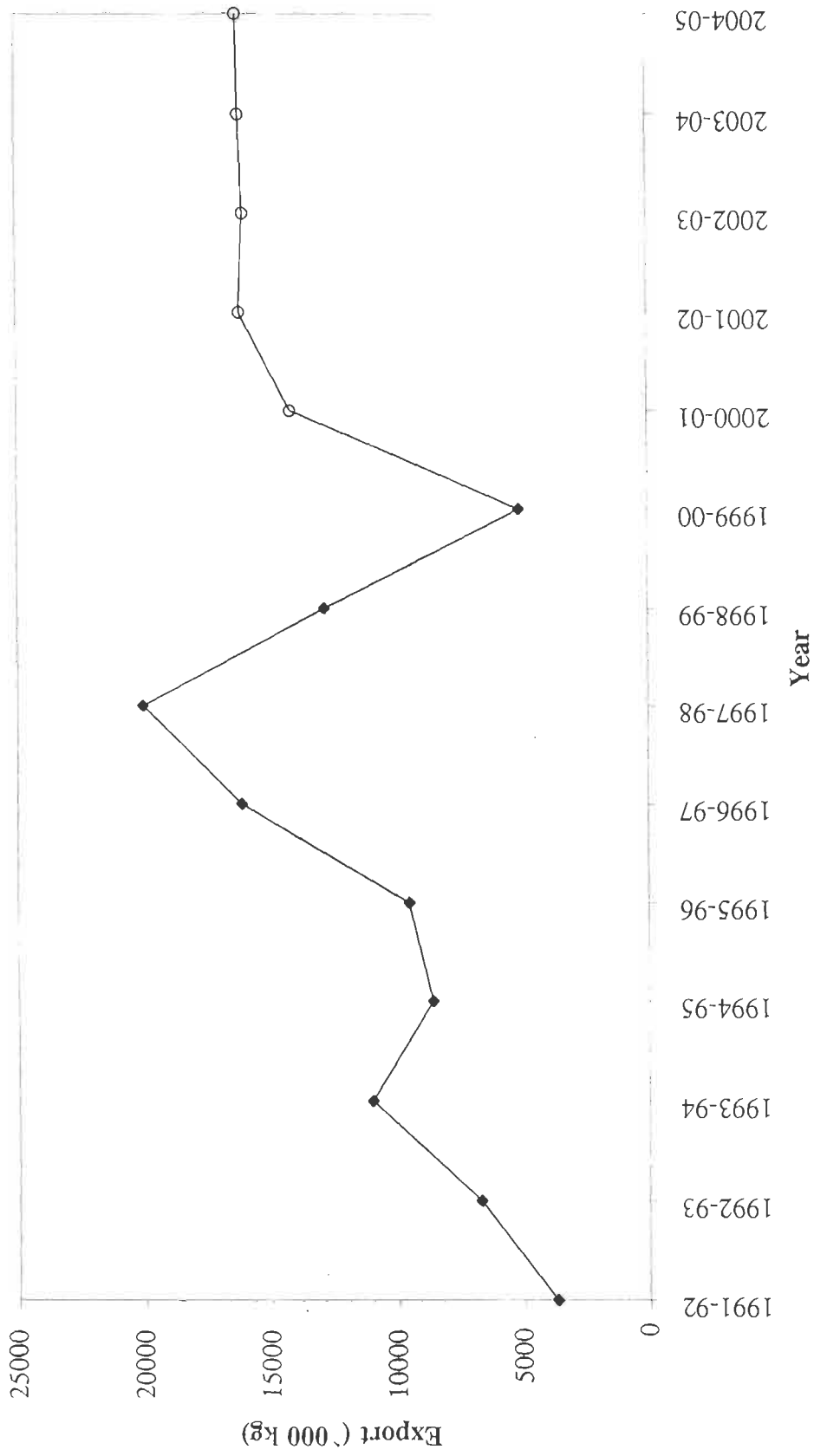


Fig. 7. Export of South Indian Tea to other Countries (1991-92 to 2004-2005)

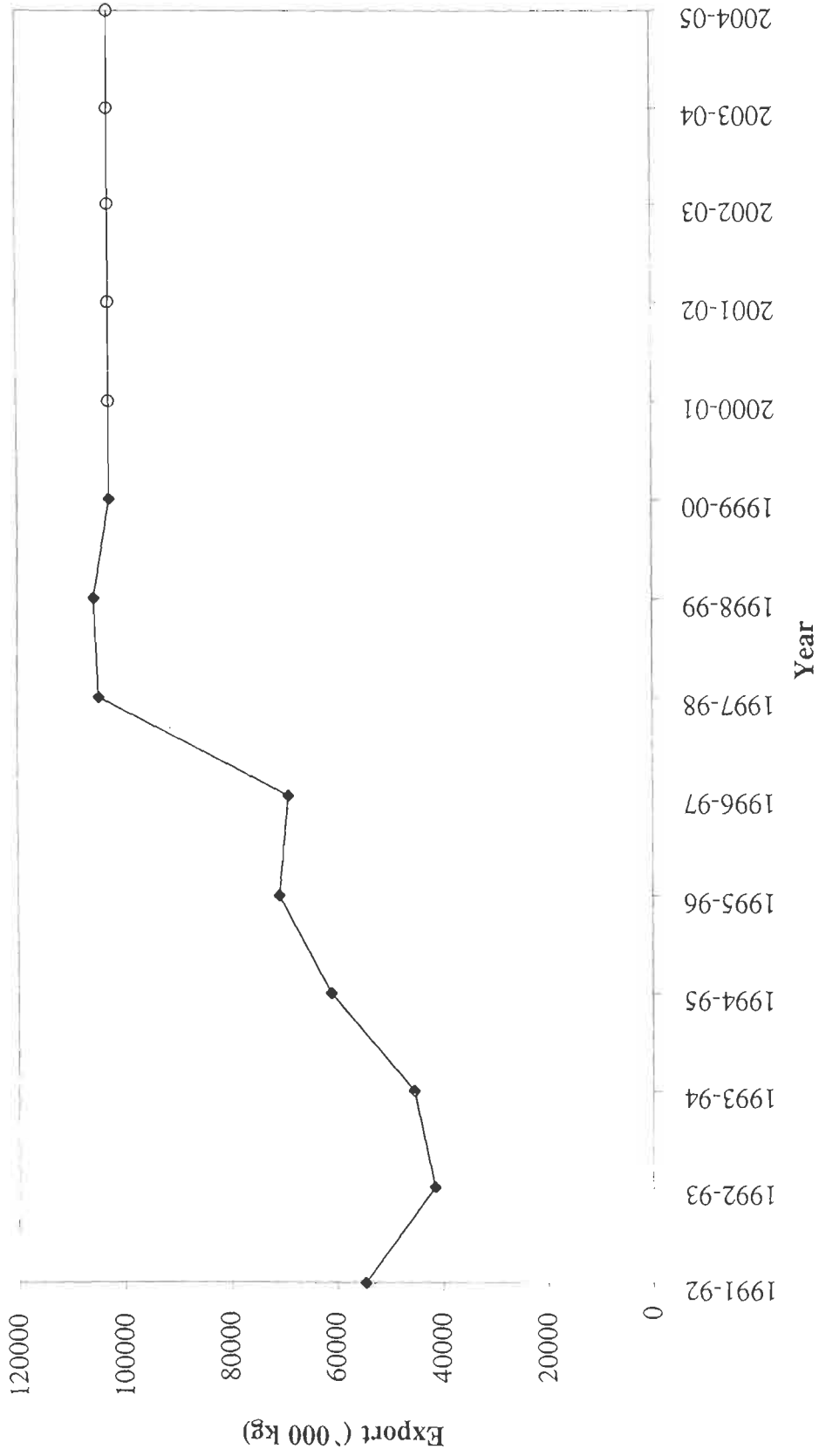


Fig. 8. Total Exports of South Indian Tea (1991-92 to 2004-2005)

increase from 70 million kg during 1991-92 to 103 million kg during 2004-05. The actual and projected exports to Russia, USA, Poland, A.R.E., other countries and the total South Indian tea exports are depicted in Fig.3 to Fig.8.

In sum, Russia is going to continue its dominant place as major importer of South Indian tea, inspite of the financial difficulties faced by this traditional market. South Indian tea exporters therefore, will have a hold in the export market of Russia and supply of quality tea at reasonable rates and favourable credit terms will improve our market share in Russia since, South Indian tea, especially black tea suits to Russian tastes. The U.K. will depend on the supply from other sources rather than South Indian tea as most of the sterling tea companies had started tea cultivation in Kenya after the implementation of Foreign Exchange Regulation Act (FERA) in India. So the United Kingdom will look forward to tea from Kenya rather than South India. U.S.A. will continue to occupy its important position in our export destination and efforts to increase the value-added, packet tea exports to U.S.A. will improve our market share in that country. Tea exports to the Near Eastern countries depend on the firmness of the oil prices. Other new countries going to be included in our export basket is a good sign of relief as, depending on one or two destinations for our exports will be more risky when those countries suffer from economic depression and other problems.

(iv). Market Integration

Market integration implies that the price changes that occur in one market would immediately be transmitted to the other market. Integration of markets is a good indicator of efficiency in the marketing system. Co-integration analysis was used to test the integration of CTC leaf tea prices. Testing was done for monthly prices of four regional auction markets namely, Kolkata, Guwahati, Coonoor and Cochin for the period 1978-2000.

Regional Integration of Market

Co-integration test starts with the pre-condition that if two time series variables could be integrated, they should be of the same order of integration. To have the same order of integration these variables should be stationary when they are differenced the same number of times. Hence, the test of co-integration starts with a test of stationarity at different differenced levels. To test for stationarity, the Dickey Fuller (DF) test and the Augmented Dickey - Fuller (ADF) tests were used. When the price data were used as such without any differencing, the DF and ADF tests gave non-significant estimates as could be seen from Table XXXI. This indicated that the null hypothesis that is, the data were not stationary, was accepted. In order to find its stationarity, the DF and ADF tests were applied on the first difference of these data. This time the estimates were found to be significant implying that the data were stationary with the order of integration being one that is, I(1).

TABLE XXXI.
TESTING FOR ORDER OF INTEGRATION - DF AND ADF TESTS
FOR CTC LEAF TEA PRICES

Variables	DF	ADF
(a) Levels		
Kolkata	-1.5145 ns	2.586 ns
Guwahati	-1.5862 ns	1.299 ns
Cochin	-1.419 ns	0.632 ns
Coonoor	-1.190 ns	0.789 ns
(b) First difference		
Kolkata	-16.688*	-3.925*
Guwahati	-16.802*	-4.354*
Cochin	-16.414*	-5.319*
Coonoor	-16.361*	-5.06*

* Significant at ten per cent level of probability

ns = Not significant

These data were now qualified for the pair-wise integration tests. Thus, the basic premise of co-integration that for a long-run equilibrium to exist between variables, the possession of the same inter-temporal characteristics were fulfilled. The results of the pair-wise co-integrating regressions were given in Table XXXII. The results showed significant coefficients and high R^2 values for all the chosen regional auction markets.

TABLE XXXII.
TESTING OF THE PAIRWISE CO-INTEGRATION - CTC LEAF TEA PRICES

Dependent variable	Independent variable	R^2	Intercept	Co-efficient**
Kolkata	Guwahati	0.99	-0.046	1.031
	Cochin	0.91	-1.485	1.319
	Coonoor	0.91	2.084	1.248
Guwahati	Kolkata	0.99	0.246	0.964
	Cochin	0.91	-1.187	1.272
	Coonoor	0.90	2.284	1.202
Cochin	Kolkata	0.91	3.477	0.695
	Guwahati	0.91	3.444	0.717
	Coonoor	0.99	2.814	0.942
Coonoor	Kolkata	0.91	0.828	0.734
	Guwahati	0.90	0.818	0.757
	Cochin	0.99	-2.719	1.052

** Significant at one per cent level of probability

For testing whether the prices were co-integrated, the residuals obtained from these co-integrating regressions were tested for stationarity using the Co-integrating Regression Durbin Watson (CRDW) and Engle Granger (EG) tests. This followed the assumption that for two variables to be co-integrated, a linear combination of the two

should be stationary. The results of the application of CRDW and EG tests on the residuals were given in Table XXXIII. All the pair-wise combinations for CTC leaf tea gave significant CRDW values showing that the prices in the regional auction markets in India were integrated. The results of the EG tests as well, gave significant estimates, again reinforcing that there existed a long-run equilibrium relationship between the prices of different regional auction markets in India. They moved close with each other and any change in price in one market was immediately passed on to the other markets.

TABLE XXXIII.
RESULTS OF THE ENGLE - GRANGER TESTS - CTC LEAF TEA PRICES

Dependent variable	Independent variable	Engle-Granger Test*	CRDW*
Kolkata	Guwahati	-13.3161	2.2
	Cochin	-5.9217	1.82
	Coonoor	-5.0939	1.82
Guwahati	Kolkata	-13.3562	2.03
	Cochin	-6.0747	1.73
	Coonoor	-5.3473	1.75
Cochin	Kolkata	-5.909	1.72
	Guwahati	-6.0203	1.71
	Coonoor	-5.7175	2.49
Coonoor	Kolkata	-5.0473	1.89
	Guwahati	-5.2570	1.89
	Cochin	-5.6873	1.93

*Significant at ten per cent level of probability

Now that it has been proved that there existed a long-term equilibrium between different regional market prices, it has to be tested whether they are in a short-run equilibrium as well. For this, the error correction model was applied to the data sets and the results are furnished in Table XXXIV. It could be noticed from the table that all the α_2 values were negative in all the pair-wise combinations. The negative values of α_2 indicated the speed at which the prices tend to approach the equilibrium in each period and it confirmed that the errors were corrected in the long-run. The selected regional auction markets in India were integrated and any price change in one market would be reflected in other market.

TABLE XXXIV.
RESULTS OF ERROR CORRECTION MODEL - CTC LEAF TEA PRICES

Dependent variable	Independent variable	α_0	α_1	α_2^{**}
Kolkata	Guwahati	0.042	0.820	-0.716
	Cochin	0.155	0.358	-0.166
	Coonoor	0.161	0.362	-0.131
Guwahati	Kolkata	-0.002	0.975	-0.793
	Cochin	0.139	0.423	-0.178
	Coonoor	0.154	0.359	-0.143
Cochin	Kolkata	0.091	0.205	-0.131
	Guwahati	0.092	0.205	-0.135
	Coonoor	0.046	0.802	-0.162
Coonoor	Kolkata	0.056	0.223	-0.078
	Guwahati	0.064	0.19	-0.081
	Cochin	0.009	0.858	-0.151

** Significant at one per cent level of probability

Integration Between Indian and International Market Prices

Co-integration tests for the regional auction markets in India namely, Kolkata, Guwahati, Coonoor and Cochin with the international auction markets London and Mombasa were attempted. The London market auction was selected as it was the major tea auction market in the international tea trade and could be quoted as the international reference market for tea. The Mombasa auction market was selected as it was considered as an emerging tea auction market in the world handling large quantities of tea, similar to that of Indian tea. As a first step in co-integration analysis, stationarity tests were done for the international markets as shown in Table XXXV. The DF and ADF tests for Mombasa auction market was not significant for levels, first differences, second differences and even third differences. Only on differencing at fourth time, it became stationary. In contrast, the London auction market was stationary at first differencing yielding significant DF and ADF values. These results confirmed that only the London auction market prices could be tested for co-integration with the Indian regional auction markets as all were stationary at the same level of differencing. The Mombasa auction market prices could not be tested for co-integration as they did not satisfy the stationarity condition. This showed that Mombasa auction market was not spatially integrated with the London auction market and the regional markets in India. The test for co-integration was carried out for the London auction market and the four regional markets and the results are furnished in Table XXXVI. A glance at the table revealed that London auction market prices were co-integrated with all the selected regional markets in India with high R^2 values and significant coefficients. The integration was confirmed by testing the residuals of the integrating regressions. The CRDW and EG tests were applied on the residuals of these regressions, gave significant estimates as shown in Table XXXVII, confirming the co-integrating relationship between the auction markets at regional and international levels.

TABLE XXXV.
TESTING FOR ORDER OF INTEGRATION - DF AND ADF TESTS

Variables		DF	ADF
(a)	Levels		
	London	-0.531 ns	-3.925 ns
	Mombasa		0.742 ns
(b)	First difference		
	London	-14.326*	-4.083*
	Mombasa		0.651 ns
(c)	Second difference		
	Mombasa	-0.652 ns	-1.107 ns
(d)	Third difference		
	Mombasa	-1.978 ns	-2.476 ns
(e)	Fourth difference		
	Mombasa	-20.450*	-9.89*

* Significant at ten per cent level of probability

ns - Not significant

TABLE XXXVI.
TESTING OF THE PAIRWISE CO-INTEGRATION WITH REGIONAL MARKETS

Dependent variable	Independent variable	R ²	Intercept	Co-efficient**
London	Kolkata	0.87	1.601	1.054
	Guwahati	0.86	1.612	1.085
	Cochin	0.82	2.175	1.279
	Coonoor	0.82	5.365	1.223
Kolkata	London	0.87	2.927	0.829
Guwahati	London	0.86	3.094	0.799
Cochin	London	0.82	3.566	0.641
Coonoor	London	0.82	0.964	0.675

** Significant at one per cent level of probability

TABLE XXXVII.
RESULTS OF THE ENGLE - GRANGER TESTS

Dependent variable	Independent variable	Engle-Granger Test*	CRDW*
London	Kolkata	-4.6323	1.65
	Guwahati	-4.9261	1.65
	Cochin	-4.1889	2.43
	Coonoor	-4.2403	1.61
Kolkata	London	-4.6073	1.61
Guwahati	London	-4.9426	1.82
Cochin	London	-4.0142	1.62
Coonoor	London	-4.1383	1.93

* Significant at ten per cent level of probability

The long-term equilibrium between London and the regional auction market prices had been proved and the test for the existence of short-run equilibrium was also done using the error correction model and the results are shown in Table XXXVIII.

TABLE XXXVIII.
RESULTS OF ERROR CORRECTION MODEL

Dependent variable	Independent variable	α_0	α_1	α_2^{**}
London	Kolkata	0.277	0.120	-0.092
	Guwahati	0.280	0.117	-0.085
	Cochin	0.289	0.113	-0.058
	Coonoor	0.282	0.142	-0.066
Kolkata	London	0.278	0.063	-0.078
Guwahati	London	0.247	0.091	-0.113
Cochin	London	0.157	0.652	-0.062
Coonoor	London	0.171	0.083	-0.073

** Significant at one per cent level of probability

All the α_2 values in the table were found to be negative in the linear combination of London auction market prices with the various regional auction market prices implying that these prices tend to approach the equilibrium in each period confirming that the errors were corrected in the long-run. Thus, the regional and international auction markets of tea are spatially integrated.

(v). Price Analysis and Forecasting of Tea

Generating meaningful price forecasts of tea will be of immense use for the producers in addition to all sectors of the economy. The Coonoor auction market price data was selected for this analysis, since the Coonoor auction market accounted for more than 50 per cent of the total auction sales of South Indian tea. The annual prices of CTC leaf tea was chosen for 26 years (1975 to 2000) and deflated using the annual wholesale price index of all commodities for Tamil Nadu, keeping the year 1970 as a base to remove the general effect of increase in the price level. The deflated prices were detrended to remove the trend effect and cyclical variations were computed from the time series data. The results of the analysis showed the existence of cycle in the prices. The length of the cycle was found to be five years which was confirmed by the harmonic analysis. The harmonic analysis results were shown in Table XXXIX. The results showed that once in five years period the tea prices will be attaining the maximum prices. The producers would obtain maximum profit in the peak years than in other years. The Coonoor tea prices followed this pattern and once in five years the prices were expected to reach the peak level and during 1997 the annual prices went upto Rs. 66/kg. In the future period, by the year 2002/2003 the prices were expected to gear up to the maximum level and currently the downward pressure on prices would continue till the next peak year would arrive. The existence of cycles in tea prices could be affected by the government policy of importing large quantities of tea through the removal of quantitative restrictions as per WTO agreement. Based on these results, forecasting of the price series was attempted with the Box Jenkin's Mixed Autoregressive Moving Average (ARMA) Model.

TABLE XXXIX.
CYCLICAL VARIATIONS IN DEFLATED, DETRENDED ANNUAL
COONOR CTC LEAF PRICES

Sl.No.	Fourier co-efficient	Value	R ² P	R ² M	K (5 years)
1.	A _p	-0.14014	0.1362	0.01178	
2.	B _p	0.1166			11.55

The price series was first tested for stationarity. The test of stationary was satisfied as, the auto-correlation function dropped off as k, the number of lags, became large. The stationary time series was checked as to whether it was generated by a white noise process, that is, the auto-correlation functions for K lag displacement was zero for all $K > 0$. In such a series aptly called as random walk, the future value depends on the current past value only and could be best explained by fitting an AR1 model. The selected time series was not a white noise process as revealed by the Box and Pierce Q statistics test. The estimated Q statistic (26.10) was greater than the critical value (22.31) at 90 per cent level and the time series was not generated by a white noise process. After satisfying stationary condition, the Box Jenkin's ARMA model fitting was done. In the first step of identification process, the auto-correlation and partial auto-correlation functions were estimated and they revealed the pattern of mixed autoregressive moving average model since no clear indication about the order of autoregressive or moving average parameters were shown by them. By trial and error process, the ARMA (5, 2) order was selected and the next step of estimation and diagnostic checking of the model was done.

In the estimation process, ARMA (5,2) was found to be the best fit equation by satisfying the test for residuals. The residuals were found to be white noise by the Box and Pierce Q statistics. The calculated Q value (6.33) was less than the critical Q value (19.81) at 90 per cent level. Here, the Q statistics test was a weak hypothesis test.¹

¹ A value of Q below the 90 per cent point on the chi-square distribution indicates that it is not necessary to reject the hypothesis that the residuals are white, since the probability that the hypothesis is true is less than 90 per cent. It is thus, only an indirect test of the hypothesis that the residuals are not white.

ARMA (5,2) model

$$(1 + 0.0217B + 0.6899B^2 + 0.3609B^3 + 0.3914B^4 - 0.4995B^5) y_t = 0.0101 + (1 - 0.3137B + 0.4529B^2)$$

$$R^2 = 0.39 \quad DW = 1.95$$

Standard error of regression = 1.09

The estimation of ARMA (5,2) equation thus gave the best fit satisfying the Q-statistics for residuals and the DW statistics was 1.95 indicating that serial correlation had no adverse effect on the regression estimates. The estimated values of auto-regressive parameters (ϕ_i) also summed upto a number less than one with a low standard error of regression (1.09). The diagnostic checking of the statistics has been satisfied now and using these estimates the forecasting of future prices was attempted for the period upto the year 2010 (Table XL). The actual and forecasted values are depicted graphically in Fig.9.

TABLE XL.
FORECASTING - COONOR CTC LEAF TEA PRICES

(Rs./kg)

Year	Actual prices	Forecast prices	Error
1975	7.49	9.17	-1.68
1976	10.32	9.01	1.31
1977	10.89	9.76	1.13
1978	8.01	9.48	-1.47
1979	11.36	10.57	0.79
1980	8.34	11.99	-3.65
1981	12.17	14.18	-2.01
1982	14.48	15.98	-1.50
1983	21.46	18.83	2.63
1984	21.52	17.82	3.7
1985	11.63	16.77	-5.14
1986	20.99	19.19	1.8

(Contd...)

TABLE XL. (Contd...)

Year	Actual prices	Forecast prices	Error
1987	19.33	19.13	0.2
1988	17.05	20.51	-3.46
1989	37.66	28.12	9.54
1990	37.83	30.86	6.97
1991	29.72	26.45	3.27
1992	29.96	28.61	1.35
1993	41.94	31.72	10.22
1994	26.83	28.54	-1.71
1995	41.05	41.01	0.04
1996	39.49	58.93	-19.44
1997	66.47	63.86	14.56
1998	53.92	51.91	2.01
1999	53.64	51.48	2.16
2000	38.45	49.16	-10.71
2001	-	52.87	-
2002	-	49.95	-
2003	-	57.92	-
2004	-	63.69	-
2005	-	63.53	-
2006	-	54.98	-
2007	-	53.91	-
2008	-	56.45	-
2009	-	60.15	-
2010	-	64.67	-

In order to assess the forecast performance of the model, the error measurements were computed and the results are furnished below in Table XLI .

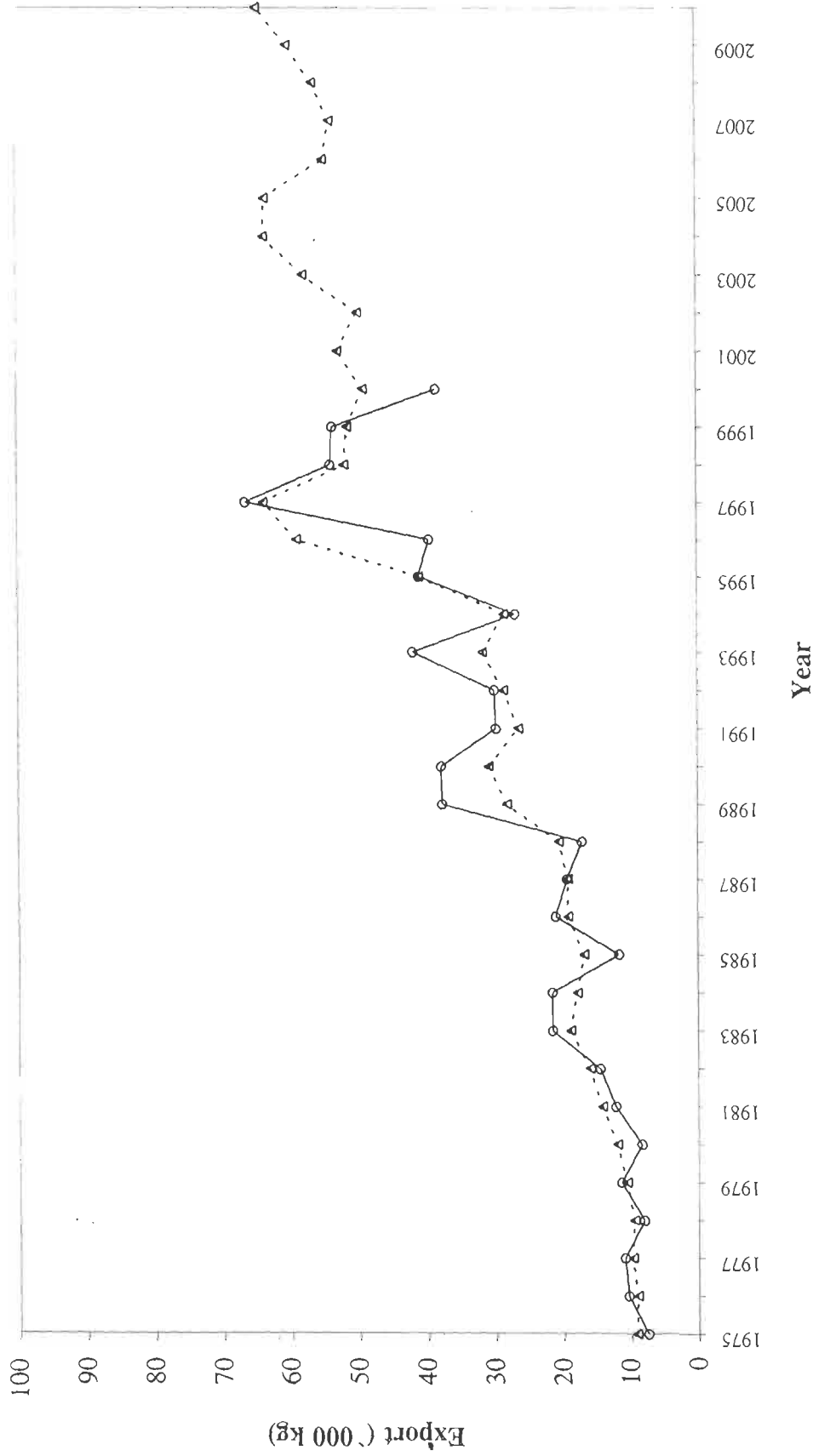


Fig. 9. Actual and Predicted CTC Leaf Tea Prices at Coonoor Auction Market

TABLE XLI.

ERROR MEASUREMENTS FOR FORECAST PERFORMANCE : (1975 TO 2000)

Mean error	0.0315
Mean absolute error	3.854
Root mean square error	5.72
Theil's inequality coefficient	0.18413

It could be inferred from the table above, that the magnitude of the estimated errors were quite low. Theil's inequality coefficient U was 0.184 implying that the selected model was performing better than the 'naïve' forecasts of no change. So, the mixed auto-regressive moving average model of order (5,2) performed well in forecasting the annual CTC leaf tea prices of Coonoor auction market.

(vi). Export Competitiveness

The export competitiveness of South Indian tea was analysed using nominal protection coefficient (NPC) and domestic resource cost (DRC) under both the importable and exportable hypotheses for the year 1998. In the domestic resource cost estimation, the average cost obtained from the UPASI-KVK statistics was used although the marginal costs were more relevant than average cost in estimating the DRC. This might have a carry over effect in the analysis. It could be observed from Table XLII, that South Indian tea was disprotected as NPC was less than one (0.63) under importable hypothesis. It showed that the domestic auction price of South Indian tea was below the international price of tea and therefore the South Indian tea was an efficient import substitute. Similarly, the domestic resource cost of tea was also less than one (0.61) under importable hypothesis and 0.79 under exportable hypothesis, indicating that the tea growers had to spend less than Re.1 to earn one rupee equivalent of foreign exchange. Hence, it was less costly to produce tea using the domestic resources than to import it.

The NPC was less than one (0.84) for South Indian tea under exportable hypothesis indicating that South Indian tea was competitive in the international market and hence it was an efficient exportable commodity.

TABLE XLII.
EXPORT COMPETITIVENESS OF SOUTH INDIAN TEA

Hypothesis	NPC	DRC
Importable	0.63	0.61
Exportable	0.84	0.79

The escalating cost of cultivation caused mainly by higher labour charges and input costs might have an effect on the competitiveness of South India tea in the present WTO environment. In such a case, the export competitiveness of tea would be eroded and the new entrants like Kenya would have an added advantage of producing tea at lower costs and higher yield levels than the established countries like India. Thus, South Indian tea might be losing its competitiveness in production in the future periods.

(vii). Exporters' Response to the Current WTO Implementation and Constraints Faced in Tea Exports

Exporters Response : Game Theory Model

With the implementation of World Trade Organization (WTO), Agreement on Agriculture (AoA), the export trade scenario underwent many changes including removal of trade barriers and quantitative restrictions. Presently, the exporters had to act in such a way to improve their trade gain realisation. A game theory model of two person zero sum game was evolved keeping some of the likely strategies or options followed by the tea exporters with the objective function to maximise the tea exports. Four scenarios that were prevailing in the current international trade pattern were assumed in view of the globalisation or trade openness. The exporters response to each scenario or their strategy of action in terms of their export value realisation was estimated. The scenarios which

were faced by the exporters were increasing competition, increasing quality consciousness, flourishing tea imports into India due to removal of quantitative restrictions and declining trend of world tea prices. The options to be followed by the exporter and the strategy played either by government or Tea Board were given as strategies S_1 to S_8 .

Strategy S_1 indicated the response of the exporter not to react to any of the scenarios and behave as in the past. The strategy S_2 indicated the response of the exporter to improve quality of tea by way of purchasing and exporting quality tea and also improve the quality by means of proper processing, blending and such other activities. The strategy S_3 indicated the response of the exporter to undertake promotional activities like floating brand name, logo mark, improved packaging, advertising and other such activities to increase their exports. The strategy S_4 indicated the action taken by the government to increase tea export by way of imposing higher import duty permitted under WTO rules, to prevent entry of cheap and poor quality tea into India either for domestic consumption or for re-export so that they would be damaging the image of Indian tea in other countries. The strategy S_5 indicated the efforts taken by the government and Tea Board to popularise our tea in new countries either by means of uninational or generic promotional activities, that is, diversify our export destinations which would be increasing our exports. The strategy S_6 was a combination of S_2 and S_3 that is, improving the quality of tea and undertaking promotional activities by the exporters. The strategy S_7 indicated the decision of government to impose higher import duty and both the government and Tea Board popularising tea in foreign countries (Combination of S_4 and S_5). The last strategy S_8 indicated the combination of strategies S_2 , S_3 , S_4 and S_5 to the four scenarios that were seen in the era of free trade.

TABLE XLIII.
PAYOFF MATRIX (EXPRESSED AS A PERCENTAGE OF GROSS
REALISATION OF EXPORT VALUE)

Constraints scenarios / strategies	A	B	C	D
S ₁	(-) 7.9	(-) 9.3	(-) 8.5	(-) 4.1
S ₂	0.5	10.2	2.9	1.1
S ₃	0.7	5.6	4.7	3.8
S ₄	0.9	4.5	1.6	1.5
S ₅	1.2	3.9	3.1	2.0
S ₆	0.8	7.3	4.8	3.9
S ₇	1.4	5.2	3.5	2.2
S ₈	4.6	12.1	8.6	5.4

Scenarios

A : Increasing competition; B : Increasing quality consciousness; C : Flourishing imports due to removal of quantitative restrictions; D:Declining trend of world tea prices.

Strategies Followed by the Exporters

S₁ - Do not react; S₂ - Improve the quality of tea; S₃ - Undertake promotional activities; S₄ - Government policy to increase import duty on tea; S₅ - Government and Tea Board to implement promotional activities in order to popularise South Indian tea in various destinations; S₆ - Improving the quality combined with undertaking promotional activities by the exporters; S₇ - Increase of import duty on tea and implementing promotional activities to popularise South Indian tea in various countries by the government and Tea Board; S₈ - Exporters activities like quality improvement and promotional activities combined with the government measures of raising import duty and popularising South Indian tea in new countries, that is, combination of S₂ to S₈ strategies.

The pay off matrix has been arrived at by calculating the percentage increase or decrease in the gross realisation of export value as a result of choosing an appropriate strategy under the prevailing scenarios. It could be seen from Table XLIII, that when the scenario of increasing competition in the world tea market exists the exporters following the strategy one which meant that they did not react to such condition, might loose their export value by 7.9 per cent and will be loosing to the maximum of 9.3 per cent, when the tea trade was based on quality consciousness in the importing nations. The loss to them was 8.5 per cent and 4.1 per cent respectively when the tea imports increased and the trend of declining tea prices in the world continued.

By following the strategies S_2 to S_8 , the exporters did not loose anything, instead gained some per cent in gross realisation of export value. By following S_2 , the tea exporters might be gaining 10.2 per cent in the quality conscious scenario, 2.9 per cent when tea imports were allowed freely by the government and 1.1 per cent when the prices were declining and 0.5 per cent when there was increased competition. The exporters would gain a maximum of 5.6 per cent when undertaking promotion measures as a strategy in the quality conscious scenario. They would gain 4.7, 3.8 and 0.7 per cent respectively under the free imports, declining prices and increasing competitive scenarios. When government imposed maximum permissible import duty, then exporters gained 4.5 per cent when all importing nations demanded quality tea, 1.6, 1.5, 0.9 per cent gain in case of higher import duty, declining prices and increasing competition scenarios.

The exporters would gain 3.9, 3.1, 2.0 and 1.2 per cent of gross realisation of their export value when government and Tea Board implemented promotional campaigns in the new destinations for promoting South Indian tea. If the exporters improved quality and undertook promotional measures, they would gain a maximum of 7.3 per cent gross realisation in quality conscious scenario, 4.8 per cent when imports were allowed freely

and 3.9 per cent when world tea prices were declining at least 0.8 per cent when the competition increases. If government imposed higher import tariff and undertook promotion campaign along with Tea Board, exporters would be gaining 5.2, 3.5, 2.2 and 1.4 per cent in gross realisation of export value in the quality conscious, imports of tea flooding in, reduction of the tea prices and increasing competition scenarios. The maximum gain of 12.1 per cent occurred when the scenario of increased quality consciousness prevailed and they opted for a mixed strategy S_8 , that is, combination of strategies, S_2 to S_5 . The exporters gained 8.6, 5.4 and 4.6 per cent respectively for imports flourishing, world tea prices declining and increasing competition scenarios.

The optimal strategies to be followed by the exporters based on their response to the various scenarios were obtained by solving the payoff matrix through linear programming format. The results indicated that S_8 strategy increased their export value realisation by at least 34 per cent and S_3 and S_4 strategies increased their export value realisation by 16 and 22 per cent respectively. When the exporters followed S_1 that is, did not react to the changing scenarios, they might be losing about 10 per cent of the export value realisation. Thus, efforts from the exporters, government and the Tea Board were essential for increasing tea exports in the future. The exporters must pay higher attention to the quality of tea they would export, undertake promotional activities to export their tea in a competitive environment. The Tea Board and Government should also take necessary actions to popularise South Indian tea in various new markets and Government should impose higher import duty on tea to permissible extent to protect the tea industry and enhance good quality tea exports in future.

Constraints Faced by the Tea Exporters

The sample tea exporters were enquired about the various constraints faced by them in exporting tea. These constraints were ranked using Garrett's Ranking technique and presented in Table XLIV.

TABLE XLIV.
CONSTRAINTS FACED BY THE TEA EXPORTERS

Sl.No.	Constraints	Mean score	Rank
1.	Huge competition from other producing countries supplying tea at lower prices	73.5	I
2.	Increasing imports of poor quality tea into our country	69	II
3.	Preference of consistent quality product (tea) at cheap rates by importing countries	63	III
4.	Inadequate promotional measures to popularise South Indian tea in the importing nations	59.75	IV
5.	Absence of export incentives from government to encourage tea exports	55.85	V
6.	Imposition of non-tariff barriers on South Indian tea by the importing countries	51.75	VI

From the table above, it could be evidenced that the presence of huge competition from other tea producing nations supplying tea at lower prices was the most important constraint faced by the exporters. Increasing imports of poor quality tea, preference of consistent quality tea at cheaper rates by the importing countries, inadequate promotional measures to popularise South Indian tea (Nilgiri tea) in the importing countries, absence of export incentives from the government to increase the tea exports and imposition of non-tariff barriers by importing countries on South Indian tea were found to be the major constraints followed in that order, as perceived by the tea exporters. Huge, competition from Kenya, Sri Lanka, Indonesia and other tea producing countries had led to an imbalance in world supply and demand for tea. Excess supply from all the producing nations had led to downward pressure on tea prices. Moreover the new emergent countries like Kenya had added advantage in production technology and enjoy cost advantage over the established nations. Similarly Sri Lanka has increased their

production, since their tea plantations were nationalised. The situations in South India, was the worst, since the cost of production was escalating due to high labour and input costs on one side and on other about 70 per cent of the tea plantations were more than 50 years old and had crossed their economic life of production. In addition, the countries like Kenya and Sri Lanka did not have a domestic base for tea and they export more than 90 per cent of production and off-load their tea at cheap rates and extended credit terms.

The importing nations, especially the third world countries facing financial problems, has turned towards the cheap tea from these nations and so our exporters were affected seriously by this situation. Removal of quantitative restriction as per the WTO rules resulted in import of tea from other countries. Since we are the largest tea consumer in the world, imports flourish from various sources and this has led to an adverse situation for the exporters. The cheap tea entering into India was blended with the tea produced here and re exported as Indian tea. This has caused concern to our exporters, since our image in the world tea market would be spoiled by such activities. The major importing nations persist for quality products at cheaper rates and our tea were subjected to quality tests by those importing nations. The traditional importers also switch over to other sources where they get cheap rate tea of consistent quality. The promotional activities for our tea in various nations were inadequate and promotional campaign conducted jointly by Tea Board and the Government had not taken place periodically in new nations to popularise our tea. Absence of export incentives was found to be a constraint by the exporters, which could not be given due to WTO restrictions. Our tea were rejected based on quality grounds and made uncompetitive by levying heavy import duties by some of the importing nations. This discriminatory policy by these importing nations has affected our exporters. So, in order to increase the tea exports in future, suitable measures to remove these constraints would be the most required ones.

SUMMARY AND CONCLUSION

CHAPTER VI

SUMMARY AND CONCLUSIONS

The present study was carried out to analyse the various aspects of export trade of South Indian tea. The specific objectives of the study were to: analyse the growth and instability of South Indian tea exports; examine the direction of South Indian tea exports and project its future exports; estimate the extent of market integration of various regional and international tea auction markets; study the price behaviour of South Indian tea and forecast the same for future period; assess the export competitiveness of South Indian tea; and perceive the response of the exporters in the present liberalised era and suggest suitable measures to overcome the constraints if any, in order to enhance tea exports.

The study was carried out based on both primary and secondary sources of data. The primary data were collected from the tea exporters in Coonoor and Coimbatore regions. These regions were selected as they served as auction centres in Tamil Nadu; the major producer of tea in South India. Based on the data collected from the tea exporters, their general characteristics like experience in tea trade, types of tea exported, promotional measures undertaken and the quantum and value of tea exported by them to various destinations were analysed. Similarly, the secondary data relating to tea exports and auction market prices obtained from UPASI and Tea Board, Coonoor, were analysed with the aid of various econometric tools to get meaningful inference. The summary of the findings, the conclusions made and the policy implications are outlined in this chapter.

(i) Summary

The findings of the study are summarised in this section.

General characteristics of the Sample Exporters

The sample exporters in Coonoor and Coimbatore regions had adequate experience and knowledge in tea trade. Majority of them (53 and 47 per cent) in

Coimbatore and Coonoor regions were exporting tea for a period of five to ten years. One third of the sample exporters in Coonoor region were having considerable experience of more than 20 years in tea trading, while 13 per cent of Coimbatore exporters were having more than 20 years experience. The sample exporters in both the regions had fairly a long experience and knowledge in the tea export trade.

The CTC and orthodox tea were the major types of tea, the sample exporters were exporting, besides the value-added tea like tea bags, packet tea in convenient and attractive consumer packs. These tea were in great demand in the developed countries like U.S.A., Europe, Australia etc.

The sample exporters in both the regions resorted to the use of brand name as a major promotional measure in exporting tea besides use of symbol, attractive packing and logo mark. Most of these promotional measures were effected for value-added or convenient tea and the sample exporters were of much concern about the quality of tea exported by them, as only good quality tea would fetch higher prices, retain the market share and maintain the good-will in the importing nations.

Export Destinations

The sample exporters export their tea to countries like Russia, United States of America, United Kingdom, Poland and Arab Republic of Egypt. However, on an average more than 60 per cent of tea was exported to Russia by the sample exporters. Eventhough Russia is facing financial problems, our exporters continue to off-load tea in that country as they had developed a base in that market and our tea also suits the Russian taste. The next major destination was U.S.A. and nearly 16 per cent of the tea export was sent to that country, followed by Poland (12 per cent), A.R.E. (7 per cent) and U.K. (4 per cent). The export quantity and value of tea to various countries differed to a great extent.

Tea Exports Growth

The growth performance of South Indian tea exports in terms of quantity, value and unit value were analysed for the pre-liberalisation, post-liberalisation and overall periods. The growth rates of export quantity, value and unit value were significantly higher in the post-liberalisation period, which was attributed partly to free trade occurring among nations and partly to the increase in tea production in the later period of the liberalisation era. Moreover, the world supply of tea was increasing in this decade causing imbalance in the demand-supply situations, thereby leading to downward pressure on tea prices. The growth in export unit value was found significant in all the three periods for the South Indian tea which might be due to the declining rupee value against dollar terms. The average rupee value against the dollar had reduced to 200 per cent in the latter period over the former period. The growth momentum in South Indian tea exports were maintained during the past two and-a-half decades.

Instability in Tea Exports

The quantitative effect of the export quantity, unit value and their variability on export value over years were analysed by decomposition method. The prime cause for the increase in the average export value (46 per cent) was the increase in the average export unit value. The increase in the average export quantity also accounted for 33 per cent increase in the average export value. The variability effect of both export quantity and export unit value and their interaction effects were contributing to 17 per cent and three per cent respectively to the increase in export value.

The major source for the instability in export value was the change in the variance of the export quantity, which accounted for 32 per cent. The interaction terms, caused both by the export quantity and unit value accounted for 24 per cent of increase in the export value variability. The change in the export unit value variance accounted for 11 per cent increase in export value variance. The co-efficient of variation of export

quantity increased to 35 per cent in the post-liberalisation period from 21 per cent in the former period and affected the stability of the export value to a larger extent. Similarly, the co-efficient of variation in export unit value reduced to 27 per cent in the post-liberalisation period from 38 per cent in the former period, which accounted for only 11 per cent increase in variance of export value. Among all the components of change, the variability effect of both the export quantity and export unit value had little stabilising effect on the variance of export value.

Directions of Tea Exports

The structural change in the share of South Indian tea exports were analysed through a first order marker model. The six major importing nations of South Indian tea were selected as they accounted for more than 80 per cent of total exports and the remaining countries were pooled under the group 'other countries'. From the transitional probability matrix, Russia, U.S.A. and 'other countries' were identified as stable importers of South Indian tea, since they had their own retention of shares and also gained from others. On the contrary, Poland, A.R.E. and Tunisia had a probability retention of zero, indicating that they were unstable importers. Poland though did not had its own share of retention, gained to a maximum extent from U.K., U.S.A., A.R.E. and Russia. U.K. had very minimal (less than one percent) retention of their own shares and lost to others. This revealed that Russia and U.S.A., the traditional importers, would continue to occupy their positions in future also, while exports to countries like Poland, A.R.E. might be fluctuating from year to year. Exports to U.K. and Tunisia were not bright in future and export to 'other countries' would gain momentum and more new countries would be included in our export basket, which was a welcome trend, since depending on one or two nations was always risky; when those countries were caught in financial crunch and other problems. The future projections to Russia, U.S.A., Poland, A.R.E. and 'other countries' were as expected and Russia occupied 60 per cent of our

export in future, U.S.A. - three per cent, Poland - 12 per cent, ARE - five per cent and other countries - 15 per cent during the year 2004 - 2005. The total South Indian exports remained at the level of 103 million kg during 2004-05.

Market Integration

The market integration of various regional and international tea auction markets were assessed employing co-integration tests. The four regional markets namely, Kolkatta, Guwahati, Cochin and Coonoor were found stationary at first differences and were found to be integrated with each other with high R^2 values and significant co-efficients. The integration of these markets were further confirmed by subjecting the residuals to EG and CRDW tests which yielded significant estimates. The integration in the long-run was thus confirmed and short-run relationship was analysed through error correction model. The results obtained indicated that the errors would be corrected in the short-run and all the selected regional tea auction markets in India were found integrated with each other.

The selected regional auction markets were further subjected to integration tests with the international auction markets namely London and Mombasa. The London market was stationary at first difference, while the Mombasa auction market was found to be stationary only at the fourth difference and so could not be tested for integration. The London auction market was found integrated with all the selected regional auction markets in India with high R^2 values and significant co-efficients. The residuals subjected to EG and CRDW yielded significant estimates and the error correction test gave significant estimates, negative value to ' α_2 ' term and these results confirmed integration of the London auction market and the four regional auction markets in India. Thus, the price change at the international level was passed on to the regional markets and the Indian auction market prices were not insulated from the international price risks.

Price Analysis and Forecasting

The temporal price analysis of Coonoor auction market was carried out for determining the presence of cyclical variations in the annual tea prices and forecasting of this price series was attempted. The CTC leaf tea annual prices for 26 years were first deflated using the annual whole sale price index of all commodities for Tamil Nadu to remove the general effect of increase in the price level. The deflated prices were then detrended to remove the trend effect and cyclical variations were computed. The existence of five year cycle was identified and was confirmed by harmonic analysis. The tea producers would reap maximum profit once in five years when the prices escalated to the peak level. The operation of cycle in tea price could be affected by random variables like the government policies involving removal of quantitative restrictions which led to large imports of tea into the country. Forecasting of tea prices was then attempted using Box Jenkins' Mixed Autoregressive Moving Average Model. The price series was found stationary and also was not found to be a random walk model. An ARMA(5,2) model was found to be the best fit satisfying the diagnostic test for the residuals, to be white noise. Using the estimated values, forecasting was done upto the year of 2010 and tea prices were found to increase slowly and attain the maximum in the year 2004. The forecast performance of the model was tested by computing the error measurements. The magnitude of the estimated errors were found to be quite low and the model ARMA (5,2) performed better in Coonoor tea price forecasting.

Export Competitiveness

The export competitiveness of the South Indian tea was assessed by the parameters NPC and DRC under both importable and exportable hypotheses. The NPC co-efficients under both hypotheses were less than one, indicating that South Indian tea was an exportable commodity and also an import substitute. The DRC measurements under both hypotheses yielded co-efficients less than one indicating that the domestic resources were used efficiently in producing tea and the tea growers had to spend less

than one rupee to earn one rupee equivalent of foreign exchange to produce tea domestically. Even though these measures indicated tea as an efficient exportable commodity, the declining tea prices at regional auction markets, high cost of cultivation due to higher labour and input costs, quality becoming poor due to improper field operations and inefficient operations at processing have caused great concern to the South Indian tea export in the future.

Exporters' Response

The sample exporters' responses to the changing scenarios in the present liberalised WTO era were assessed. The exporters who attempted to follow the combination of strategies in various scenarios in the present situation would gain some profit. The strategies like improving the quality of tea exported, undertaking promotional measures by the exporters, increasing the import duty on tea to the maximum permissible levels by Government of India and along with Tea Board undertaking promotional campaigns in foreign destinations are needed to increase the gross realisation of their export values. The exporters who did not react to the changing scenarios, that is, did not concern about quality, promotional activities, import of tea, role of government and Tea Board would be losing 10 per cent in their export gross value realisation. The optimal strategies to be followed by the exporters were arrived at by solving the pay-off matrix and the results indicated that by following the mixed strategy, that is, both the exporters, tea board and government taking suitable measures to enhance tea exports would be yielding 34 per cent increase in export value realisation. Similarly, the exporters' promotional activities and Government policy to raise the import duty of tea would increase their export value by 16 and 22 per cent respectively.

Constraints in Exports

The sample exporters were enquired about the various constraints faced by them in tea exports and the constraints were ranked using Garrett's Ranking technique.

The most important constraint faced by the exporters was the huge competition from other nations, who supplied tea at lower prices. The new entrants like Kenya, Indonesia enjoyed cost advantages in production technology and did not have a domestic base of consumption in their own nations, off-load their tea at international markets at cheaper prices and extended favourable credit terms. These were the reasons for keen competition at world level for tea. The other constraints faced by the exporters were import of tea especially cheap, poor quality tea into India due to the removal of quantitative restrictions, as per the WTO agreement. These tea were blended with Indian tea and the sub-standard tea were packed and exported as Indian tea tarnishing Indian image in the international markets. The importing nations, especially the third world countries facing economic depression or other problems preferred low priced tea and also demanded quality consistency from the suppliers. This formed the next important constraint faced by the exporters. The other constraints in the order of importance were the inadequate promotional measures by our country to popularise South Indian tea (Nilgiri tea) in the new destinations, absence of export incentives from Government of India and imposition of non-tariff barriers by on South Indian tea.

ii) Conclusions

The study results have led to conclude the following

- The growth momentum in South Indian tea exports experienced in the post-liberalisation period has to be enhanced in the future, in order to maintain South Indian export share in the international markets.
- The variances in the export quantity and unit value has to be reduced in order to stabilize the export earnings of South Indian tea.
- The diversification of South Indian tea exports in the future period called for adequate promotional efforts to popularize South Indian tea abroad.

- The integration of regional and international auction markets called for risk aversion measures in future to avoid any price shock transmitted to regional markets.
- The export competitiveness of South Indian tea in future would be enhanced by the reduction in cost of cultivation and increase in auction market prices.
- Suitable measures to remove the constraints faced by the tea exporters would improve the exports in future.

Hypotheses Testing

- The results of the export growth pattern revealed that a higher momentum of tea export growth, in the post-liberalisation period in terms of export quantity, value and unit value led to the acceptance of the hypothesis: 'There is a positive growth in South Indian tea exports'
- The increased share of exports to 'other countries' led to the acceptance of the hypotheses: 'The destinations of South Indian tea exports have widened to a large number of countries'.
- The integration of auction markets at regional and international level led to the acceptance of the hypothesis: 'There exists market integration between the various tea auction markets'.
- The export competitiveness of tea was confirmed from the nominal protection coefficient and domestic resource cost coefficient and it again led to the acceptance of the hypothesis : 'Tea is an export competitive commodity'.

(iii) Policy Implications

1. This study has shown that the export quantity, value and unit value of South Indian tea were in a growing momentum in the past decade and efforts to increase the production of tea would help in sustaining India's export share in the world market. This may be aimed at by increasing the productivity, as the area expansion has less chance.

2. The instability in the export value can be minimized / removed by improving the export quality of tea, which in turn, fetches higher unit value. The export of consistent quantity and quality tea in future must be given thrust.
3. Value-added tea exports must be given proper recognition since they are in great demand in Western countries. The instant tea, packet tea, tea bags and such other tea products must be developed and for which required infrastructural facilities must be created particularly in post-harvest technology research.
4. The future directions of export of South Indian tea relies heavily on Russia, U.S.A. and 'other countries'. Steps to popularise our tea in the new destinations by means of generic promotional programmes would help to diversify the export destinations. Once the economic crisis in Russia ends, the regular quantities could be shipped to Moscow, where our tea has become their favourite drink.
5. Feed back mechanisms on changing tastes and preferences of the foreign consumers must be well strengthened.
6. The integration of regional and inter-national auction markets implies that regional prices are not insulated from world price shocks. However, necessary preventive measures should be on hand to manage the price risk/shock transferred from world market, if any.
7. Imports of cheap and poor quality tea into India has created a threat to Indian tea industry and also tarnished the Indian image in importing countries as they were specifically meant for blending and re-export. By manipulating the tariff / import duty this problem may be well managed.

8. Tea consumption level has to be promoted among the younger generations by focussing on the health benefits of tea. Despite fierce competition in the out markets, this concept would enable the exporters to attract more foreign buyers.
9. Tea exports from India to some countries faces stiff quality tests, non-tariff barriers like involvement of child labour and presence of toxic substances in Indian tea and differential import duties. Efforts from Government are needed to manage these problems through WTO and enhance the tea exports.
10. Extending credit facilities to the exporters could increase tea exports, since other nations like Sri Lanka and Kenya extend favourable credit terms to the third world / developing countries.
11. In order to avoid production of poor quality tea, it is highly necessary that Tea Board imposes standards to prevent blending by organising a testing mechanism for different grades to ensure their originality. The imported tea should not be allowed to blend with Indian tea for re-export in Indian names. To this extent, the policy reorientation is a necessity.
12. The role of Tea Board apart from undertaking development measures, providing licences etc., should work for disseminating improved technology from the lab to the field level for production of quality tea. More research and development works should be carried out by tea research institutes to boost yield and hence production.
13. It is desirable to subject the tea produced to the test of Maximum Residue Limits (MRLs) for pesticides. Various tea importing nations are having different quality parameters and standards in force. There is an urgent need to harmonise these standards. The remedy lies in following uniform standards by both exporting and importing countries.

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APPENDICES

APPENDIX 1.

DESCRIPTION AND CHARACTERISTICS OF CTC TEA (SOUTH INDIA, NILGIRIS)

CTC Leaf Tea

FP - Flowery pekoe:
Appearance - Biggest granular size tea with embedded fibre or clean appearance
Liquor - Thin and plain 150-200 cups / kg

Pekoe

Appearance - Bolder grade with granulation and black and clean appearance
Liquor - Colour with medium strength 170-200 cups/ kg.

Bop - Broken Orange Pekoe

Appearance - Medium sized and granular clean teas
Liquor - Very coloury and strong with brightness and briskness 250-300 cups/kg

BP - Broken Pekoe

Appearance - Medium granulation with a little flaky particles
Liquor - Very coloury and strong with brightness and briskness 300-350 cups/kg

SBP - Small Broken Pekoe

Appearance - Small sized and granular shape with a little flackiness.
Liquor - Very strong and coloury with some brightness and briskness
300-350 cups/kg.

CTC Dust

PD - Pekoe Dust

Appearance - Granular fines particles with clean appearances
Liquor - Very coloury and strong 300-350 cups/kg.

RD-Red Dust

- Appearance - Finer particles of dust with clean appearance smaller than PD
- Liquor - Coloury and strong with some brightness and briskness 300-350 cup/ kg.

SRD - Super Red Dust

- Appearance - Black and clean powdery appearance smaller than RD.
- Liquor - Good colour with more strength and brightness 350-400 cups/kg.

SFD - Super fine Dust

- Appearance - Black clean very fine particles with heavy density
- Liquor - Coloury and more strength and some brightness and briskness 450-500 cups/kg.

FD - Fine Dust

- Appearance - Fine powdery dust clean fibre
- Liquor - Coloury with some strength, brightness and briskness 450-500 cups/kg.

APPENDIX 2.

TEA BOARD DEVELOPMENT SCHEMES

Sl. No.	Name of the scheme	Activity	Unit cost per Hect. (Rs.)	Nature of Assistance	% to Unit Cost	Rates Given (Rs. Hect.)
1.	Plantation Development	Extension planting, Replating, Replacement planting (Plain gardens)	1,45,000	Loan	80%	1,16,000
		Extension planting, Replanting, Replacement planting (Hill gardens)	1,90,000	Loan	80%	1,52,000
		Extension planting, Replating, Replacement planting (Darjeeling Hills)	2,10,000	Loan	80%	1,68,000
		Replanting / Replacement planting (Plains)	1,45,000	Subsidy	25%	36,250
		Replanting Replacement planting (Hill gardens other than Darjeeling)	1,90,000	Subsidy	25%	47,500
		Replanting / Replacement planting (gardens of Darjeeling hills)	2,10,000	Subsidy	25%	52,500
		Rejuvenation Pruning & Infilling	5,90,000	Subsidy	25%	15,000
		Rejuvenation Pruning, Infilling plus inter-planting	8,17,000	Subsidy	25%	20,500

APPENDIX 2. (Contd..)

Sl. No.	Name of the scheme	Activity	Unit cost per Hect. (Rs.)	Nature of Assistance	% to Unit Cost	Rates Given (Rs. Hect.)
2.	Tea Development Scheme for North East States	Tea plantation in non-traditional area in North East States	1,90,000	Subsidy	25%	47,500
		Tea plantation in non-traditional area in North East States (for growers with holding upto 5 ha).	1,90,000	Subsidy	50%	95,000
3.	New Area Development Scheme	Tea plantation in non-traditional area other than North East States	1,90,000	Subsidy	25%	47,500
4.	Small Growers Development Scheme	New Planting (Plain Gardens)	1,04,400	Subsidy	25%	26,000
		New Planting (Hill Gardens)	1,34,000	Subsidy	25%	33,500

Source : Tea Board , Coonoor.

