

केरल में प्राकृतिक रबड़ उत्पादन और विपणन का
अर्थशास्त्र

**ECONOMICS OF NATURAL RUBBER
PRODUCTION AND MARKETING IN KERALA**

ANUJA A.R.



**DIVISION OF AGRICULTURAL ECONOMICS
INDIAN AGRICULTURAL RESEARCH INSTITUTE
NEW DELHI - 110012**

2012

ECONOMICS OF NATURAL RUBBER PRODUCTION AND MARKETING IN KERALA

BY

ANUJA A.R

A thesis submitted to the
Faculty of Post-Graduate School,
Indian Agricultural Research Institute, New Delhi
in partial fulfillment of the requirements
for the degree of

**MASTER OF SCIENCE
IN
AGRICULTURAL ECONOMICS
2012**

Approved by:

Dr. Amit Kar (Chairman)

Dr. V.C. Mathur (Co-Chairman)

Dr. Pramod Kumar (Member)

Dr. Girish Kumar Jha (Member)



**DIVISION OF AGRICULTURAL ECONOMICS
INDIAN AGRICULTURAL RESEARCH INSTITUTE
NEW DELHI, INDIA -110 012**



**Dr. Amit Kar
Principal Scientist**

Dated

Certificate

This is to certify that the thesis entitled “Economics of natural rubber production and marketing in Kerala” submitted to the Faculty of the Post-Graduate School, Indian Agricultural Research Institute, New Delhi, in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Economics, embodies the results of bona fide research work carried out by Ms. Anuja A.R. under my guidance and supervision, and that no part of this thesis has been submitted for any other degree or diploma.

It is further certified that any assistance and help availed during the course of investigation as well as source of information have been duly acknowledged by her.

Dr. Amit Kar
Chairman,
Advisory Committee

... Dedicated to

**My beloved Krishnan,
Achan, Amma and Family**

ACKNOWLEDGEMENT

“I never see what has been done; I only see what remains to be done”.

(Sri Buddha)

I am beginning in the name of God, who reincarnated me every morning with strength, courage and confidence. I thank the Lord for all the grace and benevolence, he has shown to me.

*Fervently and modestly, I extend my whole hearted gratitude and sincere thanks to **Dr. Amit Kar**, Principal Scientist, Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi, and Chairman of my Advisory Committee, for his invaluable guidance, constant encouragement, genuine cooperation and the daughterly affection offered to me during the last two years. His useful discussion and peerless criticisms during the course of investigation and preparation of the manuscript helped me to achieve this milestone.*

*It is great privilege for me to express my esteem and profound sense of gratitude to **Dr. V.C. Mathur**, Professor, Division of Agricultural Economics and Co-chairman of my Advisory Committee, for his constructive and valuable suggestions.*

*I feel immense pleasure to convey my heartfelt thanks to my advisory committee members, **Dr. Pramod Kumar** and **Dr. G.K. Jha** for their constructive suggestions and generous advice throughout the research period.*

*I extend my sincere thanks to **Dr. Suresh Pal**, Head, Division of Agricultural Economics for providing me excellent tips, encouragement and facilities during my course work and research.*

*It is my pleasure to express my gratitude and reverence to **Dr. Alka Singh, Dr I. Sekhar, Dr. Shiv Kumar, Dr. D.R. Singh, Dr. B.R. Atteri, Dr.V.P. Tyagi, Ms. Shaloo Punia, Dr. P. Anbukkani, Dr. N. Sivaramane, Dr. Venkatesh Palanisamy** and all other scientists of Division of Agricultural Economics for their encouragement throughout this endeavour.*

I would be remiss if I didn't thank all my teachers in the Division of Agricultural Statistics and other divisions of IARI, for their sincere attempts to increase my knowledge.

It is my pleasure to thank all scientist and staff of Division of Agricultural Economics for the support rendered by them during course work and research work.

*I avail myself of this opportunity to convey my heartfelt thanks to my school and U.G. teachers **E.K. Thomas sir, Jessy miss, Satheesh Babu sir, Prema miss, Pilla sir, Khaleel sir, Jim sir, Sabin sir, Femi chechi, Sujatha miss, Lali miss, Rehmathunisa miss, Sali teacher, Christina sister, Magi sister, Rani sister, Nancy sister, Jayarose sister, Cherupushpam Sister, Lisy sister, Kala teacher and Vincy sister.***

*The joyful moments spent with my beloved batch mates **Rakesh, Vijith, Raju, Joel, Sakthi, Renu and Sumit** kept my spirits high during difficult times. Candid thanks are due to my seniors **Lijo chettan, Kokila chechi, Vembu akka, Shinoj ettan, Venkatesh sir, Sendhil sir, Murthi sir,***

Kavi sir, Abhimanyu sir, Manjunatha sir, Sandip sir, Subhash sir, Suresh sir, Divas sir, Varadan sir, Harish bhaia, Punit bhaia, Praveen chettan, Ajesh ettan, Arun sir, Pavitra akka and Nitya akka; Very very special thanks to my Lisa chechi and Aarathi chechi; to my juniors Denny, Siddharth, Prakash, Prabhath, Najeeb, Paulson, Manmohan, Sushil, Mahboob and Saed for their encouragement, company, advice and suggestions which helped me a lot during this study program.

I am so grateful to my dear sisters Sobhana, Soumia, Satma, Rejula, Rajna, Saritha and Rohini and to my batch mates Vinu, Manju, Sini, Reshma, Neethu, Sheetal, Kalpana, Kuldeep, Surendar, Gopal, Rajani and Shuku for their unwavering assistance throughout the period of my research.

My sincere thanks to my seniors Justin chettan, Sujith ettan, Abhinesh ettan, Shabeer akka, Eldo chettan, Rosin chechi, Shinoji chechi, Adhini chechi, Dhanya chechi, Prabha chechi, Amma, Nisha chechi, Ramya chechi, Chitra chechi, Suby chechi, Lakshmi chechi, Nimmy chechi, Dhanya kunji, Devika chechi, Susha chechi, Nithya chechi, Fleming chechi, Nisha chechi, Shameena and Anshu for their moral support and sisterly concern, encouragement and support during critical times. I would like to thank Mini madam for her unwavering affection and kindness towards me. I would like to express gratitude to Prakash sir, Naik Sir, Prabhakar sir, Kumaraswami sir, Achu, Rachukka, Srikkutty, Anusha, Manjusha, Jincy, Ani, Amrutha, Parvathy, Pushpa, Pooja, Aunty, Reeya, Sudheer akka, Amar akka, Subin chettan, Vivek ettan and Unni chettan.

I also use this opportunity to thank Satheesh Chandran sir, Claramma madam and Rameshettan of Rubber Board who have helped me a lot by providing valuable information during the field survey.

I am in dearth of words to express my love towards my Achan, Amma, Chechi, Chettan, KunjuAppu, KunjuDev, Sashi uncle and Kakka for all their boundless affection, moral support, eternal love, deep concern, prayers and personal sacrifices which sustains peace in my life. I use this opportunity to thank each and every one who has helped me to achieve this goal.

I express sincere thanks to Dean and Director of Indian Agricultural Research Institute, New Delhi. Finally, the financial assistance provided by the ICAR in the form of JRF during the tenure is gratefully acknowledged.

Place: New Delhi

Date: 30-06-2012

Anuja A.R.

CONTENTS

Chapter No.	Title	Page No.
1	Introduction	1-4
2	Background	5-15
3	Materials and Methods	16-21
4	Research Paper I:	
	Existing scenario of natural rubber production and marketing in Kerala	22-34
5	Research Paper II:	
	An economic analysis of price dynamics of natural rubber	35-49
6	Research Paper III	
	Role of rubber producers societies in marketing of natural rubber	50-57
7	Discussion	58-62
8	Summary and Conclusion	63-65
9	Abstract - English	66
	Abstract - Hindi	67
10	Bibliography	68-74
	Appendix	i-vi

LIST OF TABLES

Table No.	Title	Page No.
4.1	District wise area and production of natural rubber in Kerala with their respective percentage (2009- 2010)	25
4.2	Production system wise contribution of natural rubber in Kerala	26
4.3	Area, production and productivity of natural rubber in Kerala with indices	27
4.4	CGR& Instability Index of Area, Production and productivity of natural rubber in Kerala	28
4.5	Decomposition analysis of natural rubber production in Kerala (1987-2011)	28
5.1	Instability indices in daily domestic and international prices of natural rubber (RSS 4)	41
5.2	Instability indices in daily domestic and international prices of natural rubber (Latex 60)	41
5.3	Estimated ADF statistic for unit root test in natural rubber prices (RSS 4)	42
5.4	Estimated ADF statistic for unit root test in natural rubber prices (Latex 60)	43
5.5	Estimated AIC value for optimum lag length in natural rubber prices for Kottayam & Bangkok markets (RSS 4)	43
5.6	Estimated AIC value for optimum lag length in natural rubber prices for Kottayam & Kuala Lumpur markets (Latex 60)	43
5.7	Estimates of Johansen's cointegration test for Kottayam and Bangkok market prices of natural rubber (RSS 4)	44
5.8	Estimates of Johansen's cointegration test for Kottayam and Kuala Lumpur market prices of natural rubber (Latex 60)	44

LIST OF TABLES (Contd...)

Table No.	Title	Page No.
5.9	Estimates of vector error correction model in NR market prices of Kottayam and Bangkok markets	45
5.10	Estimates of vector error correction model in NR market prices of Kottayam and Kuala Lumpur markets (Latex 60)	45
5.11	Estimates of fitted GARCH model in NR market prices of Kottayam and Bangkok markets (RSS 4)	46
5.12	Seasonal Indices for prices of RSS 4 grade NR in Kottayam Market (2008 April to 2012 June)	47
5.13	NPC of RSS 4 grade natural rubber exports for the peak season (June 2012)	48
5.14	NPC of RSS 4 grade natural rubber exports for the lean season (January 2012)	48
6.1	Production of different grades of Sheet (Kg) in the RPSs during 2010-11	55
6.2	Comparison of price realized by members and non-members during 2010-11	56

LIST OF FIGURES

Figure No.	Title	Between Page Nos.
3.1	Diagrammatic representation of sampling framework	16-17
4.1	District wise share of production of natural rubber (NR) in Kerala (2009-10)	26-27
4.2	District wise share of area and production of NR in Kerala (2009-10)	26-27
4.3	Trends in area and production of NR in Kerala	26-27
4.4	Trends in area, production and productivity of NR in India	26-27
4.5	Trends in indices of area, production and productivity of NR in Kerala	27-28
4.6	Production system wise percentage contribution of natural rubber in Kerala	27-28
4.7	Annual growth rate of area, production and productivity of NR in Kerala	29-30
4.8	Marketing system of natural rubber producers in Kerala	29-30
4.9	Marketing channel for small holder natural rubber production system	33-34
4.10	Marketing channel for estate based natural rubber production system	33-34
5.1	Price movements for Bangkok and Kottayam Markets for the period 2005-2008	44-45
5.2	Price movements for Bangkok and Kottayam Markets for the period 2009-2012	44-45
5.3	Price movements for Kottayam and Kuala Lumpur Markets for 2005-2008	45-46
5.4	Price movements for Kottayam and Kuala Lumpur Markets for 2009-2012	45-46
5.5	Time series plot of price for RSS 4 grade of NR: Bangkok (2005-2008)	46-47

LIST OF FIGURES (Contd...)

Figure No.	Title	Between Page Nos.
5.6	Time series plot of price for RSS 4 grade of NR: Bangkok (2009-2012)	46-47
5.7	Time series plot of price for RSS 4 grade of NR: Kottayam (2005-2008)	46-47
5.8	Time series plot of price for RSS 4 grade of NR: Kottayam (2009-2012)	46-47
5.9	Seasonality indices for rubber prices in Kottayam market	47-48
6.1	Organizational structure of Rubber Producers' Societies	54-55
6.2	Marketing Channel for latex/sheets in villages with RPS	54-55
6.3	Marketing Channel for latex/Sheet in villages without RPS	54-55
6.4	Quantity of different grades of sheet produced in RPSs during 2010-11	55-56
6.5	Percentage contribution of different grades of Sheet (Kg) in RPSs (2010-11)	55-56

Introduction

Chapter 1

INTRODUCTION

Rubber is an important commodity from the standpoint of living of humankind. The Para rubber, *Hevea brasiliensis* is the most important source of natural rubber (NR) and meets around 98 percent of global requirement. *Hevea brasiliensis* is a tree native to the tropical rain forests of Amazon and introduced on a commercial scale to the Far East during the last century. In India, organised cultivation of rubber started in 1902 on an estate scale by European planters.

Over the decades, this sector has registered a tremendous growth in terms of expansion in area, increase in production and productivity. Rubber plantations occupy 0.4 per cent of the gross cropped area in India and accounts for 0.19 per cent of the country's GDP. India is the fourth largest producer of natural rubber (NR) with a share of 8.2 per cent of world production in 2010. Despite not having geographically very favourable regions for growing NR, India continued to record the highest productivity among major NR producing countries. The production of NR in 2011-12 is projected at 9.02 lakh tonnes, an increase of 4.6 per cent over 2010-11. India continues to be the second largest consumer of NR with 8.8 per cent share of world consumption in 2010. Consumption of NR in 2011-12 is projected at 9.77 lakh tonnes, an increase of 3.1 per cent over the previous year (Economic survey, 2011-12). Productivity of rubber for the year 2009-10 was 1784 kg/ha (Indian Rubber Statistics, 2010). In India, rubber production is mainly contributed by the small holders. There are more than one million small holdings accounting for 88 per cent of the total area and 92.53 per cent of total rubber production. The commodity supports nearly seven lakh workers directly or indirectly.

Increasing prices and improved demand has provided a resurgent incentive for the rubber growers to produce more thus resulted in increased production in the country, which is considered as one among the fastest growing economies globally. The country has a great potential to prosper in rubber based industries due to local availability of the product, fast growing automobile market, scope for value addition and avenues for export.

Natural rubber cultivation in India has been traditionally concentrated in Kerala and the adjoining states of Karnataka and Tamil Nadu. Kerala accounts for 78 per cent of the area under rubber in the country. Natural rubber is one of the important commercial crops of Kerala and rubber plantations have profound influence in economic and social life of people of the state.

Rubber forms the back bone of commercial agricultural scenario of the state. The coverage under the crop in 2010-11 was 5.34 lakh ha. The production of natural rubber in Kerala during the year was 7.71 lakh tonnes. Rubber is providing livelihood to a large section of the population in the state. The average daily employment in Rubber plantation is 416900 (Indian Rubber Statistics, 2009).

The achievements of Kerala's natural rubber (NR) sector have been widely recognised for its unique features. The distinctive features of the sector are a near monopoly position in India's natural rubber production during the past one century, progressive responses of a highly receptive farming community to research and development initiatives and the concomitant performance of the sector. The explicit contributory factors for the sustained growth of the sector are reported to be a comparatively stable and remunerative pricing vis-a-vis other crops in the state (Chandy *et al.*, 2010). Under the given scenario, it is important to study the economics of natural rubber, its production and marketing in Kerala.

Rubber is considered as the modern '*Kalpa vriksha*' *i.e.*, a tree with every part of it being useful and of economic importance. Besides yielding rubber, which is of most versatile application, the tree is an important source of timber, honey, rubber seed and oil cake.

Latex is obtained from the bark of the tree by tapping. Tapping is the process of controlled wounding during which thin shavings of bark are removed. The latex which gets dried up on the tapping panel (tree lace) and the shell scrap formed in the plastic cup also are part of the crop and collected by the rubber tapper in a basket before next tapping. Various operations in natural rubber production are sieving, bulking, standardisation, preservation, latex concentration and coagulation. The important forms in which the crop can be produced and marketed are Latex and its concentrates, Crepe rubber, Ribbed Smoked Sheet and Technically Specified Block rubber. Small growers in India produce natural rubber either in the form of latex or sheet rubber. Sheet rubber constitutes the largest form of production of small holders.

The system of natural rubber marketing implies the whole spectrum of activities facilitating the movement of rubber from the primary producers to the end-consumers. It has developed through the evolutionary process by undergoing changes and modifications in the structural characteristics of production and consumption, market orientation and the government intervention in the rubber market. Indian rubber marketing structure consists of three separate sectors *viz.*, individual sector, co-operative sector and corporate sector. The individual sector consists of rubber dealers, brokers and commission & forwarding agents. The co-operative sector includes co-operative rubber marketing societies (*Rubber Mark*),

Rubber Producers' Societies (*RPS*) and Kerala State Rubber Co-operative Ltd., (*RUBCO*). Under the corporate sector, the big tyre companies operate their purchasing depots at the main producing centres to collect rubber directly from the growers.

The intermediaries are an integral part of rubber marketing structure of the state. They are acting as the facilitators for the free movement of natural rubber from growers to users. There is a marked difference in the marketing channels adopted by small holders and estate holders to market their produce such as sheet rubber, field coagulum and latex. All these factors affect the efficiency of marketing channel. It is therefore necessary to examine current marketing scenario in domestic rubber market.

In international as well as domestic markets, price of natural rubber is showing volatility hence affects the income stability of small farmers. The variations are based on different factors like demand for raw rubber, production fluctuations in other countries, cost of production of synthetic rubber etc. The rubber farmers are thus exposed to price fluctuations creating uncertainty about the price they receive for their products. This uncertainty in rubber prices makes it difficult for producers to allocate resources efficiently, limits their access to credit for productivity enhancing inputs and leads to adopt low-yield, low risk production technologies, thereby lowering average incomes. Hence it is imperative to analyse the price dynamics of natural rubber.

The small rubber growers had long remained as an unorganised lot. The Rubber Board realised the need to promote a spirit of self-help among the small rubber growers and considered the formation of an institution to encourage the growers to organise themselves under dedicated co-operatives. Such an organisation could empower the rubber sector even ensuring the transfer of latest technologies. To address the above issues Rubber Marketing Cooperative Societies were introduced by rubber board from 1960's. But these societies could not reach out to a large number of growers, particularly the resource poor growers in the rural areas.

To overcome this Board promoted formation of small voluntary associations of small growers registered under the *Charitable Societies Act*, called the *Rubber Producers' Societies* (*RPS*) in 1986. This concept has been widely accepted by the grower community and at present there are 2297 *RPS*s in the country out of which 2226 are located in Kerala. *RPS* functions as self-helping group at village level under the guidance of the Rubber Board providing marketing and input services.

At farmers level, role of rubber producers' societies are gaining more importance. Analysis of the functioning of these societies shall provide much more effective strategies that are to be followed to make rubber production and marketing efficient and cost effective.

Under this backdrop, a study has been conducted with the following objectives.

1. To examine the existing scenario of natural rubber production and marketing in Kerala.
2. To analyse the price dynamics of natural rubber.
3. To study the role of rubber producers' societies in marketing of natural rubber.

Chapter 2

BACKGROUND

A comprehensive review of the past literature is useful to formulate concepts, methodologies and tools of analysis to be used for any research. In this chapter, an attempt has been made to review the important past studies relevant to the present study from the point of view of objectives as well as methodology. The review of literature is presented under the following heads:

1. Natural rubber production and marketing in Kerala
2. Price dynamics of natural rubber
3. Rubber producers' societies and marketing of natural rubber

2.1 Natural rubber production and marketing in Kerala

The achievements of Kerala's natural rubber (NR) sector have been widely recognised for its unique features. The distinctive features of the sector are a near monopoly position in India's natural rubber production during the past one century, progressive responses of a highly receptive farming community to research and development initiatives and the concomitant performance of the sector. The explicit contributory factors for the sustained growth of the sector are reported to be a comparatively stable and remunerative pricing *vis-a-vis* other crops in the state (Chandy *et al.*, 2009).

The analysis of the small holdings cultivating natural rubber in India revealed that this sector is characterized by small holding size, inability to raise huge capital, lack of sufficient awareness on planting, maintenance, harvesting and post-harvest processing and marketing. All these constraints were successfully overcome by the evolution of clusters with the help of institutional linkages established among the various member units. The experience with clusters in natural rubber production, processing and marketing has been encouraging and highly fruitful (Achyuthankutty and Arunkumar, 2009).

In a study conducted to analyse the rubber-based rural development in Malabar region of Kerala, Rajeevan *et al.* (2006) found that introduction of planting in Malabar by the migrants from Travancore has triggered rural up-liftment. The migrants started rubber cultivation besides the conventional food crops to overcome the difficulties of recession and consequent economic restrictions. Rubber cultivation brought an additional income and consequent improvement in the living conditions of the migrants. The spectacular

improvement in the living conditions of the migrants through rubber cultivation attracted the natives also in to the crop. This coupled with the financial and technical assistance extended by the Rubber Board led to the widening of rubber cultivation and consequent employment generation, higher cash flow and social development. The rural development potential of rubber plantation analysed using indirect indicators and it was concluded that contributions of the industrious migrants and the timely support of the Rubber Board as very significant factors.

In Thailand, small holders account for 95% of the total area of rubber production. Thailand's rubber production has increased steadily since 1990. However 90% of total production is exported as raw material. Most small holders produced sheet rubber and sold to local traders. The small holders also have option for selling field latex to traders, Central Rubber Market or directly to processors. Thai Government initiated small smoking house to small holders co-operatives in 1991 of which there are more than 600 co-operatives. Thai government has begun financing co-operatives' baling and packing house for ribbed smoked sheet. The Central Rubber market, which was established in the year 1991, helps individual small holders to sell more directly to the processors there by directly benefiting them by ensuring a higher percentage of export prices, *i.e.*, 85-90% (Buakaew, 2005).

According to Honggokusumo (2005), in the last decade there was not much changes in the processing of small holder rubber except in the cleanliness and the introduction of a new coagulant for latex, a couple of years ago, called DEORUB. In the marketing, there is no new system introduced and fewer projects are assisted by Government. Most rubber processors take rubber from small holders. There are three major marketing systems of small holder raw rubber materials in Indonesia, namely traditional (unorganised), partnership and auction systems.

Production and marketing of Technically Specified Rubber (TSR) started in India in the first half of 1970's. The success of TSR factories which were set up during 1980's under the Kerala Agricultural Developmental Project prompted conversion of some of the commercial crepe mills into TSR factories. As the Indian rubber industry is now exposed to global competition, it is essential to encourage TSR production. The production of TSR from whole latex coagulum and expansion of the existing TSR production capability in line with the global trend would ensure steady growth and development of the Indian rubber industry (Jacob *et al.*, 2003).

The efficiency of the marketing network with its unique conglomeration of large number of intermediaries in between the growers and the manufacturers is instrumental in maintaining the tempo of growth in the production sector. The high level of competition

existing among various categories of dealers, involvement of marketing co-operatives in the primary market and the rubber licensing system introduced by Rubber Board are prominent among the various factors that have contributed to its effectiveness. This system has been instrumental in reducing the marketing margins of the intermediaries and there by realising for the farmers the highest share of terminal market price for their produce (Thomas, 2003).

Krishnakumar (1998) opined that there is tremendous scope for improving quality of processing as about 45 per cent of processed latex is in off-grade form. The small growers have to be empowered and this sector should strongly come into processing and marketing and should be able to handle at least 30 per cent of the rubber produced in the country. To achieve this, lot of work has to be done at grass root level in the field where the informed participation of grower has to be ensured for which extension machinery need to be modernised.

2.2 Price dynamics of natural rubber

Khin *et al.* (2011) had done a comparison on forecasting abilities between univariate time series and market model of natural rubber price. The objective of the study was to compare the forecasting abilities between univariate price forecasting models of the Autoregressive Integrated Moving Average (ARIMA) and econometric market model of supply-demand of world natural rubber prices (SMR20). Both models utilized monthly data from January 1990 – December 2009 as estimation period and data from January 2010 – June 2010 was used as an ex-ante price forecast. The data were tested for unit root and the residual correction methods such as ARCH (LM) (Autoregressive Conditional Heteroscedasticity) test, Vector Error Correction Method (VECM), impulse responses function and co-integration method were used to estimate the parameters of the market model. A comparison of forecasting abilities between ARIMA and market model of supply-demand in terms of their estimation accuracy are based on RMSE, MAE, and (U-Theil) criteria. The results revealed that the econometric market model of supply-demand's ex-ante forecast was more accurate and efficient measured either in terms of its statistical criteria or by visual proximity with the actual prices.

Mathews (2011) argued that natural rubber would be dearer for subsequent two years in the backdrop of unabated demand from the booming global automobile sector, especially in countries such as China and India and lower output from major producing countries. According to Association of Natural Rubber Producing Countries (ANRPC), the slow expansion in yielding area from late 1990's to 2004 was due to the fact that investment confidence in rubber plantations was badly hit by the price crash during the period. Crude oil

markets, labour constraints and influence of currencies in the export were also cited as some other factors which influence the NR price.

According to Tiyo (2011), the notable rise in the price of Indian natural rubber during 2010-11 was mainly due to the low output resulted from weather vagaries like heavy rains and heat waves. He opined that more than weather extremities and enhanced rubber consumption led by the auto tyre sector, excessive presence of old rubber trees and the consequent fall in productivity had been causing moderation in output. The analysis on trend abroad pointed to continuance of the bullish rubber market owing to the tight supply and active demand, speculative futures trade and dwindling stocks in the major rubber producing and consuming countries.

The supply response of rubber farmers to prices and other factors in Nigeria was analysed using co-integration and vector error correction technique. The analysis was carried out on time series data collected from 1970 to 2008. The data were however tested for their time series characteristics using ADF tests. Preliminary analysis suggested that estimations based on their levels might be spurious as the results indicated that all the variables in the model were not stationary at their levels. Further results indicated that producers' prices and the structural break significantly affected the supply of rubber. Response of rubber farmers to price were low with an estimated elasticity of 0.373 in the short-run and 0.204 in the long-run due to price sustainability and the emergence of other supply determinants indicating significant production adjustments based on expected prices. Policy efforts in promoting sustainable marketing outlets and promoting high value and high quality products for export were suggested in understanding farmers' responses to incentive changes (Mesike *et al.*, 2010).

Romprasert (2010) worked on the case of RSS 3 futures to have an idea about the co-integration and error correction model of agricultural futures in Thailand. ECM showed that contract one-month ahead and future spot price would have speed of adjustment. In short-run, RSS3 had co-integration in all contract-month but it would reject the un-biasness hypothesis after contract two-month ahead.

Fathoni (2009) analysed the market system and market integration for rubber cultivation in Jambi Province Indonesia. The institutional and functional approach was used in order to analyse rubber market system that includes characteristics of market, marketing channel and the role of stakeholders in analysis. For further analysis, marketing margin and price analysis were also used to study the price differentiation from the producer's level to consumer's level. In order to analyse integration in rubber market, Augmented Dickey Fuller (ADF) test is used to ascertain that the variables are exact order of integration. After co-

integration test, Error Correction Model (ECM) is used to identify that market price of peripheral price on main market price and vice versa. Results of analysis show that rubber market in Jambi Province is characterized as monopolistic competition with the existence of many traders in rubber market. From the marketing margin analysis, it shows that margins at every stage of marketing are positive that implies there are additional marketing services to maintain the quality of rubbers. For the market integration, the analysis indicates that variables are stationary and co-integrated both in Jambi and Malaysia rubber prices, and there is causality in at least one direction from Malaysia to the price in Jambi auction market.

Philip (2008) conducted an analytical study for market integration hypothesis for natural rubber cultivation of Kerala. The market integration and causal nexus between two market prices of rubber in Kerala Economy during the period of pre and post reform was analysed. Augmented Dickey Fuller (ADF) test was used to ascertain that the variables are exact order of integration. Co-integration technique was used to examine the validity of the market integration hypothesis with reference to prices of rubber in Kerala. After co-integration test, Error Correction Model (ECM) used to identify the market prices of peripheral price on main market price and vice versa. The analysis showed that a strong evidence of an existence of market integration in Rubber price during the post reform period. Moreover, the price changes of rubber would be transmitted from peripheral to main market and vice versa during the reform period.

Mushtaq and Khalid (2006) measured the implication of market integration in Pakistan. The cost of stabilization is reduced by market integrations. The price integration is conducted to identify sets of markets that lead other markets such as agricultural market in the price transmission process. It provides better implication on best supply and consumption improves supply in the market on reliable prices and removes transaction cost.

According to Edirisinghe and Perera (2005), to have an uninterrupted supply of rubber, it is vital that the balance between mature and immature rubber stands be maintained in the long run. One of the major variables that affect the replanting decision by farmers is the price of rubber. The role played by the lagged price of rubber in replanting decision making was evaluated. Almon lag model was employed to data related to rubber prices from 1980 to 2004. A second degree polynomial was found to be best in describing the data, as expected. The maximum time lag was found to be eight years but a lag of four years had the highest impact on the replanting decision.

The statutory regulations on NR prices in India, which began in 1942 through the monopoly purchase of NR at fixed prices was a major mile stone in the evolutionary growth of the industry in India. Notification of maximum and minimum prices, buffer stock, direct

market interventions through State Trading Corporations, export and barriers on NR import through tariff and non-tariff measures etc. are the subsequent policy initiatives followed by the Government of India to stabilise NR prices at remunerative levels so as to insulate the domestic market from fluctuations in the global market and to achieve self-sufficiency in NR production. As a part of the economic reforms launched April 1992, manufacturers were allowed to undertake direct import through duty free channels and channelized import of NR through the STC was discontinued. Consequently, the integration process of the Indian market with the global market has taken place and trends in world market, whether boom or depression began to reflect in Indian market too (Thomas, 2003).

Lekshmi *et al.* (1996) analysed the trend and pattern of natural rubber price in India during the period from 1968-69 to 1994-95. The trend in the price was examined using a 'random test' supplemented by an analysis of three year moving average intended to even out the seasonal fluctuations and to capture the secular trend in the price movements. A semi-log quadratic equation was fitted to detect the direction of price movements. The relationship between price and its explanatory variables was analysed by fitting a linear regression model. The trend analysis showed that NR price in India did not show any significant pattern of consistent movement towards a particular direction in the long run. Among the different economic variables *viz.*, production, consumption, stock, import and world price of NR, the production of NR was found to be the most significant variable influencing the price. Significant statistical relations were not discernible with import and world price.

Sreekumar *et al.* (1990) conducted a study to estimate the share of the producer in the consumer's price of NR. The data, collected from *Kanjirappally* and *Changnacherry* taluks of Kottayam District, showed that the producers' share in the consumers' price was 0.88, based on the weighted average price of sheet and scrape rubber. However in the case of sheet rubber the producers' share was found to be 0.92.

Ipe (1988) attempted to study the seasonal fluctuations in the price of natural rubber in India. The seasonal indices were worked out by the classical decomposition methods- the ratio to trend method- assuming a multiplicative time-series model. The analysis showed that the seasonal index was the highest in July and lowest in December. Production of rubber showed marked seasonality. The analysis of price in relation to production and consumption showed that seasonality in prices was not much pronounced during months in which production change was predominant, which in turn point to the possibility of oligopsony in the buying market. During the peak production period, consumption was found to fall resulting in low prices.

2.3 Rubber producers' societies and marketing of natural rubber

Rubber Producers' Society was started during 1986 by Rubber Board at grass root levels for sustainability of rubber producers as well as to disseminate knowledge and skill on the latest improvements in cultivation and processing of rubber (Anon., 2001). Rubber Producer Societies (RPS) are registered with the District Registrar under the Charitable Societies Act based on a draft bye-law issued by the Rubber Board. These associations are meant for the socio-economic welfare of the small rubber growers. Rubber growers in the area of operation can become the members of the society. Members are marketing the rubber latex and scrap produced in their holdings through society.

As per the bye-law only 7 small holder promoters need be there to register an RPS. The Board insisted that to qualify for the Board's approval there should be 50 rubber small grower members each contributing Rs 50/- as entrance fees and Rs 10/- as annual subscription in the beginning. Once this condition is satisfied the Board would accord its approval to the RPS after an on the spot inspection by the Board's field officer of the area to verify the eligibility of the members enrolled, viability to function as a voluntary association of small growers, premise where the RPS intends to operate from, calibre of the organisation etc. The Field Officer of the area is then nominated to the governing body of the RPS to guide its functioning for achieving the laid out objectives of improving the production, productivity, processing and marketing of the rubber of the members of the society.

The general body in the first meeting elects from among themselves the President of the society. The President in turn conducts the election of six members of the executive committee. The president will hold the office for three years and two members of the executive committee will retire every year. The members who are to retire at the end of first year and second year respectively will be chosen by drawing of lots, on a rotation basis. All elected members of executive committee will hold office for a period of three years. There is no bar for re-election of retiring members. The management of the society is vested in the Executive Committee consisting of the President and the six persons elected by the general body from among its members.

The general body of the society is suggested to be held at least once in three months, preferably in a holding of one of the members of the society and discuss the calendar of cultural operations to be followed in their holdings for trees of differing age groups during the succeeding quarter. Demonstrations by the extension officer of the Board on relevant techniques are also to be done if necessary at such meetings, such as correct methods of planting, manuring, tapping plant protection, processing, nursery raising etc.

Haridasan (1988) compared the marketing structure of Indian natural rubber with that of the other major producing countries like Malaysia, Thailand and Sri Lanka. It was found that unlike India, co-operative rubber marketing had not made any headway in these countries. However, Group Processing Centres had been organised in the three countries under the encouragement of Government agencies. The group processing centres had made considerable progress in Malaysia, compared to Thailand or Sri Lanka. It was also noticed that the GPCs provided common facilities to the small growers for rolling and smoking of rubber.

Narayanan (1990) remarked that for RPSs, improvement in the processing and marketing operations of small holders' rubber is an area of emphasis. The study classes and demonstrations which were arranged under the RPSs regarding correct processing techniques enabled members to produce better grade sheets which would fetch higher price. Alongside, arrangements for marketing small holders rubber, based on the grade of the sheets, helped in creating 'grade-consciousness' which finally led to the improvement in the quality of the sheets.

Ipe (1992) conducted a study to analyse the structure, conduct and performance of the Indian rubber market. The study showed that the marginal decline in producer's share in the manufacturer's rupee was due to the relative increase in costs and margins of primary and secondary dealers. To improve the existing market structure, measures like quality improvement through providing incentives (pricing based on the grades), construction of smoke houses and group processing centres to produce technically specified rubber in the co-operative sector was suggested.

According to Jacob (1999), the natural rubber market in India was evolved through the past many years, undergoing a series of changes in the process to accommodate in its mainstream, the varying consumer preferences and producer capabilities. Since an individual RPS was small with very limited financial resources, the Rubber Board set up a number of processing and trading companies with equity participation of the Board and the RPSs, to strengthen the edifice of this movement. With the formation of these companies, RPSs came to be actively involved in the field of latex collection and scrap procurement to feed these factories. The study also envisages the increased involvement of RPSs in the natural rubber marketing in the years to come.

Jacob and Chandy (2000) identified various marketing intermediaries in natural rubber marketing in India. The major intermediaries involved were village level dealers, town level dealers, terminal leaders, co-operative societies, RPSs and companies and brokers. The study showed that the RPS undertake and assist group marketing of member growers'

produce at remunerative prices by offering grade differentials. The RPS also help the small growers to organise at the grass root level and group process their crop to value added marketable grades. Fifteen private limited companies, which were set up by RPS in association with Rubber Board, also found to be useful in modern processing and trading of rubber and estate inputs.

Abraham (2003) studied the role of co-operatives in NR marketing and processing. The research revealed that the formation of co-operatives had a great impact on the production of NR, its processing as well as marketing. Whenever NR prices fell steeply, the Government of India intervened in the market exclusively through the co-operatives. Later Rubber Board shifted its patronage to the RPSs which acted as agencies through which the Board implemented all its schemes for improved productivity and quality.

According to Geevergees *et al.* (2003) rubber producers societies has been successful in making considerable improvement in quality of produce by group processing of rubber to fetch better price. The challenges facing the rubber plantations particularly the small growers could be addressed through group approach. The consortium of RPS and marketing companies in the co-operative sector has proved worth in this context.

A constraint analysis of the factors leading to the varying level of performance of the various RPS across Kerala by Krishnakumar (2003) revealed that while 70 per cent of the growers who are members of good RPSs achieved higher productivity, only 26.3 per cent of poor RPS could maintain the same level of productivity. A factor analysis for the various indicators identified as contributing factors to the level of performance of the RPS have been described and the importance of initiatives of Rubber Board in involving farmer resource persons and implementing women and tribal development projects in the rubber sector is highlighted.

The analysis of performance of selected RPSs in Thiruvananthapuram district of Kerala indicated that marketing/group processing through RPS has helped in improving the quality and also could limit the exploitation of middlemen to a great extent. The difference in price realized by the growers in the RPS compared to non-members has been statistically significant. It was concluded from the study that RPS play an important role in the capacity building at the grass root level especially among the rubber farmers in that area (Rani, 2003).

Mani (2004) studied regarding the functioning of rubber co-operative sector in Kerala. It was pointed out that the estate sector has its own effective marketing system and has direct access to the consumers to secure maximum price prevailing in the market whereas the smallholding sector has all sort of problems in marketing of their produce. The rubber

marketing co-operatives were mostly found functional at taluk and district levels. Hence these co-operatives were not able to set active participation of the small growers located on the villages and this led to the formation of RPSs which may act as an interface between the Rubber Board and small holders. Along with that the bye law of some marketing co-operatives had amended to make RPSs also eligible to become members to ensure their active participation on the functioning of co-operatives.

Rani (2005) advocated that the formation of RPSs among the small rubber growers had initiated Community Based Development approach in rubber sector. The institutionalization process of RPS had incorporated the key features of CBD since late 1990s through a coherent approach to promote the setting up of infrastructure facilities for processing and marketing. The study which has been covered twenty RPS in South India randomly selected revealed that the small holders who were strewn and vulnerable could be mobilised to form viable groups, so as to foster collective action at the community level, through a participatory action and learning process. Facilitated by Rubber Board, the grower community had been able to organise themselves, mobilise resources, and develop skill related to production, marketing integration and enhance capacities, which enable them to manage their own resources.

According to Geevergees *et al.* (2009) the people's participation programme with the involvement of RPS has achieved considerable improvement in the quality of processed rubber and thereby helped in realising better price. Group marketing through an apex company fetches a higher price. Group marketing through RPSs have advantages of sharing, fetching higher price through switching over mechanism, quality improvement, better bargaining capacity etc. Member growers have price advantages compared with non-members.

Rubber Self-Help Groups (RSHG) popularly known as *Rubber Swasraya Sangham*, of marginal and resource poor farmers have been promoted by Rubber Board with the aim to ensure community participation and more inclusive development in the rubber sector. These groups were envisaged to function as 'activity groups' to tap the labour potential and enhance production and productivity by timely utilization of inputs and technologies. It also strengthens the activities of RPS the voluntary association of small growers, by diversified and family based activities and by providing service to growers. Study has proved that the rubber self-help groups could initiate a new domain of activity through service and skilled labour. The evaluation of the activities of RSHG with the focus on labour generation found that they have made a good launch by supplementing the efforts of collective action in the

rubber sector to increase production, productivity and market integration (Kunjappan *et al.*, 2009).

Santhakumari and Pillai (2009) studied the impact of rubber processing and trading companies on RPSs in Kerala. It was concluded that the working of the Rubber Processing and Trading Companies had significant impact on the RPSs in the areas of supply of inputs and the processing of latex and production of superior grade sheet rubber.

With the increase in rubber trade and self- help activities; there was significant increase in number of actively functioning RPS. Impact assessment studies of RPS conducted among members and non-members revealed significant difference between the two groups in utilisation of trained tappers and adoption of productivity enhancement measures. Empowerment of growers is obvious through technology transfer, quality improvement and employment generation.

Materials and Methods

Chapter 3

MATERIALS AND METHODS

3.0 DATA AND METHODOLOGY

3.1 Sampling framework

Kerala is the major rubber growing state in India. The Indian Rubber Board and Rubber Research Institute of India are located in Kerala. Kerala state is having 14 districts and delineated into 13 agro-climatic zones based on parameters like rainfall, soil type, altitude and topography. Kottayam and Ernakulam district together account for 32 per cent of area and 35 per cent production respectively (Farm Guide, 2012). Hence these districts were selected purposively for collecting primary data on role of Rubber Producers' Societies in marketing of natural rubber in Kerala.

From each district 4 villages were purposively selected based on the performance of the RPS. Two villages with effectively functioning RPSs and two without RPSs were identified. From each village 15 rubber farmers were randomly identified. A total of 120 farmers in the state consisting of RPS beneficiaries and non-beneficiaries with and without access to input and marketing services were surveyed.

Rubber farmers who are members of *Valakom* and *Kunnackal South* RPSs were selected from Ernakulam District. Farmers who are non-beneficiaries were surveyed from *Paipra* and *Anicadu* villages of the same district. *Chirakkadavu* and *Aymanam* villages having RPSs and *Madapally* and *Champakkara* villages without RPSs were surveyed from Kottayam District. The study pertains to the year 2011-12. The diagrammatic representation of the sampling framework is given as Fig. 3.1.

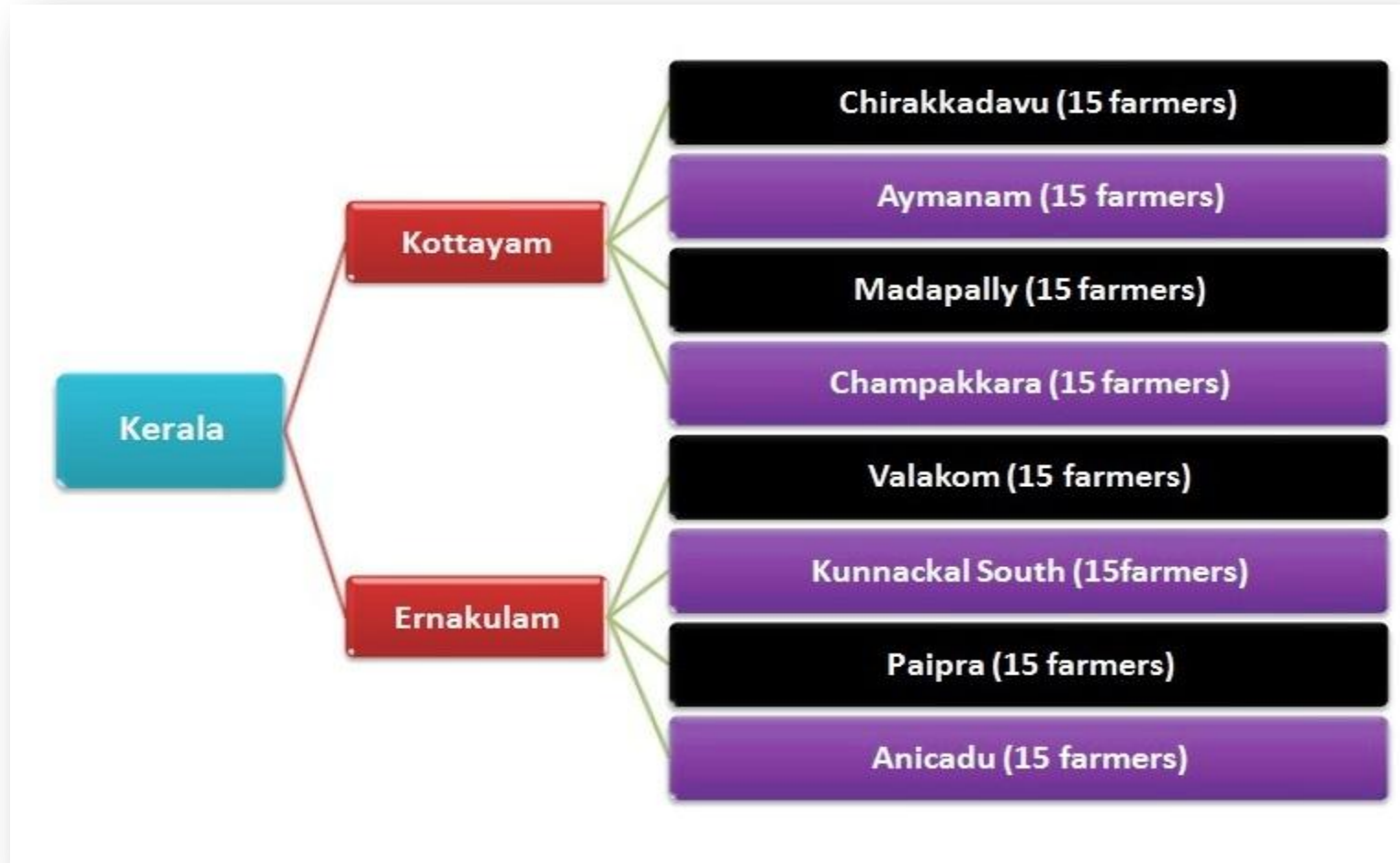
3.2 Data source

The data used for the study include both primary and secondary, for the compilation of which following sources were relied upon.

3.2.1 Primary data

Primary data were collected from randomly selected 120 farmers. Two districts - Kottayam and Ernakulam - from which, 4 villages each with two having RPSs and two without RPSs were purposively identified. From each village 15 farmers were surveyed.

Fig. 3.1 Diagrammatic Representation of Sampling Framework



3.2.2 Secondary data

The sources from which secondary data were compiled are given below:-

1. Rubber Board, Kottayam, Kerala, India- Head office and Muvattupuzha Regional office
2. Indian Rubber Statistics- published by Rubber Board
3. Rubber Research Institute of India, Kottayam, Kerala, India
4. Agricultural Statistics, Department of Economics and Statistics, Government of Kerala, India
5. Farm Guide, Farm Information Bureau, Govt. of Kerala

3.2.3 Data on variables

The structured interview schedule were developed and used for interviewing the participants of the survey, for gathering primary data, is given in the Appendix. Secondary data were collected on the following variables:

1. State wise time series data on area, production and productivity of natural rubber in Kerala.
2. Time series data on domestic and international prices of important grades of rubber.

3.3 Analytical tools

3.3.1 Existing scenario of natural rubber production and marketing in Kerala

3.3.1.1 Cuddy-Della Valle index

For Kerala, with a major share in the country's production of natural rubber, fluctuation in rubber prices has always been a matter of concern. With its multidimensional impact on area, yield and subsequently on production, instability in prices affect rubber economy in different ways. Cuddy-Della Valle index was used to estimate the Kerala state level instability in total area, production, productivity. The index was originally developed by John Cuddy and Della Valle (Cuddy and Della Valle, 1978). It is an improved measure compared to coefficient of variation because it is inherently adjusted for trend, often observed in time series data. It is also superior to other scale dependent measures of deriving the standard deviation or root mean square of the residuals obtained from the fitted trend lines of the raw data, and hence suitable for cross comparisons (Sen, 1989).

$$II = CV \times (1 - R^2)^{0.5}$$

Where,

II = Instability index (per cent)

CV = Coefficient of variation (per cent)

R^2 = Coefficient of determination from a time trend regression adjusted by the number of degrees of freedom.

3.1.1.2 Trend analysis using index numbers

Index numbers are used for measuring differences in the magnitude of a group of related variables having different units (Croxtan *et al.*, 1979). Using the following formula index numbers on area, production and productivity of natural rubber in Kerala was worked out;

$$I_t = (P_t/P_0) 100$$

Where,

I_t = Index number

P_t = Current year value for the variable

P_0 = Base year value for the variable

The index number for area, production and productivity of natural rubber during the period from 1987 to 2011 were worked out.

3.1.1.3 Compound Annual Growth Rate

Compound Annual Growth Rate (CAGR) was calculated by exponentially fitting time series data on total area, production, productivity against time using the below given formula,

$$Y_t = Y_0 (1 + r)^t$$

Taking natural logarithm of above equation, the formula was re-written as,

$$\ln Y_t = \ln Y_0 + t \ln (1+r)$$

$$r = (e^{b_2} - 1) \times 100$$

Where,

r = CAGR

$\ln Y_0 = b_1$

$\ln (1+r) = b_2$

3.1.1.4 Decomposition analysis

In order to measure the relative contribution of area, yield and their interaction to production, decomposition technique was adopted. Minhas' component analysis model was used for the purpose (Minhas, 1963). The output growth for the purpose of decomposition analysis was computed as the change in output of current period (taking average of the last three years) over the base period (taking average of first three years) for each time period. The changes in components had also been similarly computed on the basis of three year average of the base and current years.

Let P_0 and P_n be the production in the base year and n^{th} year respectively, they are given by,

$$P_0 = A_0 \times Y_0 \text{ and } P_n = A_n \times Y_n$$

Where, A_0 and A_n represent the area and Y_0 and Y_n represent the yield in the base year and n^{th} year respectively,

$$P_n - P_0 = \Delta P, A_n - A_0 = \Delta A, Y_n - Y_0 = \Delta Y$$

From the above equations we can write,

$$\Delta P = A_0 \Delta Y + Y_0 \Delta A + \Delta A \Delta Y$$

i.e., Change in Production = Yield Effect + Area Effect + Interaction Effect

Thus, the total change in production can be decomposed into three effects, *viz.* yield effect, area effect and the interaction effect due to the change in yield and area.

3.3.2. Price dynamics of natural rubber

3.3.2.1 Cuddy Della Valle instability index

The magnitude of instability in the prices of rubber was measured in relative terms by Cuddy Della Valle Index which is used in recent years by a number of researchers as a measure of variability in time-series data. Simple coefficient of variation overestimates the level of instability in the time series data characterised by the long term trends whereas Cuddy Della Valle Index corrects the coefficient of variation.

$$II = CV * (1 - R^2)^{0.5}$$

Where

II = Instability index (per cent)

CV = Coefficient of variation (per cent)

R^2 = Coefficient of determination from a time trend regression adjusted by the number of degrees of freedom.

3.3.2.2 Co-integration analysis

Co-integration test was used to estimate the degree of competitiveness among the markets. The integration of domestic market and international market was studied using the co-integration method (Johansen, 1991). Under Johansen's co-integration test, we determine whether the given set of non-stationary series is co-integrated or not. The null hypothesis assumes that no two series are co-integrated.

In a vector auto regression (VAR) of order p as given below,

$$Y_t = A_1 Y_{t-1} + \dots + A_p Y_{t-p} + B X_t + \varepsilon_t$$

Where, Y_t is a k-vector of non-stationary 1(1) variables, X_t is a d vector of deterministic variables, and ε_t is a vector of innovations. If there are k endogenous variables, each of which has one unit root, there can be from zero to k-1 linearly independent, co-integrating relations.

Each column of the matrix gives an estimate of a co-integrating vector. The co-integrating vector is not identified unless we impose some arbitrary normalisation. The software E-Views 5 version was used for the estimation as it adopts a normalisation scheme that solves the r co-integrating relations for the first r variables in the Y_t vector as a function of the remaining k-r variables.

3.3.2.3 GARCH (Generalized Auto Regressive Conditional Heteroscedasticity)

GARCH model was used to measure volatility in the time series price data of natural rubber. If an autoregressive moving average model (ARMA model) is assumed for the error variance, the model is a Generalized Auto Regressive Conditional Heteroscedasticity, (Bollerslev, 1986) model. The simplest GARCH model is the ARCH (1,1) model which can be written as,

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 \sigma_{t-1}^2$$

This says that the conditional variance of u at time t depends not only on the squared error term in the previous time period but also on its conditional variance in the previous time period. The software E-Views 5 version was used for GARCH analysis.

3.3.2.4 Export competitiveness

The export competitiveness of natural rubber was studied using the Nominal Protection Coefficient (NPC). NPC is a simple index which measures the divergence of domestic price from international price and determines the degree of export and import

competitiveness of the commodity in question (Porter, 1990). NPC is the ratio of the domestic price to the border price (Gulati *et al.*, 1994; Datta, 2001).

$$NPC = P_d / P_b$$

Where,

NPC = Nominal protection Coefficient of the commodity under consideration

P_d = Domestic price of the commodity

P_b = Border price or reference price after taking care of transportation and marketing expenses

The coefficient can be worked out either under exportable or importable hypothesis depending upon whether the commodity under consideration is exportable or an importable item. Under exportable hypothesis, the relevant border price is the fob price, whereas under importable hypothesis the border price is the *CIF* price in the domestic port.

3.3.2.5 Seasonality

Seasonal variation is a component of a time series which is defined as the repetitive and predictable movement around the trend line in one year or less. It is detected by measuring the quantity of interest for small time intervals, such as days, weeks, months or quarters. Ratio to moving average method was used to measure the seasonality in the monthly price data of natural rubber in domestic reference market *i.e.* Kottayam.

3.3.3 Role of rubber producer societies in the marketing of natural rubber

The data used for the study include primary data, for the compilation of which following resources were relied upon. Primary data were collected from randomly selected 120 farmers. Two districts Kottayam and Ernakulam from which 4 villages each with two having RPSs and two without RPSs were purposively identified. From each village 15 farmers were surveyed. The structured interview schedule used for interviewing the participants of the survey, for gathering primary data, is given in the Appendix I.

3.3.3.1 Tabular analysis

Tabular analysis had been made use of in comparison of RPS beneficiaries and non-beneficiaries. The comparison has made in quality of grades of sheets produced and price realisation. The primary data required had collected through pretested interview schedules and discussions.

Chapter 4

RESEARCH PAPER I

Existing Scenario of Natural Rubber Production and Marketing in Kerala

ABSTRACT

Kerala is the nearly monopolistic contributor to the natural rubber production of India with 90 % of the total production and 78 % of the area under cultivation in the country. The natural rubber production of the state during 2010-11 was 7.71 lakh tonnes and the coverage under the crop was 5.34 lakh ha. The productivity in Kerala was found to be less compared to the national average *i.e.*, 1419 against 1784 kg/ha, during 2009-10. In Kerala, around 40 per cent of the area as well as 45 per cent of production of rubber comes from three districts; Kottayam, Ernakulam and Pathanamthitta and small holders contributed 92.5 3% to the total production. The instability in area, production and productivity during the period were 2.56, 5.84 and 6.37 per cent respectively. The decomposition analysis showed that the yield effect is contributing nearly two fold to the total production compared to the area effect. Ribbed Smoked Sheet (RSS), Latex Concentrates (LC), Technically Specified Rubber (TSR), Pale Latex Crepe (PLC) and Estate Brown Crepe (EBC) are the important marketing forms of natural rubber. RSS is graded into six grades on the basis of its quality, *i.e.* RSS 1X, RSS 1, RSS 2, RSS 3, RSS 4 and RSS 5. Rubber marketing structure of the state consists of three separate sectors *viz.* individual sector, co-operative sector and corporate sector. Rubber mark, RUBCO and RPSs are the three major players in the cooperative sector and their interventions in the market reduce the influence of middlemen ensuring more return to the producers.

KEY WORDS: Natural rubber, Economic analysis, Kerala

4.1 INTRODUCTION

India is the fourth largest producer of natural rubber with a share of 8.2 per cent in world production in 2010. The production of natural rubber (NR) in the country was 8.31 lakh MT in 2009-10, registering a 3.8 per cent decline compared to the previous year, while in 2010-11, natural rubber production of India increased to 8.62 lakh MT which marked an increase of 0.31 lakh MT over the previous period. Production of natural rubber for the year 2011-12 was projected at 9.02 lakh tonnes with a growth rate of 4.6 %. Among the major natural rubber consuming countries, India has second position after China, relegating United States and Japan to third and fourth position, with 8.8 per cent share of total world

consumption. The natural rubber consumption in the country has increased from 9.31 lakh MT in 2009-10 to 9.49 lakh MT in 2010-11(Economic review, 2011). Consumption of NR in 2011-12 was projected at 9.77 lakh tonnes, an increase of 3.1 per cent over the previous year. Despite not having geographically very favourable regions for growing NR, India continued to record the highest productivity among major NR producing countries (Economic survey, 2011-12).

Kerala is the major rubber producing state in the country. Rubber plantations have profound influence in economic and social life of people of Kerala. National institutes on rubber like Rubber Research Institute of India and Rubber Board are located in the state itself show the importance of the crop in the area. In this backdrop, a study has been conducted to analyse the existing economic scenario of natural rubber production and marketing in the state of Kerala.

4.2 METHODOLOGY

Rubber is an important crop as far as the agricultural economy of Kerala is concerned. The study was based on analysis of secondary data available from various official sources and also self-conducted market study. The time series data (1987-2010) on various aspects of rubber like state as well as district wise area, production and productivity were collected from different sources like Rubber Board, Farm Guide published by Farm Information Bureau, Government of Kerala, publications by Economics and Statistics Departments etc.

4.2.1 Cuddy-Della Valle Instability Index

Cuddy-Della Valle index was used to estimate the Kerala state level instability in total area, production and productivity.

$$II = CV (1 - R^2)^{0.5}$$

Where,

II = Instability index (per cent)

CV = Coefficient of variation (per cent)

R^2 = Coefficient of determination from a time trend regression adjusted by the number of degrees of freedom.

4.2.2 Trend analysis using index numbers

Index numbers were used to measure the trend in area, production as well as productivity of natural rubber in the state. Index numbers were worked out using the formula,

$$I_t = (P_t / P_0) 100$$

Where,

I_t = Index number

P_t = Current year value for the variable

P_0 = Base year value for the variable

The index numbers for area, production and productivity of natural rubber during 1987 to 2011 were worked out.

4.2.3 Compound Annual Growth Rate

Compound Annual Growth Rate (CAGR) was calculated by exponentially fitting time series data on total area, production, productivity against time using the below given formula,

$$Y_t = Y_0 (1+r)^t$$

Taking natural logarithm of above equation, the formula is re-written as,

$$\ln Y_t = \ln Y_0 + t \ln (1+r)$$

$$r = (e^{b_2/b_1} - 1) 100$$

Where,

$$\ln Y_0 = b_1$$

$$\ln (1+r) = b_2$$

$$r = \text{CAGR}$$

4.2.4 Decomposition Analysis

Decomposition technique was used to measure the relative contribution of area, yield and their interaction effect to the production of natural rubber. Minhas' component analysis model was used for the purpose (Minhas, 1963). The output growth for the purpose of decomposition analysis was computed as the change in output of current period (taking average of the last three years) over the base period (taking average of first three years) for each time period.

Let P_0 and P_n be the production in the base year and n^{th} year respectively, they are given by,

$$P_0 = A_0 \times Y_0 \text{ and } P_n = A_n \times Y_n$$

Where, A_0 and A_n represent the area and Y_0 and Y_n represent the yield in the base year and n^{th} year respectively

$$P_n - P_0 = \Delta P, A_n - A_0 = \Delta A, Y_n - Y_0 = \Delta Y$$

From the above equations we can write,

$$\Delta P = A_0 \Delta Y + Y_0 \Delta A + \Delta A \Delta Y$$

i.e., Production = Yield Effect + Area Effect + Interaction Effect

Thus, the total change in production can be decomposed in to three effects, *viz.*, yield effect, area effect and the interaction effect due to the change in yield and area (Kalamkar *et al.*, 2002).

4.3 RESULTS

4.3.1 Natural rubber production in Kerala

The coverage under the crop in 2010-11 was 5.34 lakh ha, higher by 8822 ha over the previous year. The production of natural rubber in Kerala during the year was 7.71 lakh tonnes, indicating a 3.36 per cent increase over the previous year. In 2010-11, the productivity increased slightly to 1442 kg/ha from 1419 kg/ha in the previous year. During the period, Kerala accounted for the 90 per cent of the production of natural rubber in India. The productivity in Kerala was found to be less compared to the national average *i.e.*, 1419 against 1784 kg/ha, during 2009-10.

Table 4.1 District wise area and production of natural rubber in Kerala with their respective percentage (2009- 2010)

Districts	Area (ha)	Percentage contribution	Production (tonnes)	Percentage contribution
Thiruvananthapuram	30449	6	42900	6
Kollam	36111	7	50830	7
Pathanamthitta	49957	10	77400	10
Alappuzha	4329	1	6580	1
Kottayam	112918	21	170800	23
Idukki	39679	8	54600	7
Ernakulam	58729	11	90770	12
Thrissur	15017	3	21800	3
Palakkad	35559	7	47930	6
Malappuram	38136	7	48080	6
Kozhikode	20358	4	28275	4
Wayanad	9723	2	8400	1
Kannur	43819	8	58125	8
Kasaragod	30624	6	39020	5
Total	525408	100	745510	100

(Source: Farm Guide, 2012)

In Kerala, around 40 per cent of the area as well as 45 per cent of production of rubber comes from three districts *i.e.*, Kottayam, Ernakulam and Pathanamthitta. The district wise area and production details are presented in Table 4.1, Fig. 4.1 and Fig. 4.2.

The relative share of small holder production system and estate production system to the total production of the state is presented in Table 4.2. There was a steady declining trend in the contribution of estates for the last three decades and now their contribution is around 7 per cent only (Fig. 4.6).

Table 4.2 Production system wise contribution of natural rubber in Kerala

Year	Production (Tonnes)		Contribution (%)	
	Small holder	Estate	Small holder	Estate
1970-71	86773	40633	68.11	31.89
1975-76	128769	53134	70.79	29.21
1980-81	140320	45400	75.55	24.45
1985-86	184563	50792	78.42	21.58
1990-91	307521	61115	83.42	16.58
1993-94	408311	67210	85.87	14.13
1994-95	442830	65915	87.04	12.96
1995-96	474555	70410	87.08	12.92
1996-97	512756	74425	87.33	12.67
1997-98	541935	76830	87.58	12.42
1998-99	559099	78045	87.75	12.25
1999-2000	572820	77665	88.06	11.94
2000-01	579866	76635	88.33	11.67
2001-02	580970	76080	88.42	11.58
2002-03	596737	69355	89.59	10.41
2003-04	657024	64555	91.05	8.95
2004-05	696513	64070	91.58	8.42
2005-06	742845	63095	92.17	7.83
2006-07	780945	63090	92.53	7.47
2007-08	754065	60670	92.55	7.45
2008-09	737605	59550	92.53	7.47

(Source: Rubber Board)

4.3.1.1 Trends in natural rubber production in Kerala

The production of NR was contributed by the factors of area and yield. The area, production and productivity of NR in Kerala were showing a steady increasing trend for the last few decades. The trend in area, production and productivity of natural rubber for the last 25 years is presented in Table 4.3 and explained with Fig. 4.3, Fig. 4.4 and Fig. 4.5.

Trend analysis using index numbers showed that over a period of last 25 years, the area under rubber and its productivity increased to an extent of 46 per cent and 135 per cent

Fig. 4.1 District wise share of production of natural rubber (NR) in Kerala (2009-10)

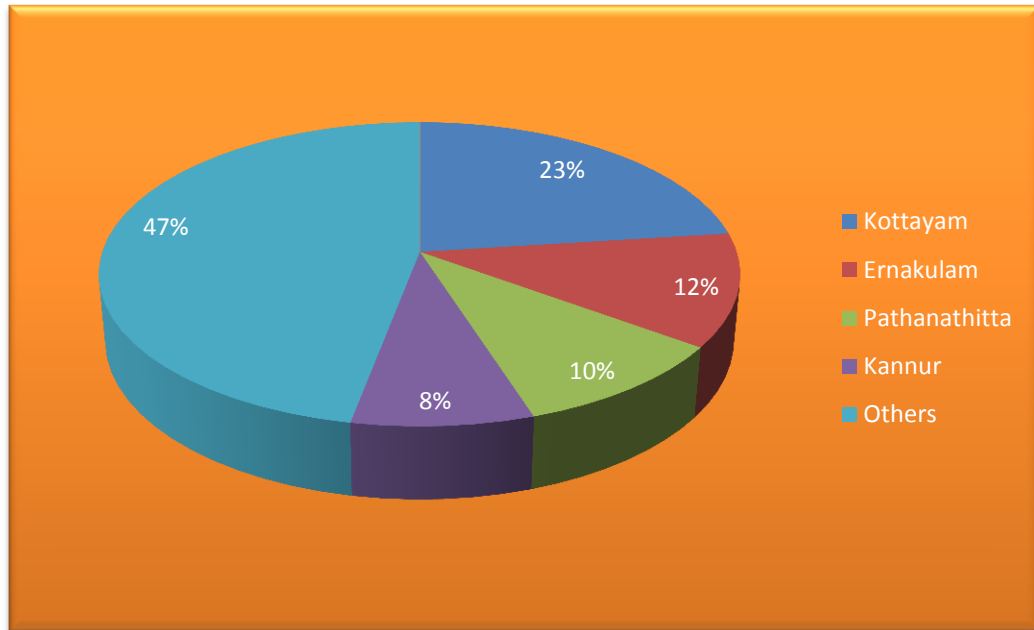


Fig. 4.2 District wise share of area under production of NR in Kerala (2009-10)

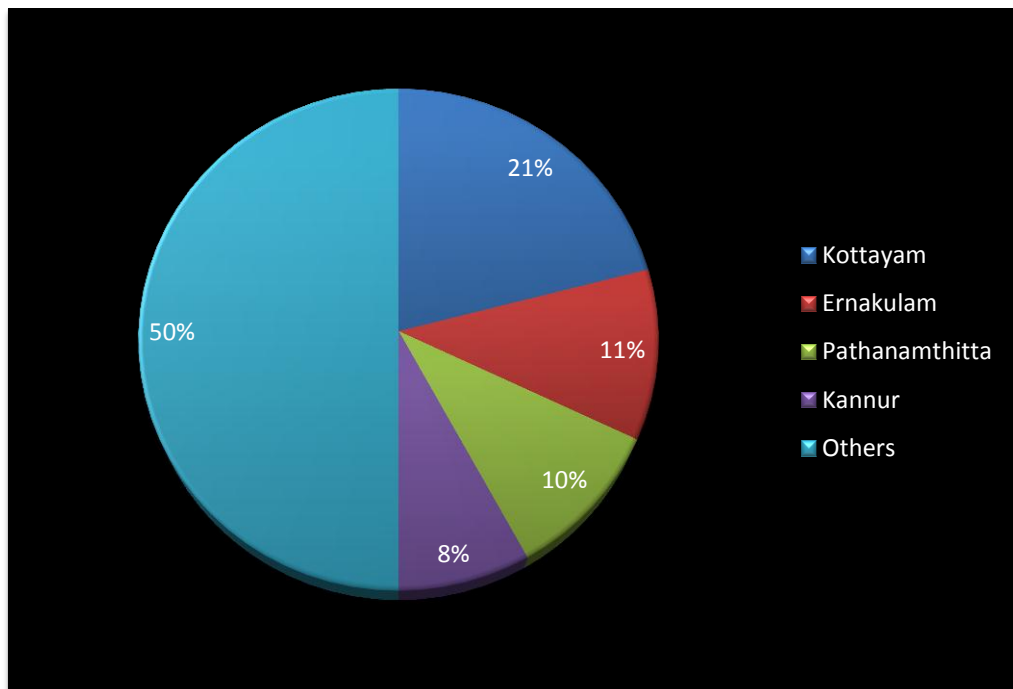


Fig. 4.3 Trends in area and production of NR in Kerala

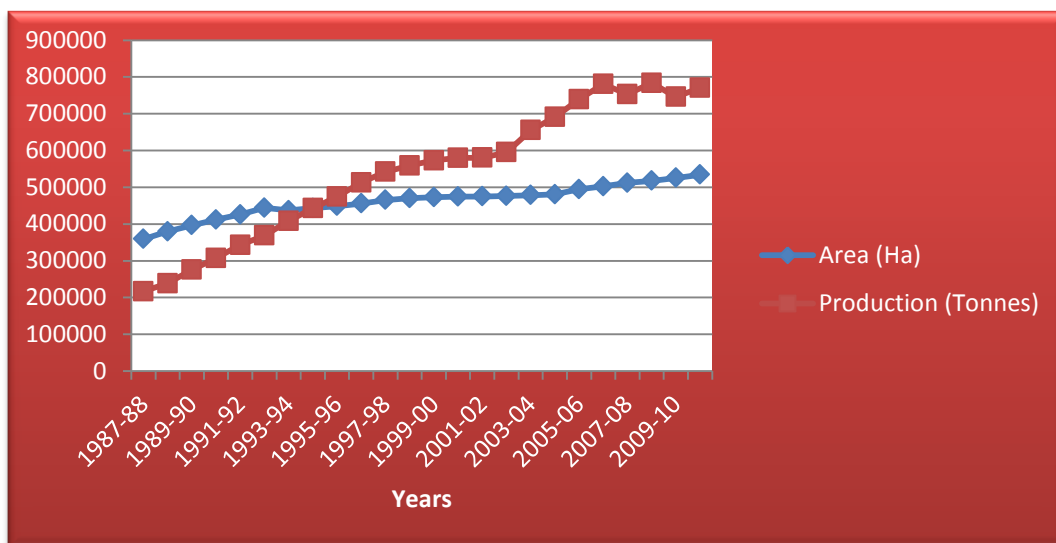
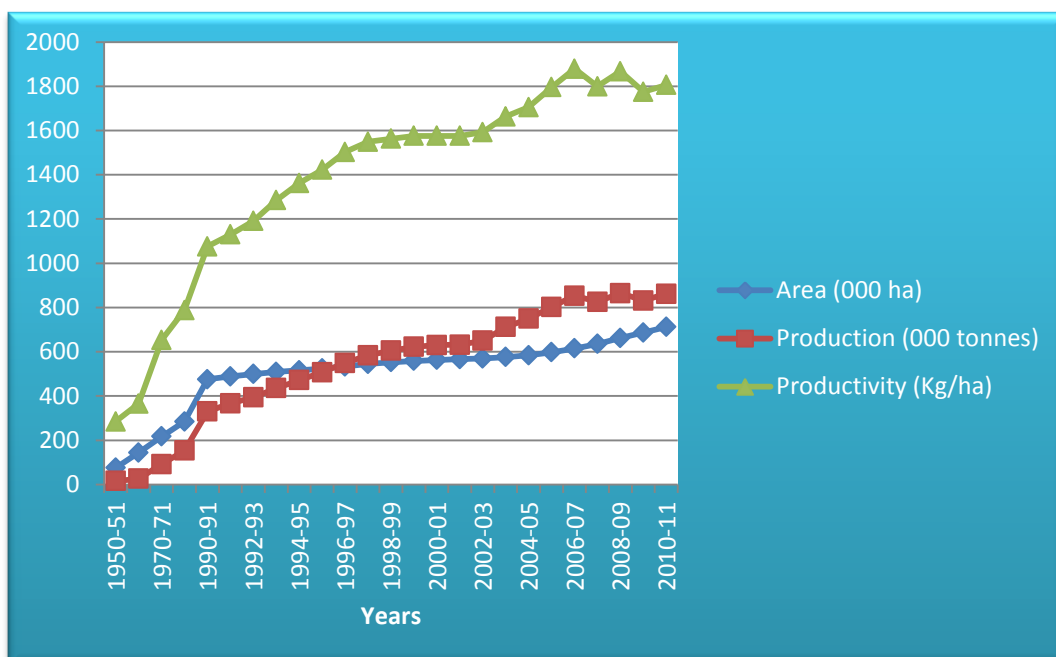


Fig. 4.4 Trends in area, production and productivity of NR in India



respectively and resulted in 244 per cent rise in NR production in Kerala. There was a decrease in the pace of growth during the period from 1999 to 2003, but after that growth gained the acceleration again and for the last three years it was consistent. The trend analysis showed that there was a sudden jump in the production as well as productivity during 2002-2003. This was mainly due to the better agro management scientific practices adopted by the farmers under the expert guidance of Rubber Board, rather than influence of high yielding varieties.

Table 4.3 Area, production and productivity of NR in Kerala with Indices

Year	Area (ha)	Indices	Production (Tonnes)	Indices	Productivity (kg/ha)	Indices
1987-88	358960	100	216560	100	603	100
1988-89	379670	105.77	238410	110.09	628	104.15
1989-90	396470	110.45	275400	127.17	694	115.09
1990-91	411620	114.67	307520	142.00	800	132.67
1991-92	425770	118.61	343110	158.44	806	133.67
1992-93	444100	123.72	368650	170.23	830	137.65
1993-94	437140	121.78	408310	188.54	934	154.89
1994-95	443300	123.50	442830	204.48	999	165.67
1995-96	449000	125.08	474560	219.14	1057	175.29
1996-97	455570	126.91	512760	236.78	1126	186.73
1997-98	465280	129.62	541940	250.25	1165	193.20
1998-99	469920	130.91	559100	258.17	1190	197.35
1999-00	472900	131.74	572800	264.50	1211	200.83
2000-01	474360	132.15	579870	267.76	1222	202.65
2001-02	475040	132.33	580350	267.99	1222	202.65
2002-03	476040	132.62	594920	274.71	1250	207.30
2003-04	478400	133.27	655130	302.52	1369	227.03
2004-05	480660	133.90	690780	318.98	1437	238.31
2005-06	494400	137.73	739230	341.35	1495	247.93
2006-07	502240	139.92	780410	360.37	1554	257.71
2007-08	512045	142.65	753135	347.78	1471	243.95
2008-09	517475	144.16	783485	361.79	1514	251.08
2009-10	525408	146.37	745510	344.25	1419	235.32
2010-11	534230	148.82	770580	355.83	1442	239.14

(Source: Farm Guide, 2012)

4.3.1.2 Instability and growth in area, production and productivity

The compound growth rate and instability index of area, production and productivity of natural rubber in Kerala for the last 25 years (1987-2011) are presented in Table 4.4. The annual growth rate during the period is presented in Fig. 4.7. The NR production in Kerala grew annually by 5.40 per cent and was contributed more by growth in productivity (3.95 %) than in area (1.36 %). The instability in area, production and productivity during the period were 2.56, 5.84 and 6.37 per cent respectively.

Fig. 4.5 Trends in indices of area, production and productivity of NR in Kerala

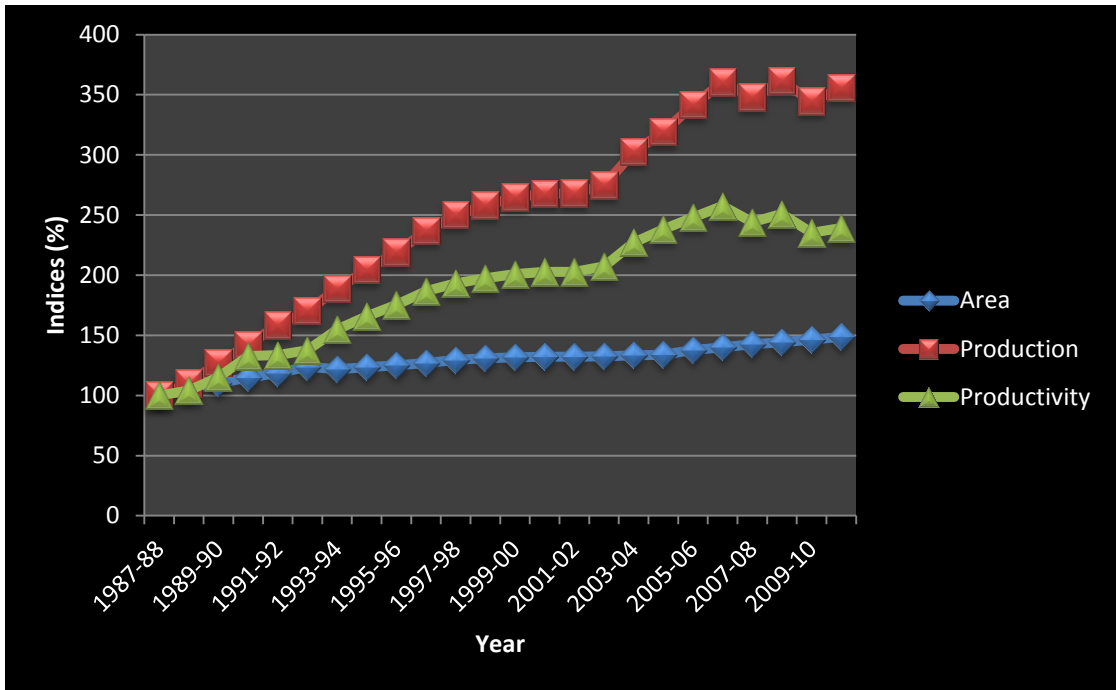


Fig. 4.6 Production system wise percentage contribution of NR in Kerala



Table 4.4 CGR and Instability Index of Area, Production and productivity of NR in Kerala (in percentages)

	Area		Production		Productivity	
	CGR	Instability	CGR	Instability	CGR	Instability
Kerala	1.36	2.56	5.40	5.84	3.95	6.37

(Data source: Farm Guide, 2012)

4.3.1.2 Decomposition Analysis

The result of the decomposition analysis is presented in Table 4.5. The analysis showed that the yield effect is contributing nearly two fold to the total production compared to the area effect. The yield effect was contributing 54.36% against 19.1% area effect, whereas 26.54% of the growth was contributed by the interaction effect.

Table 4.5 Decomposition analysis of natural rubber production in Kerala (1987-2011) in MT

Change in production (1987-2011)	Yield Effect	Area Effect	Interaction Effect
553799	301060	105740	147000
Percentage contribution	54.36	19.1	26.54

(Data source: Farm Guide, 2012)

4.3.2 Natural rubber marketing in Kerala

4.3.2.1 Marketable forms of natural rubber

Rubber is considered as the modern “*Kalpa vriksha*”, *i.e.*, a tree with every part of it being useful and of economic importance. Besides yielding rubber, which is of most versatile application, the tree is an important source of timber, honey, rubber seed and oilcake. Latex is obtained from the bark of the tree by tapping.

Ribbed smoked sheet (RSS), Latex concentrates (LC), Technically Specified Rubber (TSR), Pale Latex Crepe (PLC) and Estate Brown Crepe (EBC) are the important marketing forms of natural rubber. Ribbed Smoked Sheet (RSS) is the common method of processing latex. It is graded into six on the basis of its quality. They are RSS 1X, RSS 1, RSS 2, RSS 3, RSS 4 and RSS 5. Usually RSS 1X, RSS 1, 2, and 3 are produced by estate holders and are considered as the best quality of NR. Small holders produce low grade rubber *i.e.*, RSS 4 or RSS 5. It is marketed as an ungraded lot rubber consisting of a mixture of RSS 4 and 5. Latex concentrates are generally marketed in two forms *viz.* centrifuged latex having a dry rubber contents (DRC) of 60 % and Creamed latex having a DRC of 55 %.

TSR is produced in blocks of convenient size, out of latex in order to satisfy the specific requirements of Rubber Goods Manufacturers. Bureau of Indian Standards (BIS) prescribes six grades of block rubber *viz.* ISNR 3CV, ISNR 3L, ISNR 5, ISNR 10, ISNR 20, and ISNR 50. Pale Latex Crepe (PLC) is processed from pure latex and fetches a higher price than RSS 4 in the Indian rubber market. It is mainly used for the production of foot wears. Estate Brown Crepe (EBC) is processed from field coagulum (FC) and it is consumed by the tyre companies. The individual grower or processor selects a particular form of NR for its production on the basis of technical know-how, potential demand, expected production, investment capacity, price and profitability.

4.3.2.2 Natural rubber marketing system of Kerala

Natural rubber marketing system denotes the whole band of activities aiding the movement of rubber from the primary producers to the end-consumers. It has evolved through the process of undergoing changes and modifications in the structural features of production and consumption, market orientation and the government intervention in the rubber market.

Rubber marketing structure of the state consists of three separate sectors *viz.* individual sector, co-operative sector and corporate sector (Fig. 4.8). The individual sector consists of rubber dealers, brokers, commission and forwarding agents. The co-operative sector includes Co-operative Rubber Marketing Societies (Rubber Mark), Rubber Producers' Societies and Kerala State Rubber Co-operative Ltd. (RUBCO). Under the corporate sector, the big tyre companies operate their purchasing depots at the main producing centres to collect rubber directly from the growers.

4.3.2.2.1 Individual sector

Private sector enjoyed a prominent role in the Indian rubber market. Rubber dealers are the significant intermediaries, who are acting as the connecting link between the producers and consumers of natural rubber. Rubber dealers include both licensed and unlicensed dealers. Licensed dealers are the formal dealers who operate a trading house to collect and stock rubber brought by producers and sellers. Whereas unlicensed dealers are informal dealers who cannot operate a trading house to collect or stock rubber. Instead they collect directly from the small holders' premises and sell it to a licensed dealer at a margin. Rubber dealers are operating in a three-tier system of village, town and terminal market levels. Dealers are broadly classified into three groups depending on the nature and volume of transactions. They are primary or village level dealers, medium or taluk level dealers, and terminal or big dealers.

Fig. 4.7 Annual growth rate of area, production and productivity of NR in Kerala

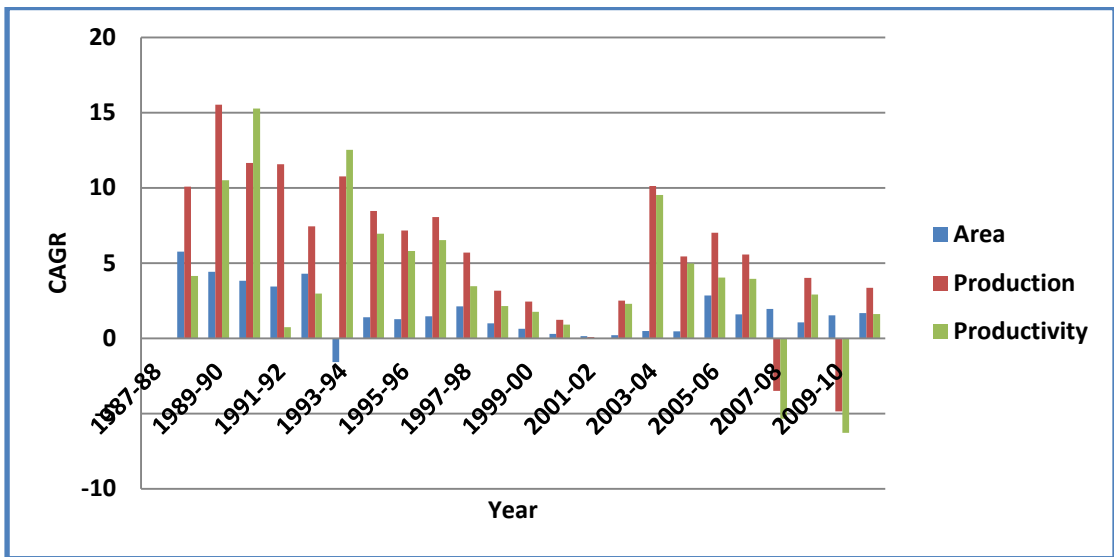
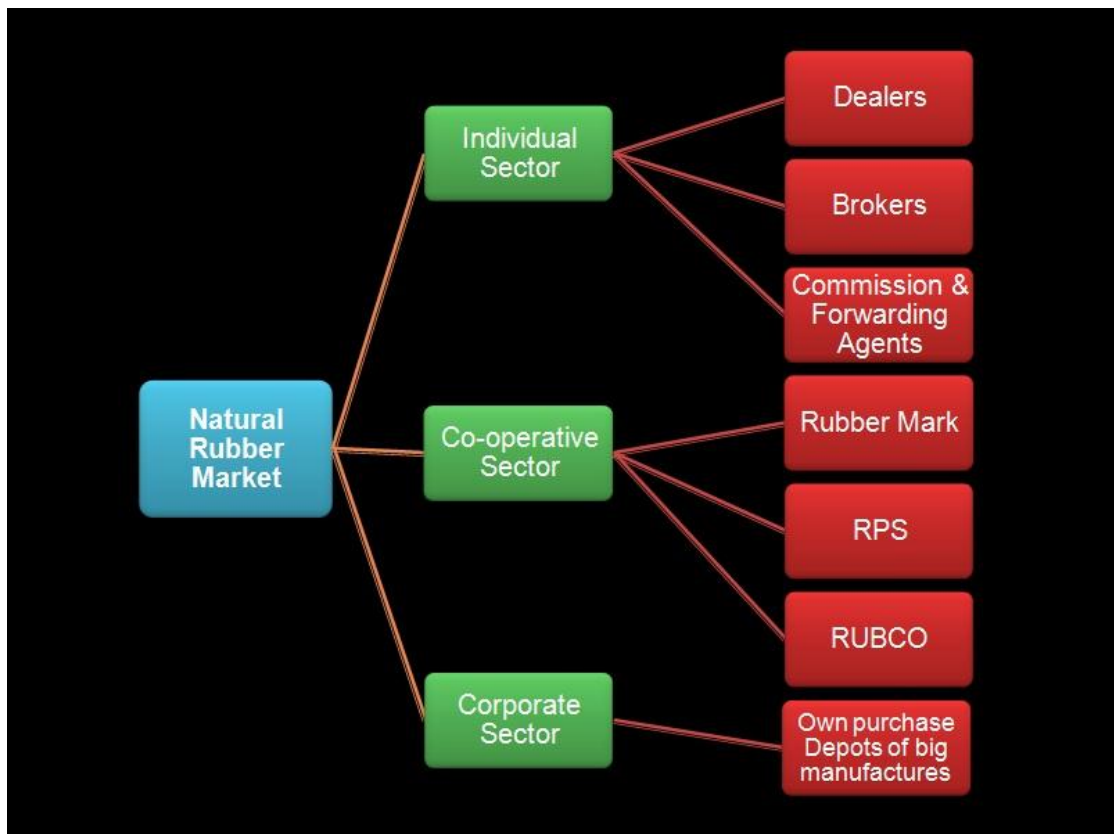


Fig. 4.8 Marketing system of natural rubber producers in Kerala



Big dealers in the terminal markets of Kottayam and Kochi have operating branches in the important rubber consuming centres outside the state such as Bombay, Delhi, Calcutta, Jalandhar etc. Similarly, big dealers with headquarters outside the state of Kerala also operate their branches in the state. In the rubber marketing system in India, it can be seen that the agents and brokers are intermediaries to bring together the purchasers and sellers of NR. Rubber dealers acting as the agents of other dealers and manufacturers are paid a commission ranging from 0.5 % to 1 % on the total turnover. Brokers are also rubber dealers who bring together the buyer and seller of NR in contact and collect brokerage from both the parties. They are found to be active in Kottayam and Kochi markets. They neither purchase nor sell rubber in their names and will not retain or release the commodity physically.

The intermediaries are an integral part of rubber marketing structure of the country. They are acting as the facilitators for the free movement of natural rubber from growers to users. There is a marked difference in the marketing channels adopted by small holders and estate holders to market their produce such as sheet rubber, field coagulum and latex. All these sectors affect the efficiency of marketing channel and trade.

4.3.2.2.2 Cooperative sector

The co-operative sector entered into the field of rubber marketing in 1960 with the active support of the Rubber Board. This sector has emerged with a view to minimise the number of intermediaries and to limit the influence of the individual sector. Agencies working under this sector and the overall progress attained by the co-operative sector are analysed below.

4.3.2.2.2.1 Co-operative Rubber Marketing Societies

Co-operative rubber marketing societies are considered as the second important intermediary facilitating the flow of NR from growers to users in the Indian rubber market. These societies were emerged in the Indian rubber market during the early years of 1960's with the active support and patronage of Rubber Board with a view to offer a reasonable price to growers. A network of primary co-operative marketing societies came into existence in almost all the major rubber producing areas in Kerala during 1960's. A federation of the primary societies was set up in 1971 with headquarters at Kochi. It is known as the Kerala State Co-Operative Rubber Marketing Federation (KSCRMF) popularly known as "Rubber Mark". This apex institution guides, co-ordinates and strengthens the activities of the primary societies. The Rubber Mark procures rubber from member societies and arranges for its successful sale in the terminal market.

4.3.2.2.2 Rubber Producers' Societies (RPS)

They are voluntary associations of small growers registered under the Societies Registration Act, 1860 as charitable societies. These societies came into being during 1980's with the objectives of group processing and marketing. RPS help the village growers to process their crop to value added marketable grades and also help them to organise group marketing by offering a remunerative price for different grades of rubber. These societies in association with Rubber Board have set up 19 private limited companies to undertake modern processing and for trading rubber and estate inputs. The companies were set up in such a way that at least 30 societies are to be brought within the working area of a company handle field coagulum, sheet rubber, TSR and latex concentrates. In Kerala there were 2226 RPS on 31st March 2012.

4.3.2.2.3 Kerala State Rubber Co-operative Ltd. (RUBCO)

RUBCO has been in operation in the Indian rubber market since 1997 as an intermediary between rubber growers and manufacturers. Though it was started in the co-operative sector with headquarters at Kannur, it has no administrative tie up with co-operative rubber marketing societies and their apex body, Rubber Mark commenced in the mid-1960s. Its main objective is to stabilise the price of NR by procurement at the time of price crash.

4.3.2.3 Corporate sector

Under this sector, big rubber goods manufacturing companies directly purchase rubber from the growers, by opening collection depots in the important rubber producing areas. It will not become part of intermediaries found in the Indian rubber market. With the emergence of RPS, tyre companies like Dunlop, Modi, MRF, Vikrant and Appolo have started procuring natural rubber directly from the smallholding sector. Almost all the tyre companies in India have opened their purchasing depots in Kochi and Kottayam markets as well as in important production centres.

4.3.2.3 Marketing Channels of Natural Rubber

4.3.2.3.1 Small holder production

The product mix of small rubber growers includes ribbed smoked sheet (RSS), latex and field coagulum (FC). The channels used for marketing these three products are as follows.

4.3.2.3.1.1 Ribbed Smoked Sheet (RSS)

Sheet rubber is the main produce of small holders. They are using the village level dealers (primary dealers) as the most common channel for marketing sheet rubber. In certain

cases town level dealers are also being used by small growers to sell their produce. Co-operative rubber marketing societies are another option before the small holders for marketing sheet rubber. RUBCO and its collection depots are available to small holders to sell their sheet rubber. Finally, the small growers can sell their sheet rubber through the Rubber Producers' societies located in the important production centres.

4.3.2.3.1.2 Latex

It is the second important constituent of the product mix of the small growers. They sell this product without any processing to the agencies like latex collection centres operated by RPS, latex collection centres operated by co-operative rubber marketing societies and private dealers and processors.

4.3.2.3.1.3 Field Coagulum (FC)

This is the last item of marketable form of rubber produced by growers. Late dripping of latex and residue of latex on the tapping channel are treated as field coagulum which is popularly called 'scrap rubber'. Following are the marketing channels available in the Indian rubber market to sell field coagulum of the small growers. a) Licensed dealers b) Co-operative rubber marketing societies c) Collection depots of RUBCO d) Crepe mills e) TSR factories and f) Unlicensed dealers. Among these various channels, unlicensed dealers are the main agents through whom the bulk of FC channel into the market in the rural areas. They visit the small holders periodically and purchase FC at a fixed price. Then they sell it either to licensed dealers or to processors.

The flow diagram of small holder marketing channel is given as Fig. 4.9.

4.3.2.3.1 Marketing channels of estate holders

The produce of estate holders includes RSS, Latex and FC as in the case of small holders. Large plantation companies have their own infrastructure facilities for processing different types and grades of rubber in accordance with market demands. Therefore, on the basis of price differentials, they can increase or reduce or even stop the production of a particular grade of rubber with a view to maximise the profit. It is noticed that estate holders are in a better position to market their produce than that of small holders. Therefore, the former group of growers realise a better price for their produce than the latter group of rubber growers. Small and medium estates have the facilities to process only sheet rubber and FC and latex are sold as such. They sell sheet rubber either to manufacturers directly or to terminal dealers in Kottayam or Kochi markets. Latex and FC are sent to own processing units or processing units operated by others for producing

different grades of rubber and finally reaches rubber goods manufacturers. The marketing channel of estate holders is visualised in Fig. 4.10.

4.4 DISCUSSION

Rubber plantations occupy 0.4 per cent of the gross cropped area in India, and accounts for 0.19 per cent of the country's GDP. Kerala occupies a monopolist position in the production of natural rubber in India with a share of 90 per cent of total production and 78 per cent of the total area under cultivation in the country. Rubber is the fast growing agricultural sector in the state and the growth rate is higher compared to other agricultural commodities. The advantage of Kerala in rubber production is that, the cultivation of natural rubber for the first time in the country in large scale was started in the state. The progressive responses of a highly receptive farming community to research and development initiatives and the concomitant performance of the sector also contributed to the growth of the sector. The explicit contributory factors for the sustained growth of the sector are reported to be a comparatively stable and remunerative pricing *vis-a-vis* other crops in the state (Chandy *et al.*, 2009). The productivity of natural rubber in Kerala is lower compared to the national average and this can be understood with the fact that the farmers of Kerala are following the cultivation traditionally, whereas in other parts of the country, they started the plantations recently with high yielding, highly resistant varieties with good management scientific practices under institutional guidance.

In the state of Kerala itself the production is concentrated in few regions. The Kottayam district had an annual contribution of 170800 tonnes (23 %) during 2009-10, followed by Ernakulam (90770, 12 %) and Pathanamthitta (77400 tonnes, 10 %). These three districts contributed 45 % of the total rubber production of the state and 40 % of total area under cultivation. This accumulation might be due to the historical reason of starting of rubber plantations in these regions for the first time and the subsequent market development in and around this area and experience gaining, promoting the acceptance of this by more and more people within the region as a livelihood measure with better returns. The contribution of the estate holders is also declining in the total production with increased small holder contribution. The contribution of estate type during 1970-71 was 32 % and came down to around 7 % by 2008-09. This should be correlated with the overall turn down in the estate type plantations like tea and rubber, due to the non-availability of sufficient labour force and the transformation of people in to self-responsible and entrepreneurship type jobs.

The trend analysis for the last 25 years revealed that natural rubber production in Kerala increased by 244 %, area by 46 % and the productivity by 135 %. There was a

Fig. 4.9 Marketing channel for small holder natural rubber production system

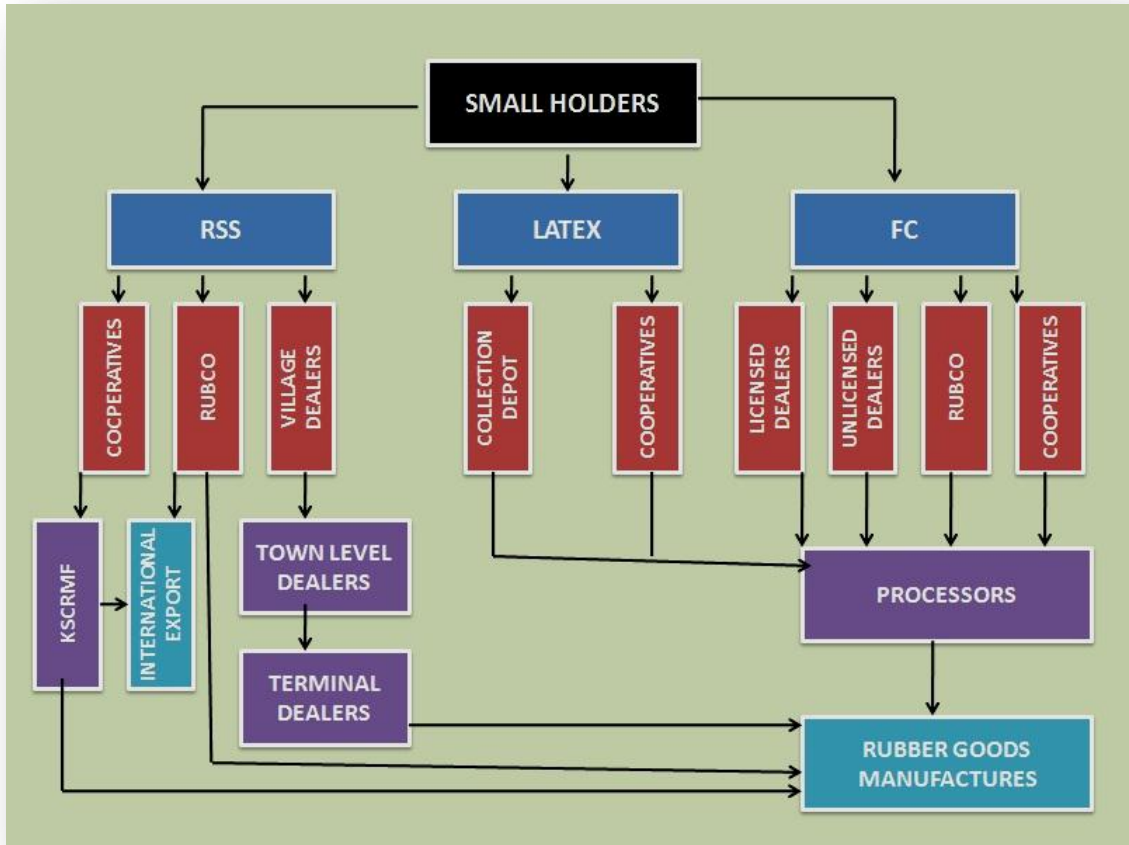
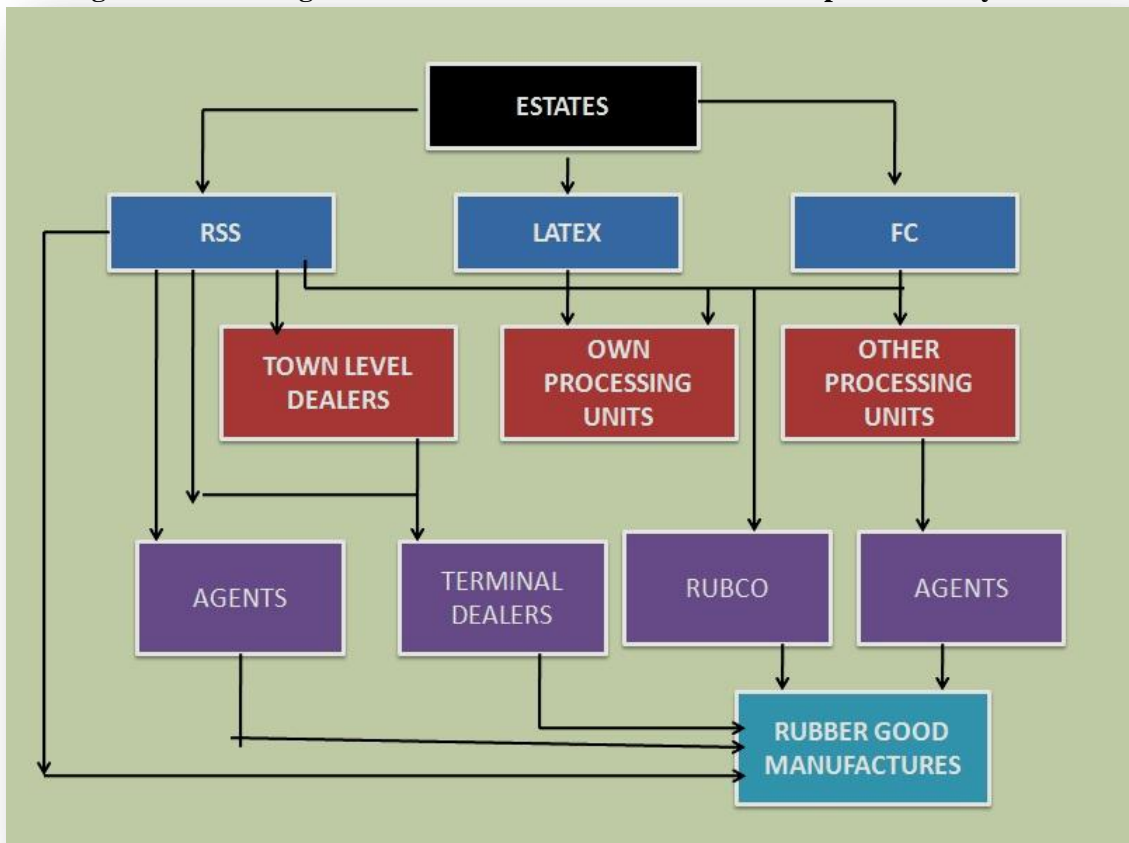


Fig. 4.10 Marketing channel for estate based natural rubber production system



slowdown in the pace of growth during 1999 to 2003, because during the period, there was sharp decline in the price of natural rubber and the people were reluctant to expand the cultivation due to lower earnings. But after this period, the growth regained the momentum and now moving in an accelerated fashion.

The compound growth rate for the period from 1987-2011 showed that the production increased by 5.40 % and this was contributed more by productivity (3.95 %) rather than area (1.36 %). The instability index showed that there was high instability in case of productivity during the period.

4.5 CONCLUSION

Natural rubber production of the country is mainly concentrated in Kerala. Over the years area, production and productivity of natural rubber of the state showing an increasing trend. Production system wise analysis showed that contribution of Estate holders was showing a declining trend over the years. Using Cuddy Della Valle Index, instability in area, production and productivity was measured as 2.5, 5.8 and 6.4 per cent respectively. The decomposition analysis showed that the yield effect is contributing two fold to the total production compared to the area effect. Individual sector, cooperative sector and corporate sector together constitute the natural rubber marketing system of the state. Sheet is the major produce and for small holders and Estate holders separate marketing channels were identified.

Research Paper II

Chapter 5

RESEARCH PAPER II

An Economic Analysis of Price Dynamics of Natural Rubber

ABSTRACT

Rubber is a perennial crop with an economical life span of 10-20 years. Price fluctuations has got multifaceted effect on the area, productivity and hence the production of the crop. Unexpected and wide fluctuations in prices may discourage farmers from taking up of improved production and protection methods which may result in low production and instability in farm income. Cuddy Della Valle Instability Index showed that rubber prices were having considerable instability in both domestic and international markets. Uniformity in prices and thereby efficiency in marketing system can be brought about by integration of the economy. Johansen's co-integration analysis was used to test the market integration between domestic and international reference markets of rubber and the results revealed that there exists long run equilibrium. GARCH (1, 1) model was applied to analyse the extent of volatility in prices of natural rubber for RSS 4 grade. Results indicated that the markets experienced high level of volatility during the study period (2005-06 to 2011-12). Seasonality indices showed that natural rubber price was maximum in the month of July and minimum in January. Export competitiveness measured using Nominal Protection Coefficients (NPC) revealed that domestic rubber was not export competitive during both peak and lean seasons.

KEY WORDS: Price Dynamics, Natural Rubber, Cointegration, Seasonality

5.1 INTRODUCTION

Agricultural production is risky and uncertain in nature. Ambiguities associated with production as well as prices are having negative effect on agricultural growth. Technically while agricultural production is linked with uncertainties, prices are always associated with risk (Ramasundaram, 2004). The majority of the rural producers are unable to understand and interpret the market and price behaviour into their advantages (Ajjan *et al.*, 2009). Prices of agricultural commodities are generally highly volatile in nature *i.e.* fluctuations are more than that of industrial goods. The wide price fluctuations affect the incomes and living standards of farmers, rural labourers and the non- farming population (Acharya and Agarwal, 1991).

Having a clear idea about the spatial and temporal variations in prices is of at most importance as far as policy decisions are concerned. This will be helpful to producers as these are indications given by the markets regarding the demand and supply situations. Proper

allocation of limited resources with maximum profit structure can be decided using these price signals. Knowledge on price dynamics will be helpful to the consumers also.

Rubber is a perennial crop with an economic life span of 10-20 years. Price fluctuations has got multifaceted effect on the area, productivity and hence the production of the crop. Unexpected and wide fluctuations in prices may discourage farmers from taking up of improved production and protection methods, which may result in low production. And these dynamics will affect the farm income adversely. Since rubber is a major plantation crop contributing considerable degrees to the agricultural economy of the country, it is important to study the behaviour of prices over the time period. This will give insight to the different aspects of prices and hence will be useful to the millions of farmers and stake holders.

The rubber framers are exposed to price fluctuations creating uncertainty about the price they receive for their products. High volatility in natural rubber price may be a result of international trade policies, natural disasters and political changes and also due to different factors like demand for raw rubber, cost of production of synthetic rubber etc (Abeysekera, 2011).The price factor which strongly affects demand remains mostly in favour of natural rubber as it enjoys a comparative advantage in India against general purpose synthetic rubber (Mohankumar *et al.*, 1994). This uncertainty in rubber prices makes it difficult for producers to allocate resources efficiently, limits their access to credit for productivity enhancing inputs, and leads to adopt low-yield, low risk production technologies, thereby lowering average incomes. Success of price stabilisation policies is dependent upon the availability of quality assessment of price volatility and price movements.

Plantation expansion plans of the major natural rubber producing countries are getting accelerated on account of the rising trend in rubber prices (Mathews, 2011). The pro-active policy level interventions during the five decades from 1942 to 1991 had been effective in insulating the domestic market from external competition and ensured a comparatively stable and remunerative price (George and Chandy, 1996). However, the hitherto unperturbed profile of the price policy has been seriously challenged by a host of external trade policy reforms initiated since 1991. The subsequent integration of national and international markets and the transmission of world market price instabilities to the domestic market posed serious questions on the sustainability of the state's natural rubber sector (Chandy *et al.*,2010).

To have a continuous supply of rubber, it is vital that the balance between mature and immature rubber stands be maintained in the long run. One of the major variables that affect the replanting decision by farmers is the price of rubber (Edirisinghe and Perera, 2005). Efficiency of market can be arbitrated based on prevalent price in the whole market system. Existence of uniform price throughout the markets can be considered as a situation of

efficient market system. In other words, an agricultural market is said to be efficient if there is a uniform price prevailing in the entire market area for an identical commodity. Efficiency in agricultural marketing system is necessarily a precondition for agricultural growth. Under such a system, consumers get the product at affordable prices and the producers get the remunerative prices. Uniformity in prices and thereby efficiency in marketing system can be brought about by integration of the economy. To be precise, an integrated market system is synonymous with an efficient marketing system.

Agricultural sector in India underwent unprecedented policy changes in 1990's and it has significant influence on the extent of integration of domestic market price with that of world market price. With the establishment of WTO, the extent of integration of domestic market prices and world market prices have increased and volatility of the prices of agricultural commodities in domestic markets have been affected. Markets that are not integrated may deliver vague idea regarding the prices that might mislead production decisions and cause to inefficiencies in markets. This slow transmission of price information would adversely affect small holders, especially rural producers. The demand as well as supply variations in a market will have an equal impact on prices of both markets if the markets are integrated and having free trade. Underdeveloped markets will have high marketing margins due to transportation costs, poor infrastructure and communication facilities. High transfer costs and marketing margins hinder the transmission of price signals, as they may prohibit arbitrage (Sexton *et al.*, 1991; Badiane and Shively, 1998).

5.2 DATA AND METHODOLOGY

The present study of analysing the price dynamics of natural rubber in India is based on the secondary data published by Rubber Board, Kottayam. Price data from the period of 2005 to 2012 for domestic as well as international markets were collected. The main items of observations were the daily as well as monthly prices of RSS 4 and latex 60 from Kottayam, Bangkok and Kuala Lumpur markets. The domestic market at Kottayam was purposively selected for studying the price dynamics of natural rubber because Kottayam is a reference market for rubber prices in India. Since the rubber prices in the domestic markets are affected by the international prices, price data of major international markets *i.e.*, Bangkok and Kuala-Lumpur were also taken.

5.2.1 Cuddy Della Valle Instability Index

The magnitude of instability in the prices of rubber was measured in relative terms by Cuddy Della Valle Index which is used in recent years by a number of researchers as a measure of variability in time- series data. Simple coefficient of variation overestimates the

level of instability in the time series data characterised by the long term trends whereas Cuddy Della Valle Index corrects the coefficient of variation.

$$II = CV * (1 - R^2)^{0.5}$$

Where

II = Instability index (per cent)

CV = Coefficient of variation (per cent)

R^2 = Coefficient of determination from a time trend regression adjusted by the number of degrees of freedom.

Deflated price data for the period 2005-06 to 2011-12 was used to find out the instability index.

5.2.2 Co-integration Analysis

Market integration has usually been conceived in terms of co movements or long run relationship between the spatial prices (Fackler, 1996). Before testing for co-integration, the time series has to be checked for its stationarity. The stationarity properties and the exhibition of unit roots in the time series are substantiated by performing the Augmented Dicky Fuller (ADF) test. This test is conducted on the variables in level (original price series) and first differences (Dickey and Fuller, 1979). The variables that are integrated of the same order may be co-integrated, while the unit root test finds out stationarity of the time series. In a co-integrated equation system,

$$\Delta Y_t = \sum \Pi I \Delta Y_{t-i} + \alpha \beta Y_{t-k} + \varepsilon_t$$

Where, Y_t is the price time series, ΔY_t is the first order difference and matrix $\Pi = \alpha\beta$ is (n x n) order with rank 'r' ($0 \leq r \leq n$), the number of independent co-integration relations. The model is estimated by regressing ΔY_t matrix against the lagged differences ('k' lags) of ΔY_t and ΔY_{t-k} and to determine the number of co-integration vectors, the rank of $\Pi = \alpha\beta$ has to be found. The order of co-integration vectors is to be determined by estimating the corresponding Eigen values, where the number of co-integration vectors equals the rank of $\Pi(r)$. The rank of Π can be determined by λ_{trace} using trace or test statistics. The trace statistics is given by

$$\Lambda_{trace} = -T \sum_{i=r+1}^n \ln(1-\lambda_i), \text{ for } r = 0, 1, \dots, n-1$$

Where λ_i are the Eigen values representing the strength of the correlation between first difference part and the error correction part. Then the following hypothesis can be tested,

Ho: rank of $\Pi = r$ (null hypothesis), and H1: rank of $\Pi > r$ (alternate hypothesis), where 'r' is the number of co-integration equations.

In the co-integration regression model, the residual shows the deviation from equilibrium and this equilibrium in long run tends to be zero. This equilibrium error has to be made stationary for getting co-integration between two integrated variables. The stationarity of the error can be verified with the usual ADF test. The test implies that errors adjust to the long run equilibrium.

5.2.3 GARCH (Generalised Autoregressive Conditional Heteroscedasticity)

Generalised Autoregressive Conditional Heteroscedasticity (GARCH) was used to measure the extent of volatility in agricultural commodity prices. This approach distinguishes not only between predictable and unpredictable components of prices but also allows the variance of unpredictable element to be time varying (Bollerslev, 1986). The commonly used GARCH (1, 1) model is defined below.

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \beta_1 \sigma_{t-1}^2$$

This says that the conditional variance of u at time t depends not only on the squared error term in the previous time period but also on its conditional variance in the previous time period. The software E-Views 5 version was used for GARCH analysis.

The sum of $(\alpha_1 + \beta_1)$ gives the degree of persistence of volatility in the price series. The closer the sum to one, greater is the tendency of price volatility to persist for longer time in the variable under consideration. If the sum exceeds one, it indicates an explosive time series with a tendency to meander away from the mean value.

5.2.4 Seasonality

Seasonal variation is a component of a time series which is defined as the repetitive and predictable movement around the trend line in one year or less. It is detected by measuring the quantity of interest for small time intervals, such as days, weeks, months or quarters. Ratio to moving average method was used to measure the seasonality in the monthly price data of natural rubber in domestic reference market *i.e.*, Kottayam (2008 April to 2012 June).

5.2.5. Export Competitiveness using Nominal Protection Coefficient (NPC)

The export competitiveness of natural rubber was studied using the Nominal Protection Coefficient (NPC). NPC is a simple index which measures the divergence of domestic price from international price and determines the degree of export and import competitiveness of the commodity in question (Porter, 1990). NPC is the ratio of the domestic price to the border price (Gulati *et al.*, 1994; Datta, 2001).

$$NPC = P_d / P_b$$

Where,

NPC = Nominal protection Coefficient of the commodity under consideration

P_d = Domestic price of the commodity

P_b = Border price or reference price after taking care of transportation and marketing expenses

The coefficient can be worked out either under exportable or importable hypothesis depending upon whether the commodity under consideration is exportable or an importable item. Under exportable hypothesis, the relevant border price is the fob price, whereas under importable hypothesis the border price is the CIF price in the domestic port.

5.3 RESULTS AND DISCUSSION

5.3.1 Price Instability (Cuddy Della Valle Index)

Several aspects have influenced the price of rubber in the past quarter of the century. Growth in population and the development of world economy have enhanced the demand for goods and services, including rubber products. But the supply of rubber has not kept pace with the rise in demand. The collapse of the last surviving commodity price stability agreement -International Natural Rubber Agreement (INRA)-, the establishment of World Trade Organisation (WTO), the Asian financial crisis and the formation of International Tripartite Rubber Organisation (ITRO) by top three NR producing countries Thailand, Indonesia and Malaysia were some of the specific developments that had a great bearing on NR price trends during the past 25 years.

There are also other factors like impact of climate change on natural rubber output, role of hedge funds, futures market activities, exchange rate variations in currencies, rise in oil prices and stock position that have influenced the NR market. These have brought about fluctuations in natural rubber prices, which have ultimately affected the growth prospects of the rubber producing sector and the rubber manufacturing sector.

Instability is one of the most important decision parameters in development dynamics and so in the context of agricultural production. An analysis in the fluctuations of prices of crops is very important for understanding the nature of supply and income stability. Fluctuation in crop prices will affect the demand conditions as well as the disposable income of farmers. High growth in production accompanied by the low level of instability in prices is desired for the sustainable development of natural rubber sector.

The instability in daily prices of RSS 4 & Latex 60 grades of natural rubber in Kottayam-Bangkok markets and Kottayam-Kuala Lumpur markets were checked for the period of 2005-2006 to 2011-2012. The study period was divided into two in order to compare instability of daily prices of rubber in the reference domestic and international markets. The first phase of the study period ranges from 2005 April 1st to 2008 March 31st. Cuddy Della Valle Instability index (CDI) was used for estimation of instability since it is a better measure compared with simple coefficient of variation.

Table 5.1 Instability indices in daily domestic and international prices of natural rubber (RSS4) (In percentage)

Price	2005-2008			2009-12		
	1-R ²	CV	CDI	1-R ²	CV	CDI
Particulars						
Kottayam	0.47	16.54	11.34	0.30	25.18	13.79
Bangkok	0.67	18.01	14.75	0.55	27.41	20.33

(Source: Price details from Rubber Board)

Instability analysis of daily domestic and international price of natural rubber (RSS 4 grade) for the periods 2005-2008 and 2009-2012 using Cuddy Della Valle Index has been shown as Table 5.1. The index showed that 11 % and 14 % instability was found in the price of Kottayam and Bangkok markets for the period of 2005-2008. It was observed that during the second phase of the study the instability indices were comparatively high *i.e.* 13 % & 20 % respectively for the domestic (Kottayam) and international market (Bangkok).

Table 5.2 Instability indices in daily domestic and international prices of natural rubber (Latex 60) (In percentage)

Price	2005-2008			2009-12		
	1-R ²	CV	CDI	1-R ²	CV	CDI
Particulars						
Kottayam	0.69	18.07	15	0.39	22.57	14.15
Kuala Lumpur	0.79	19.21	17.08	0.37	26.49	16.33

(Source: Price details from Rubber Board)

Table 5.2 gives an idea about the level of instability in prices of natural rubber (Latex 60). The analysis showed that there exists a significant level of instability in the prices of international market *i.e.*, Kuala Lumpur compared to that of Kottayam. It can be observed that the instability was getting reduced while moving from first phase to the second phase of

study. For the domestic market Kottayam the instability index got slightly reduced from 15 % to 14 %. International market (Kuala Lumpur) had also shown the similar trend.

The comparison between two tables showed that latex 60 grade was showing more instability to that of RSS 4 for all the study period except for Bangkok market (2009-12 period). The prices showed moderate instability during the period of analysis. It is found that the instability in prices of RSS 4 is getting widened for both domestic and international market. For domestic market the instability was comparatively low for both the time periods. High transfer costs and marketing margins hinder the transmission of price signals, as they may prohibit arbitrage (Sexton *et al.*, 1991; Badiane and Shively, 1998). Because of the comparative inefficiency of the Kottayam market, prices were got partially insulated. Along with this there were effect of the price risk mitigation measure in the form of Price Stabilisation Fund Scheme which was launched in April 2003 against the backdrop of decline in international and domestic price of rubber helped domestic Kottayam market to maintain low instability in prices . Natural rubber price instability during the liberalisation periods had fallen more than its level recorded during pre-liberalisation period (Mohan Kumar, 2011). International demand and supply fluctuations caused the significant instability in prices of RSS 4 for Bangkok market which is the reference market for international rubber trade. Instability in international market is having considerable impact on the domestic market since the price movements are in same direction.

5.3.2 Market Integration (Johansen's Co integration Test)

The estimated ADF statistic for unit root test of the time series data on the prices of natural rubber for the period 2005-2008 and 2009-2012 are presented in Table 5.3 and 5.4. The results indicated the presence of non-stationarity in time series data of prices of Kottayam and Bangkok markets at their levels. However, all the non-stationary variables were found to be stationary at their first differences, and therefore, re-integrated of order one I (1). This conformation that each level series is I (1) allows proceeding with the Johansen's cointegration test. The estimates of the cointegration analysis are presented in Table 5.3 and 5.4.

Table 5.3 Estimated ADF statistic for unit root test in natural rubber prices (RSS 4)

Period	Kottayam		Bangkok	
2005-2008	-1.82	-19.79*	-2.04	-14.84*
2009-2012	-1.49	-16.28*	-1.61	-17.11*

Note * indicates significance at 1% of MacKinnon (1996) one-sided p-values

Table 5.4 Estimated ADF statistic for unit root test in natural rubber prices (Latex 60)

Period	Kottayam		Kuala Lumpur	
	2005-2008	-2.08	-7.62*	-2.82
2009-2012	-1.81	-23.30*	-1.23	-12.93*

Note * indicates significance at 1% of MacKinnon (1996) one-sided p-values

To proceed with the cointegration analysis, it is necessary to decide well before the optimum lag length since Johansen's cointegration is much sensitive to the number of lags. It confirms the influence of lagged days on the current day price. For the present study the optimum lag length was estimated using the AIC criterion (Table 5.5 and 5.6). Lag length of 8 was selected for the test.

Table 5.5 Estimated AIC value for optimum lag length in natural rubber prices for Kottayam & Bangkok markets (RSS 4)

Period	AIC value	Order of lag
2005-2008	-14.68646*	3
2009-2012	-15.53894*	4

* indicates lag order selected by the criterion

Table 5.6 Estimated AIC value for optimum lag length in natural rubber prices for Kottayam & Kuala Lumpur markets (Latex 60)

Period	AIC value	Order of lag
2005-2008	- 10.09765*	5
2009-2012	-13.63518*	4

* indicates lag order selected by the criterion

Correlation analysis was done to identify short run integration between domestic and international markets. Correlation analysis revealed a significant positive co-movement between Kottayam and the International reference markets. This indicated a strong interaction between the price movements in both markets.

Johansen's cointegration test reveals the Eigen value and the trace statistic for each set of variables. The test rejects the null hypothesis of no cointegration relationship between domestic and international reference markets ($r=0$) indicating the presence of one cointegration equation between two markets. The purpose of the test is to identify whether the

two markets are integrated, thereby price transmission (information flow) takes place helping in the process of price discovery.

Table 5.7 Estimates of Johansen's cointegration test for Kottayam and Bangkok market prices of natural rubber (RSS 4)

Period	Correlation	Eigen value	Trace statistic	Null hypothesis	Log likelihood ratio
2005-2008	0.90 [^]	0.009694	15.50	r=0*	4732.787
		0.007492	3.74	r≤1	
2009-2012	0.97 [^]	0.016455	16.84643	r=0*	5106.887
		0.009164	6.011887	r≤1	

*Denote the rejection of null hypothesis at 5% level of significance, ^ indicates the significance of correlation coefficients at 1% level of probability.

Table 5.8 Estimates of Johansen's cointegration test for Kottayam and Kuala Lumpur market prices of natural rubber (Latex 60)

Period	Correlation	Eigen value	Trace statistic	Null hypothesis	Log likelihood ratio
2005-2008	0.67 [^]	0.035253	26.63	r=0*	3194.950
		0.006557	4.124561	r≤1	
2009-2012	0.93 [^]	0.018773	15.69209	r=0*	4453.671
		0.005214	3.392768	r≤1	

*Denote the rejection of null hypothesis at 5% level of significance, ^ indicates the significance of correlation coefficients at 1% level of probability.

Johansen's test revealed the long run equilibrium between the market prices of natural rubber for domestic and international markets, justifying the use of a vector error correction model (VECM) for showing the short run dynamics (Table 5.7 and 5.8). If the estimated error correction coefficient in international market is negative (positive), it indicates that decrease (increase) in the previous period equilibrium error, which leads to decrease (increase) in the current period domestic market price. Both the error correction coefficients suggest that sustainable long run equilibrium is achieved by bridging the gap between international and domestic markets prices (Fig. 5.1 and Fig. 5.2).

The results of VECM in natural rubber market prices indicated that most of the coefficients turned positive for both domestic Kottayam and Bangkok market (Table 5.9). The vector error correction coefficient was -0.016565 and -0.003747 for Bangkok and Kottayam markets (2005-2008).

Fig. 5.1 Price movements for Bangkok and Kottayam Markets for the period 2005-2008

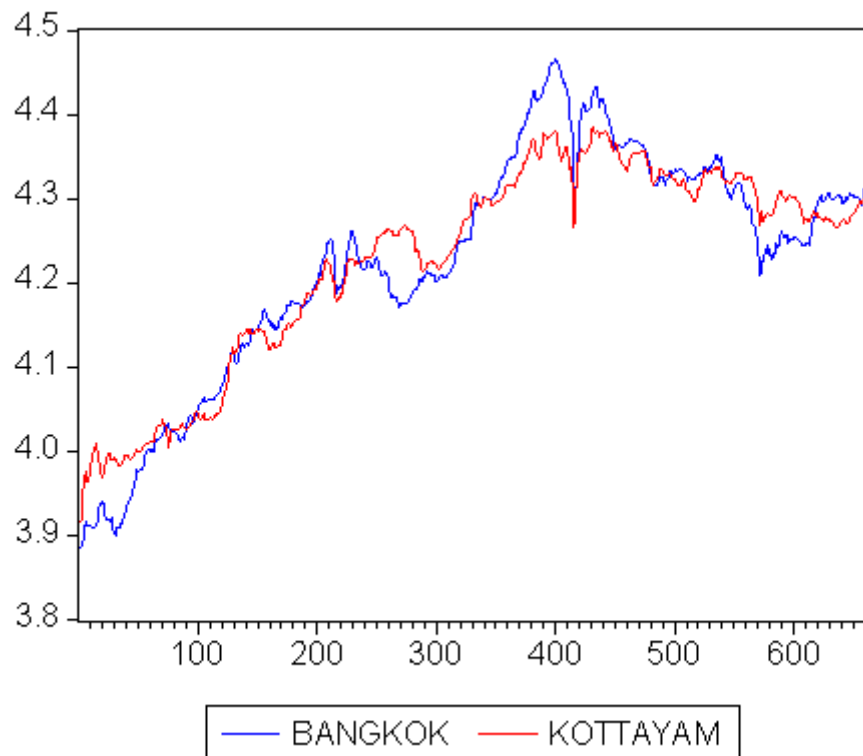


Fig. 5.2 Price movements for Bangkok and Kottayam Markets for the period 2009-2012

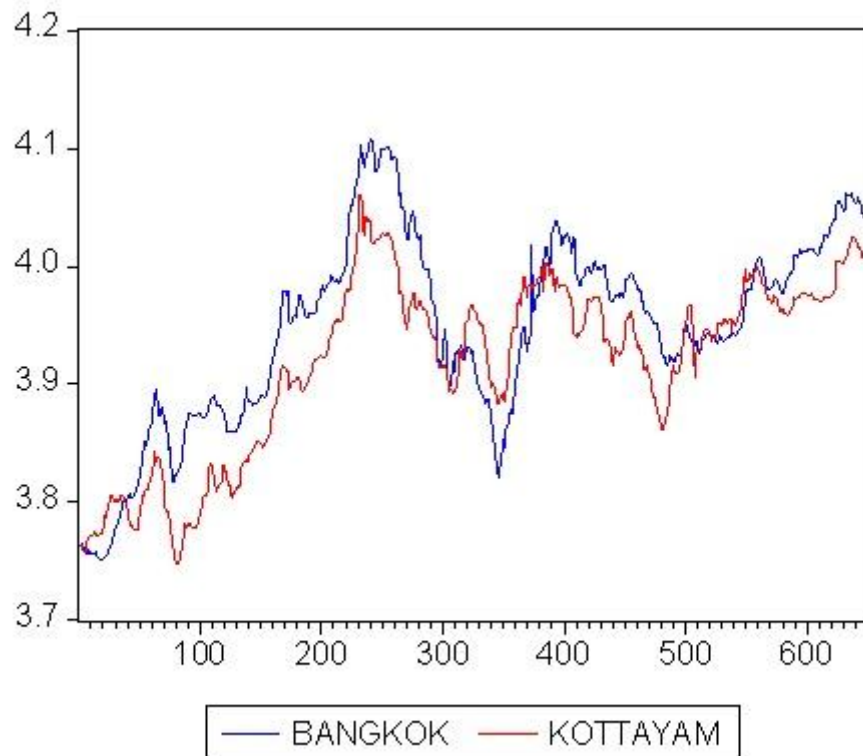


Table 5.9 Estimates of vector error correction model in natural rubber market prices of Kottayam and Bangkok markets

Period	Cointegration equation		Error correction estimates	
	Constant	Coefficient	Bangkok	Kottayam
2005-2008	-1.113605	-0.723320 (0.21382)	-0.016565 (0.00668)	-0.003747 (0.00597)
2009-2012	0.943778	-1.222870 (0.09163)	-0.005146 (0.00588)	0.014496 (0.00568)

Table 5.10 Estimates of vector error correction model in natural rubber market prices of Kottayam and Kuala Lumpur markets (Latex 60)

Period	Cointegration equation		Error correction estimates	
	Constant	Coefficient	Kuala Lumpur	Kottayam
2005-2008	0.158256	-1.041458 (0.06486)	0.509340 (0.05248)	-0.006010 (0.00268)
2009-2012	-0.852425	-0.791324 (0.08016)	0.005754 (0.00554)	-0.043644 (0.01402)

This indicated that how quickly the dependent variables such as domestic and international market prices absorb and adjust themselves for previous period disequilibrium errors. In other words, the coefficient measures the ability of the prices to incorporate shocks or news in the prices. In this case the Kottayam and Bangkok market absorb only 1 and 0.37 per cent respectively to bring about the equilibrium in prices. The information flow is more in Kottayam market compared to Bangkok. For the period 2009-12 the rate of adjustment was 0.05 and 1.44 per cent respectively.

Similar kind of interpretations can be done for the Kottayam- Kuala Lumpur markets (Fig. 5.3 and Fig. 5.4). The error correction coefficients in Kuala Lumpur and Kottayam markets were 0.51 and 0.006 respectively (Table 5.10). This indicated that 51 per cent of disequilibrium is corrected each day by changes in the international reference prices. Similarly only 0.6 % of disequilibrium is corrected each day by changes in the Kottayam market prices. It also implies that information flows from international to domestic market. During the period 2009-12, error correction coefficients were 0.005 and 0.044, respectively *i.e.*, only 0.5 percent disequilibrium was corrected each day by changes in international reference prices of Kuala Lumpur. Whereas 4.4 per cent of the disequilibrium was corrected

Fig. 5.3 Price movements for Kottayam and Kuala Lumpur Markets for 2005-2008

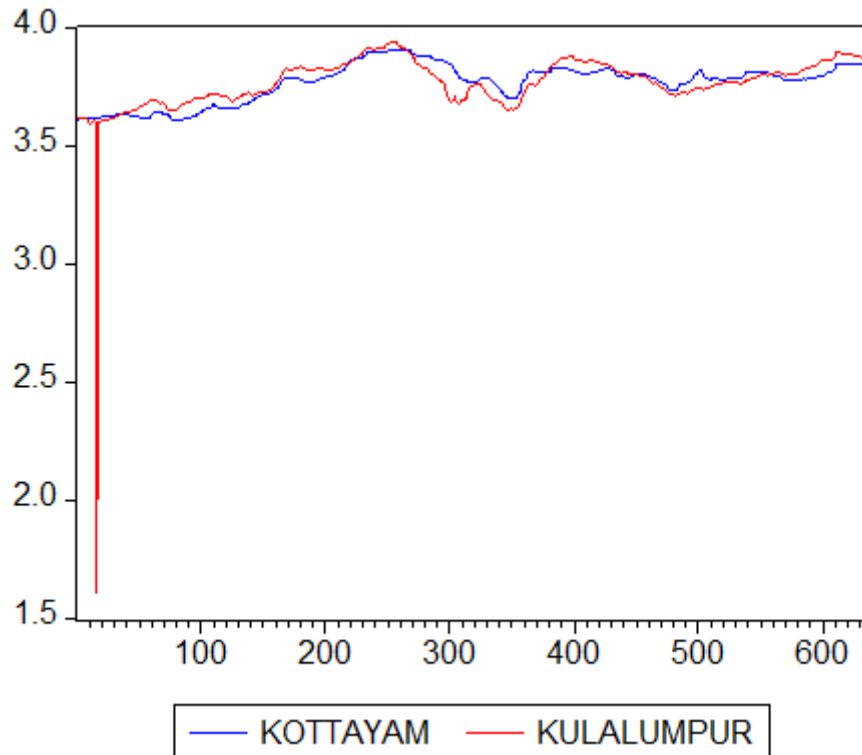
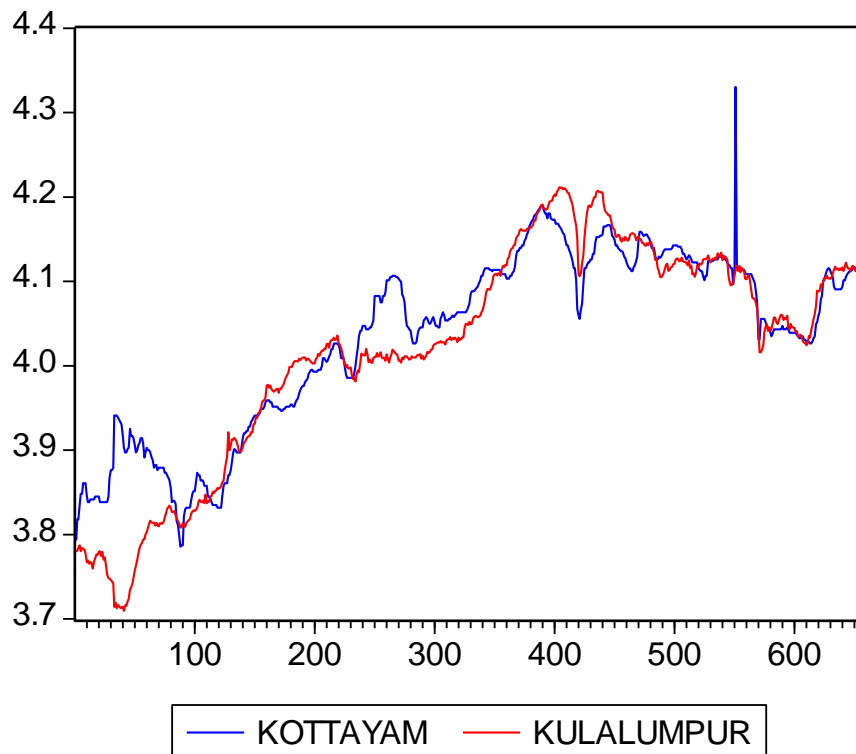


Fig. 5.4 Price movements for Kottayam and Kuala Lumpur Markets for 2009-2012



each day by changes in the Kottayam market price i.e., the information flow in the Kottayam market was high.

5.3.4 Price Volatility (GARCH model)

GARCH model was fitted to compute the extent of volatility in domestic and international market prices of rubber for the periods 2005-2008 and 2009-2012. Daily prices, the best indicator of volatility were collected for the representative domestic and international markets of natural rubber transformed into natural logarithms. The entire study period was divided into two for the comparison purpose. The missing observations are adjusted with the previous closing prices of daily trading.

Analysis of behaviour of prices was done by plotting the daily prices of commodities (Fig. 5.5, 5.6, 5.7 and 5.8). All the plotting showed an increasing trend to the rise in price of natural rubber. GARCH model (1, 1) was used for analysis of time series data. The results of the GARCH analysis clearly indicated that the volatility in the current day depends on volatility in the preceding day and the conditional variance for all the commodities as evident from the significant ARCH and GARCH term.

Table 5.11 Estimates of fitted GARCH model in natural rubber market prices of Kottayam and Bangkok markets (RSS 4)

Period	Bangkok			Kottayam		
	Estimates of ARCH term (α_i)	Estimates of GARCH terms (β_i)	$\alpha_i + \beta_i$	Estimates of ARCH term (α_i)	Estimates of GARCH terms (β_i)	$\alpha_i + \beta_i$
2005-2008	0.283739*	0.756912*	1.04	0.184145*	0.729285*	0.90
2009-2012	0.345918*	0.723343*	1.06	0.622581*	0.337767*	0.96

*Significant at 1 percent level of probability (z statistic)

The ($\alpha_i + \beta_i$) coefficients for Bangkok and Kottayam markets were 1.04 and 0.90 respectively (Table 5.11) for the period 2005-08. It can be inferred that the price volatility is getting widened over the period of time since during the 2nd phase of study the ($\alpha_i + \beta_i$) coefficients for Bangkok and Kottayam markets were 1.06 and 0.96 respectively. The international market prices were showing very high volatility of 1.04 and 1.06 over the period. In domestic Kottayam market also prices were highly volatile but slightly low compared to that of Bangkok market. This is due to the effect of Price Stabilisation Fund Scheme launched in domestic markets (2003).

Fig. 5.5 Time series plot of price for RSS 4 grade of NR: Bangkok (2005-2008)

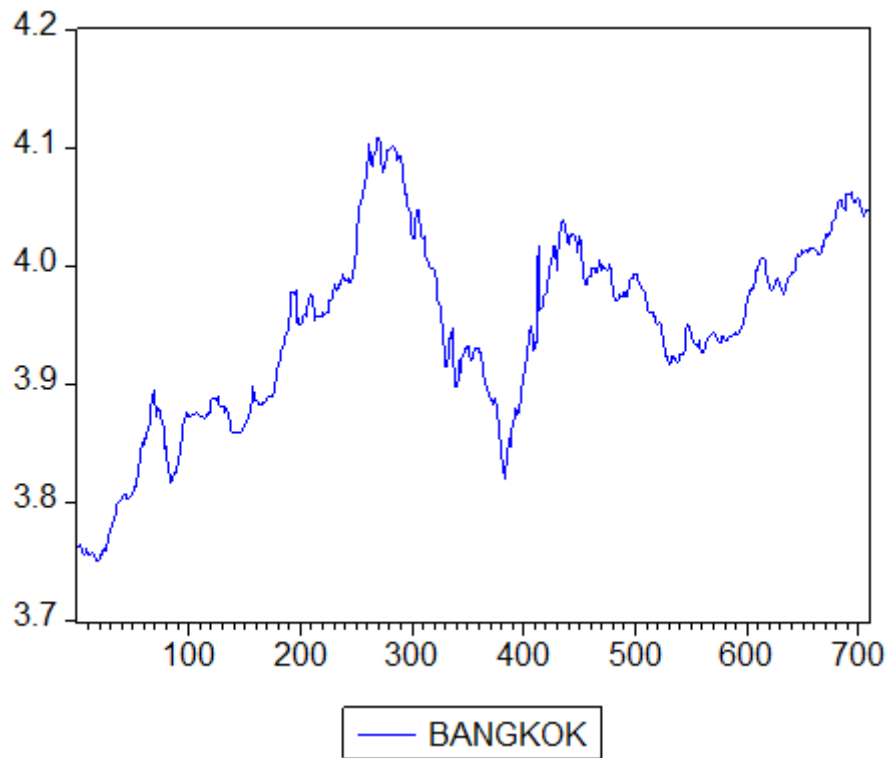


Fig. 5.6 Time series plot of price for RSS 4 grade of NR: Bangkok (2009-2012)

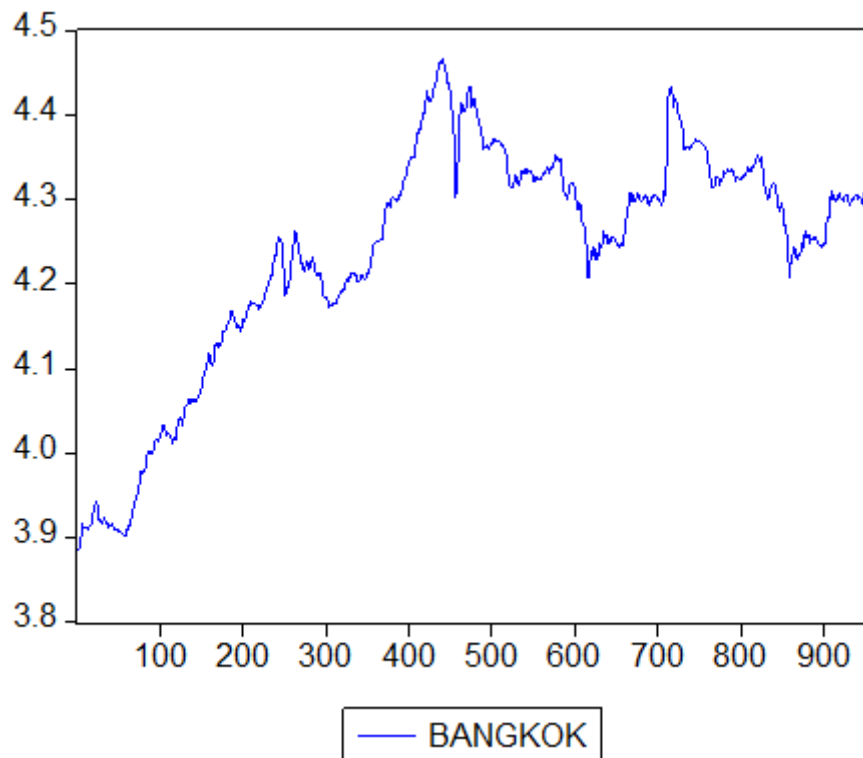


Fig. 5.7 Time series plot of price for RSS 4 grade of NR: Kottayam (2005-2008)

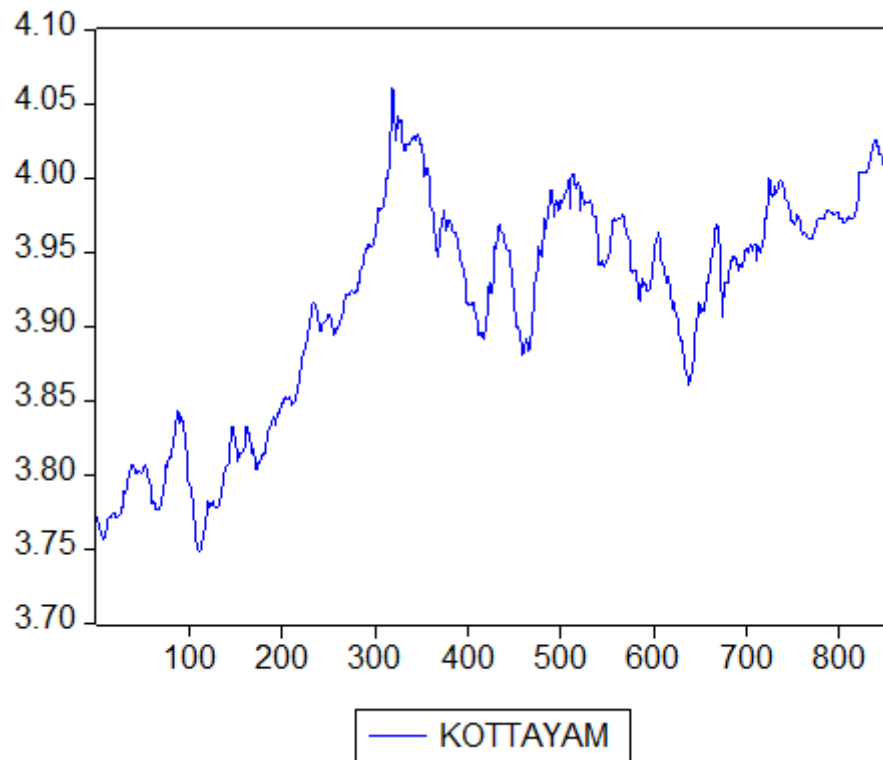
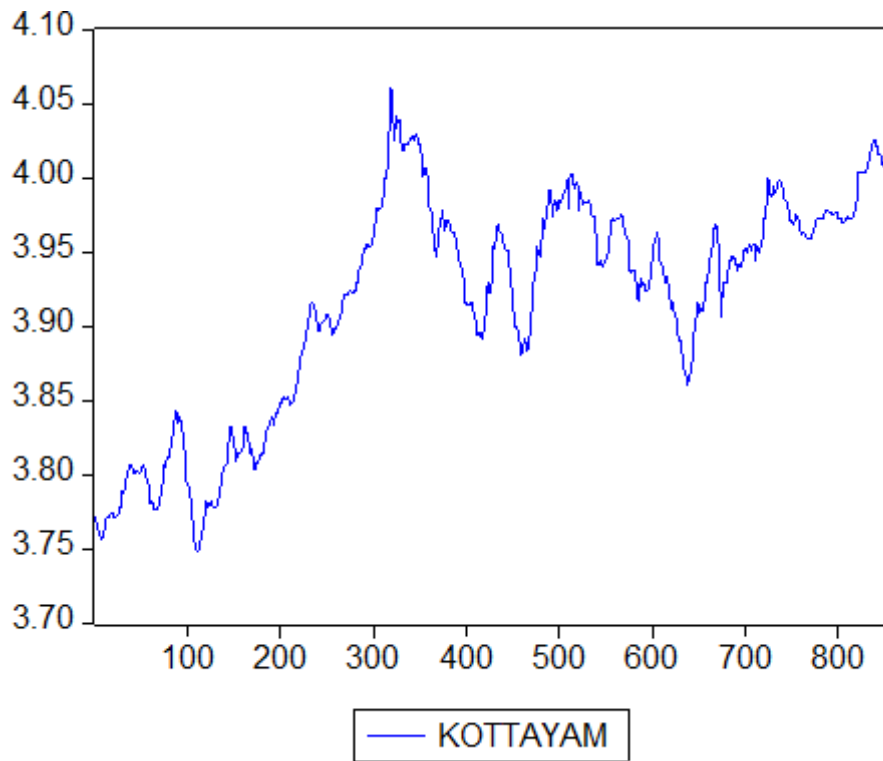


Fig. 5.8 Time series plot of price for RSS 4 grade of NR: Kottayam (2009-2012)



Comparison of both periods under study indicated only a miniscule change in the GARCH model ($\alpha_i + \beta_i$) coefficients. The extent of volatility ranges from 0.95 to 1.06. The higher volatility of international market is caused by the fluctuating global demand and supply conditions which are mainly affected by crude oil and petroleum prices. This may be due to variations on different factors like demand for raw rubber, production fluctuations in other countries, cost of production of synthetic rubber etc. World prices of rubber are not only subject to changes in demand, but also to speculation regarding future markets (Chang *et al.*, 2009).

5.3.5 Seasonality

Seasonal variation is a component of a time series which is defined as the repetitive and predictable movement around the trend line in one year or less.

Table 5.12 Seasonal Indices for prices of RSS 4 grade NR in Kottayam Market (2008 April to 2012 June)

Month	Seasonal indices
January	0.703171
April	0.757106
July	1.042308
October	0.916700

(Source of data: Rubber Board)

The seasonal indices for the prices of RSS 4 grade natural rubber was calculated using monthly data collected from Rubber Board. The ratio to moving average method was employed to separate out seasonality from the price data collected. The results revealed that January was the month showing lowest price index (Table 5.12). July was found as the month having peak seasonal price index (Fig. 5.9). Production of the rubber was maximum in winter season and it is getting reduced with the onset of monsoon. Hence the prices exhibit the reverse trend. This explains the behaviour of seasonality indices.

5.3. Export Competitiveness (NPC)

The competitiveness of Indian natural rubber export was examined using nominal protection coefficients (NPC). The nominal protection coefficients of RSS 4 were estimated for the year 2012. Lean and peak periods *i.e.*, for the month of January and June NPCs were estimated under exportable hypothesis and the results of the analysis are presented in Table 5.13 and 5.14.

Fig. 5.9 Seasonality indices for rubber prices in Kottayam market

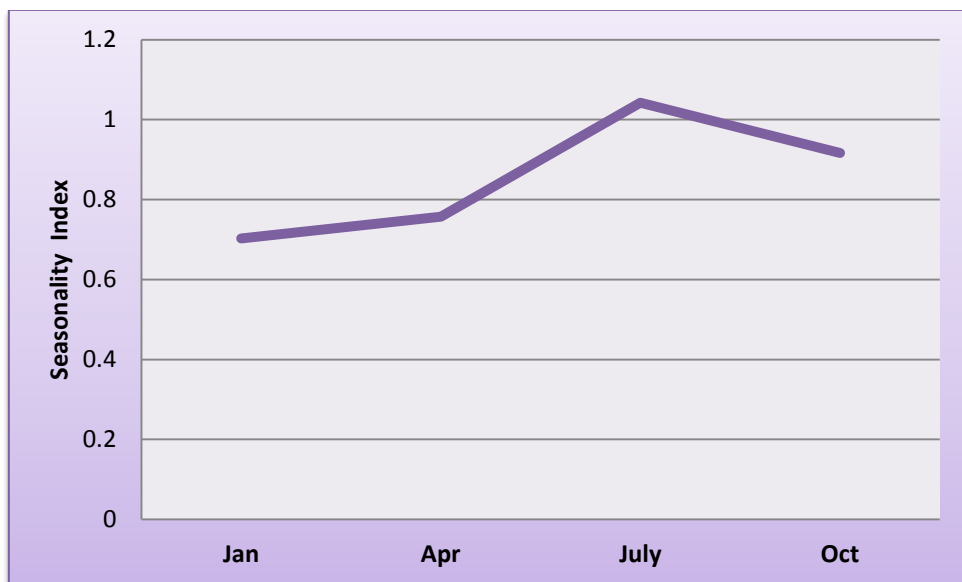


Table 5.13 NPC of RSS 4 grade natural rubber exports for the peak season (June 2012)

Sl. No.	Particulars	Place	Unit	Value
1	Wholesale price of RSS 4	Kottayam	Rs/ tons	186500
2	Plus transport cost to	Kochi	Rs/ tons	461.5
3	Plus marketing margin (5%)			9325
4	Plus Port clearing & handling charges		Rs/ tons	435.89
5	Equal FOB price (1+2+3+4)	Kochi		196722.4
6	Plus Freight charge		Rs/ tons	1315
7	Plus insurance at 2% of price			3730
8	Equals landed cost (5+6+7)			201767.4
9	Exchange rate		1 \$ = Rs	57
10	CIF price (row 8/row 9)			3539.99
11	Reference price	Bangkok		3252.46
12	NPC of RSS 4 (row 10/row 11)			1.09

Table 5.14 NPC of RSS 4 grade natural rubber exports for the lean season (January 2012)

Sl. No.	Particulars	Place	Unit	Value
1	Wholesale price of RSS 4	Kottayam	Rs/ tons	189500
2	Plus transport cost to	Kochi	Rs/ tons	461.5
3	Plus marketing margin (5%)			9475
4	Plus Port clearing & handling charges		Rs/ tons	435.89
5	Equal FOB price (1+2+3+4)	Kochi		199872.4
6	Plus Freight charge		Rs/ tons	1315
7	Plus insurance at 2% of price			3790
8	Equals landed cost (5+6+7)			204977.4
9	Exchange rate		1 \$ = Rs	57
10	CIF price (row 8/row 9)			3596.095
11	Reference price	Bangkok		3514.62
12	NPC of RSS 4 (row 10/row 11)			1.023182

(Source of data: Rubber Board)

The nominal protection coefficients of export of natural rubber were found to be higher than unity (1.09) for the month June 2012 under exportable hypothesis. This implies that natural rubber grade RSS 4 is not a competitive exportable product. NPC calculated was found to be marginally higher than unity (1.02) for or the month of January 2012 also. The foregoing results revealed that natural rubber was not competitive in the international market and hence the domestic market is protected in nature.

5.4 CONCLUSION

From the present study it is concluded that rubber price are showing considerable instability in both domestic and International price behaviour. It was found that the markets are having significant positive integration. The results help to explore further on the market research studies of natural rubber which is a major raw material. Such studies are equally important as they provide better information on which decisions about resource allocations can be made. Allocation of more resources will be done to the markets having high degree of integration because such markets provide less or no market distortions, thereby making resource allocation more efficient ultimately leading to the market efficiency.

It can also be concluded that the price volatility is getting widened over time and found to be higher in international markets. The extent of the volatility is determined by the variances of supply shocks and by the elasticity of coefficients of the supply and demand functions. Seasonality indices showed that natural rubber price was maximum in the month of July and minimum in January. The export competitiveness analysis showed that natural rubber is not competitive for export to international market.

Research Paper III

Chapter 6

RESEARCH PAPER III

Role of Rubber Producer Societies in Marketing of Natural Rubber

ABSTRACT

Small holders contribute to 93 per cent of total natural rubber production. But small holdings suffer from low productivity, poor quality of processing and weak marketing system. From the very beginning the private traders enjoyed the monopoly in trading of natural rubber in Kerala. With a view to overcome the problems that the small rubber growers experienced in marketing, the Rubber Board suggested the formation of a grass root level organisation in the villages called Rubber Producer Societies (RPS) in 1986. The area of thrust is the improvement in the processing and marketing operations of small holder's rubber through RPSs. It was found that members of RPSs are getting better prices compared to that of non-members. RPSs provide input as well as marketing services to the members effectively. Group processing and community smoke house facility help RPSs to produce good quality sheets. This would reduce the drudgery in processing and storage of small holders. Uniformity and good quality of sheets help RPS processed rubber to get international acceptance in export.

KEY WORDS: Rubber Producers Society, Marketing, Natural rubber

6.1 INTRODUCTION

Rubber cultivation in the state is mainly coming from smallholders. According to Rubber Board data (2008-09), 93 per cent of the natural rubber is produced by small holders. But small holdings in India, as in other rubber producing countries, suffer from low productivity, poor quality of processing and weak marketing system. The major factors affecting the growth and development of the small holders are financial constraints, fluctuation in rubber price and technological backwardness (Cyriac, 1986).

From the very beginning the private traders enjoyed the monopoly in trading of natural rubber in Kerala. The traders exploited small rubber growers and did not offer attractive prices for their products. The small rubber growers remained unorganised for a long period of time. With a view to overcome the problems that the small rubber growers experienced in marketing, the Rubber Board promoted rubber marketing co-operative societies in Kerala in the early 60's. The concept of such an initiation was that, it could help

in empowering the rubber sector even by ensuring the transfer of latest technologies. These marketing co-operative societies were mainly located in district or taluk headquarters and were not accessible to small farmers located in village areas. The rubber marketing societies have developed successfully in the matter of membership, but only a limited percentage of the total small holder's crop could be channelized through the societies. Rubber Board hence suggested the formation of a grass root level organisation in the villages called Rubber Producer Societies (RPS) in 1986. RPSs are societies registered under the *Charitable Societies Act* as the village level association of small growers.

The adverse effect of monopolisation in the rubber market can only be tackled by forming a consortium of raw material producers under the RPS which are in turn linked to companies jointly promoted by the RPS and Rubber Board (Geeverghese *et al.*, 2003). The role of RPS became significant considering the exploitation of growers by private sheet procurement agencies. Small growers accepted the concept of rubber producer societies with wide enthusiasm. At present there are 2226 registered RPS in Kerala (Rubber Board, 2011).

The RPSs are envisaged as non-profit making institutions imparting technical and scientific know how to the members for the general improvement of their plantations and there by achieving economic and social welfare. The area of thrust is the improvement in the processing and marketing operations of small holder's rubber through RPSs. Study classes and demonstrations are arranged under the RPSs regarding correct processing techniques, so that members are able to make rubber sheets of better grade which would fetch higher price. In the beginning, the activities of majority of these RPSs were confined to conducting group meetings and seminars, training programmes in crop exploitation etc.

Initially RPSs were engaged in the collection of latex only. This was marketed to processing companies. Later they got evolved and started processing by building infrastructure availed from the Rubber Board. The Board implemented a scheme for setting up model RPS in 1999 with the objective of demonstrating the function of RPS in various regions. The model RPS built up facilities not only for group processing but also for transfer of technology and distribution of agro inputs.

For sustaining and strengthening the performance of the RPSs, private limited companies were formed as joint ventures of the RPS and Rubber Board for setting up processing factories and taking up trading of latex, sheet rubber, field coagulum and agro inputs. These companies form regional level apex bodies of RPSs.

Natural rubber processing standards are now on par with the domestic requirement of the country. The quantitative restriction in import of rubber was removed since 1 April, 2001.

Hence the processing sector was increasingly under compulsion to face the challenges posed by the potential cheap imports. This could affect the domestic markets due to the glut situation. In this situation, dependence on domestic market alone won't sustain the rubber plantation industry. Hence it is imperative to get established in the international market for which one has to ensure regular supply line of reasonable quantity of good quality rubber. The situation also calls for empowering the small holder to face the challenges of the WTO mandated regime. Infrastructure will have to be developed in the rural areas for cost effective and quality processing, for imparting required training to the needy and for ensuring access to essential information (Varghese *et al.*, 2006). Hence the role RPS in the marketing service of natural rubber is of paramount significance.

6.2 MATERIALS AND METHODS

The study is exploratory and analytical combining both qualitative and quantitative methods. A primary survey of the rubber growers who have practical experience of the problem is used for materialising the study.

6.2.1 Sampling framework

Kerala is the major rubber growing state in India. The Indian Rubber Board and Rubber Research Institute of India are located in Kerala. Kottayam and Ernakulam district together accounts for 32 per cent of area and 35 per cent production respectively (Farm Guide, 2012). Hence these districts were selected purposively for collecting primary data on role of Rubber Producers Societies in marketing of natural rubber in Kerala.

There are around 2226 Rubber Producers Societies functioning in the state. From each district 4 villages were purposively selected based on the performance of the RPS. Two villages with effectively functioning RPSs and two without RPSs were identified. From each village 15 rubber farmers were randomly identified. A total of 120 farmers in the state consisting of 60 RPS members and 60 non-members with and without access to input and marketing services were surveyed.

Rubber farmers who are members of *Valakom* and *Kunnackal South* RPSs were selected from Ernakulam District. Farmers who are non-beneficiaries were surveyed from *Paipra* and *Anicadu* villages of the same district. *Chirakkadavu* and *Aymanam* villages having RPSs and *Madapally* and *Champakkara* villages without RPSs were surveyed from Kottayam District. The field survey pertains to the year 2011-12.

6.2.2 Data source

The data used for the study include primary data, for the compilation of which following resources were relied upon. Primary data were collected from randomly selected 120 farmers. Two districts Kottayam and Ernakulam from which 4 villages each with two having RPSs and two without RPSs were purposively identified. From each village 15 farmers were surveyed. The structured interview schedule used for interviewing the participants of the survey, for gathering primary data, is given in the Appendix I.

6.2.3 Tabular analysis

Tabular analysis had been made use of in comparison of RPS beneficiaries and non-beneficiaries. The comparison has made in

- a) Quality of grades of sheets produced
- b) Price realisation

The primary data required had collected through pretested interview schedules and discussions.

6.3 RESULTS AND DISCUSSION

6.3.1 Organisational structure of RPSs

The organisational structure of the Rubber Producers Societies can be represented as Fig. 6.1. Each RPS is a group of 50 to 300 small growers residing in a locality forming themselves into a society registered under the 12th *Travancore Cochin Literary, Scientific and Charitable Societies Act* of 1956. The RPS is conceived largely as non-political. The society acts as a centre for distribution of inputs and expedites the distribution of financial and technical assistance from the rubber board and other agencies by collective action.

The RPSs help the members in marketing their produce and distributing the agricultural inputs to them at reasonable rates. Other functions of the society are

1. Pooling the rubber produced by members and marketing it grade wise at remunerative prices.
2. To establish smoke houses for group processing of latex to upgrade quality by availing financial aid from the Rubber Board.
3. To promote group approach for new planting, replanting, availing bank finance, subsidy and other facilities.
4. To raise nurseries and supply high yielding planting materials grown in polythene bags to members at fare price with the support of the Rubber Board.

5. To promote bee-keeping in the member's holdings to supplement their income
6. Share participation in processing factories owned jointly by the RPSs.

6.3.2 Marketing channels identified for members and non-members

Farmers of villages with Rubber Producer Societies provided latex directly to the RPSs. They employ collecting agents on commission basis for this purpose. This would help farmer to save transportation cost, time and drudgery. Price of the latex was decided based on the Dry Rubber Content (DRC). Producer farmer would get a price at a difference of one to two rupee less than the market price. RPSs having processing facilities would process the latex into good quality sheets usually of RSS 1 grade. RPSs also provided facility of community smoke houses to store the rubber sheets without deterioration in quality and fungal attack. Those RPSs which were not having processing facilities would sell the processed latex directly to any of the three channels displayed in the Fig. 6.2, *i.e.* tyre companies, RPTC (Rubber Processing and Trading Companies) or Exporting agencies based on the prices and ease of transportation. Rubber Processing and Trading Companies are the joint ventures by Rubber Board with Rubber Producer Societies with 51 per cent equity participation by the Board and the Remaining 49 per cent by the RPSs. The prominent areas of operations of the RPTCs are developing supply of inputs to RPSs, imparting technical know-how and assisting in processing and marketing of the produce. The profit obtained from the sale of quality grade sheet after meeting the processing costs was equally divided among member farmers. Thus functioning RPSs acted as a strong support in the marketing procedure of natural rubber.

Some RPSs which were not having processing facilities did collection and grading of sheets and scrape rubber brought by member farmers. Proper grading, economies of scale in the bulk transportations and bargaining power helped the members to realise better prices.

Individual producer usually process the latex into sheets in villages without RPS. These sheets usually of low quality (RSS 4 & RSS 5) were traded to village level rubber dealers or private latex collecting centres (Fig. 6.3). The exploitation chances were found to be higher in this channel. Price realisation is comparatively low due to the low bargaining power of the individual farmer producer. Additional cost of individual smoking house and drudgery associated with sheet processing was seemed to be associated with the channel.

6.3.3 Role of rubber producer societies in marketing of natural rubber

The RPSs provide the small rubber growers various kinds of services. These services are crucial as they affect the social and economic conditions as well as the standard of living

Fig. 6.1 Organizational Structure of Rubber Producers' Societies

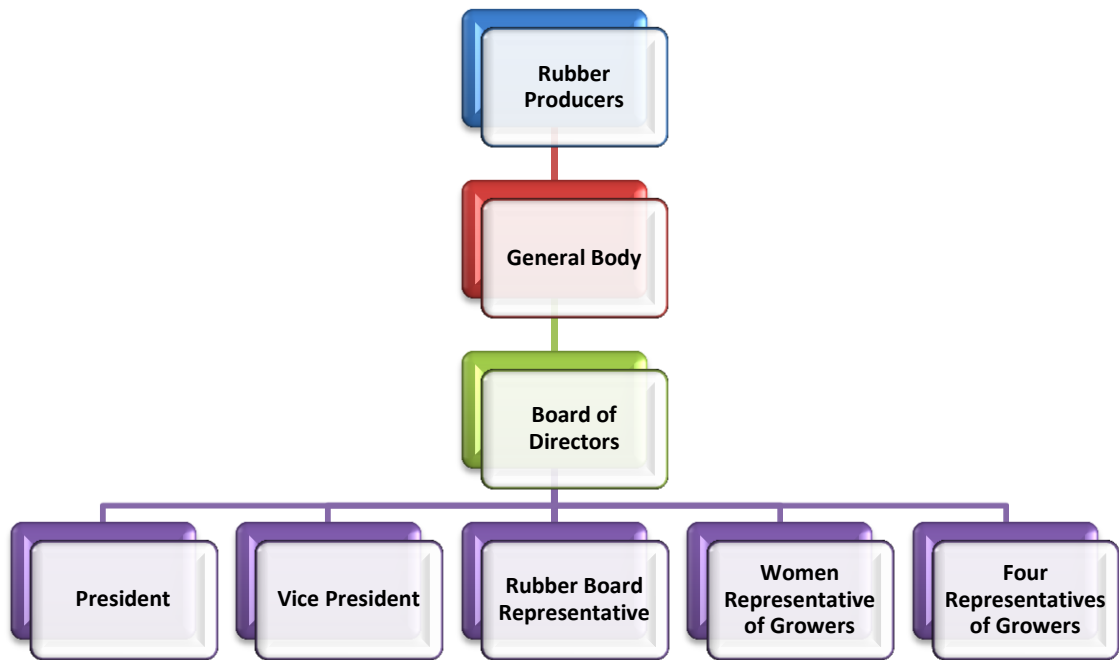


Figure 6.2 Marketing Channel for Latex/Sheets in villages with RPS

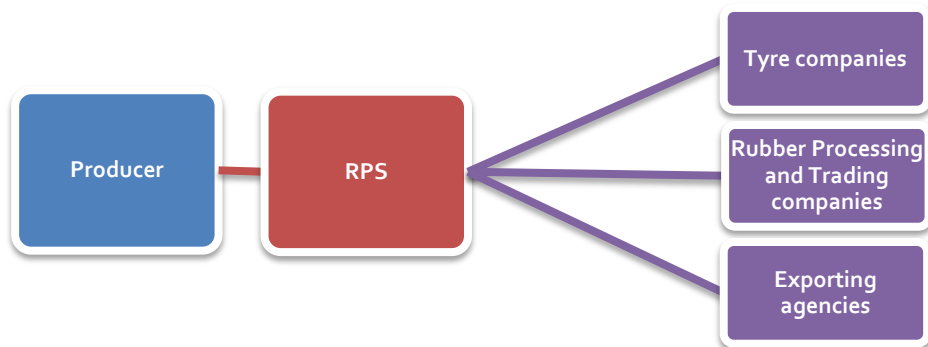
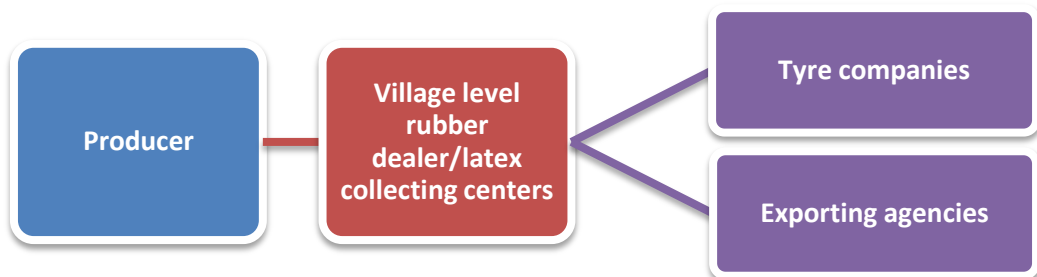


Figure 6.3 Marketing Channel for Latex/Sheet in villages without RPS



of the small rubber growers. Even though there are differences in the extent of services rendered by the diverse RPSs, they have a critical role in all the spheres of the life of the small rubber growers. The RPSs collect latex, sheets and scrap from their members and sell it at remunerative prices to processors. The Rubber Board supplies necessary equipment such as platform balance to weigh latex, sheet and scrap.

6.3.3.1 Economic benefits in marketing rendered by RPSs to the members

6.3.3.1.1 Improvement in quality

Table 6.1 Production of different grades of Sheet (kg) in the RPSs during 2010-11

Region	RSS 1	RSS 4	RSS 5	Total
Valakom	8056	46398	-	54454
Kunnackal South	67856	7568	712	76136
Chirakkadavu	52965	8956	0	61921
Aymanam	48536	5778	0	54314
Total	177413	68700	712	246825

(Source: Field Survey)

The shift from homestead processing to group processing has brought about remarkable improvement in the quality of the sheets produced. A considerable quantity of sheets produced in the RPSs is of RSS 1 grade. The quantity of the different grades produced in the RPSs is given in Table 6.1 and Fig. 6.4. The percentage of the different grades produced is shown in Figure 6.5. It is also important that the production of RSS 5, the lowest grade among the graded sheets is almost nil or brought to a minimum in all the three regions. The RPSs ensures that not a single sheet that came out of their smoke house is ungraded. Bulk of the production from *Kunnackal South*, *Aymanam* and *Chirakkadavu* regions was coming from RSS 1. In *Valakom* region RSS 4 was the major grade that produced.

The improvement in quality is conspicuous as the small growers were not able to produce and market the superior grades of rubber without the group approach. The production of RSS 1 grade before the implementation of group processing by the RPSs was nil. This is because small holders with homestead processing won't be able to undertake processing activities for RSS 1. In *Paipra*, *Anicadu*, *Madapally* and *Champakkara* regions individual farmers was producing sheets of either RSS 4 or RSS 5 grades.

A major constraint identified in the RPSs producing good quality sheets were defects in construction of smoke houses and pollution problem. Two out of the four RPSs were having biogas plants to tackle the problem. There has been a significant change in the

Figure 6.4 Quantity of Different Grades of Sheet Produced in RPSs during 2010-11

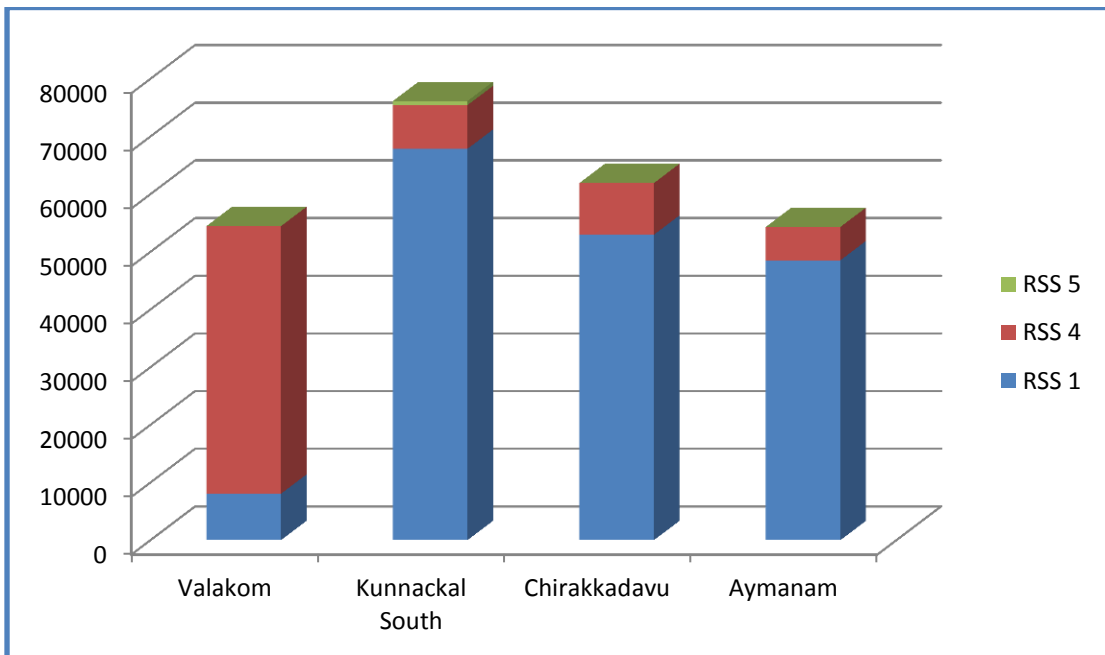
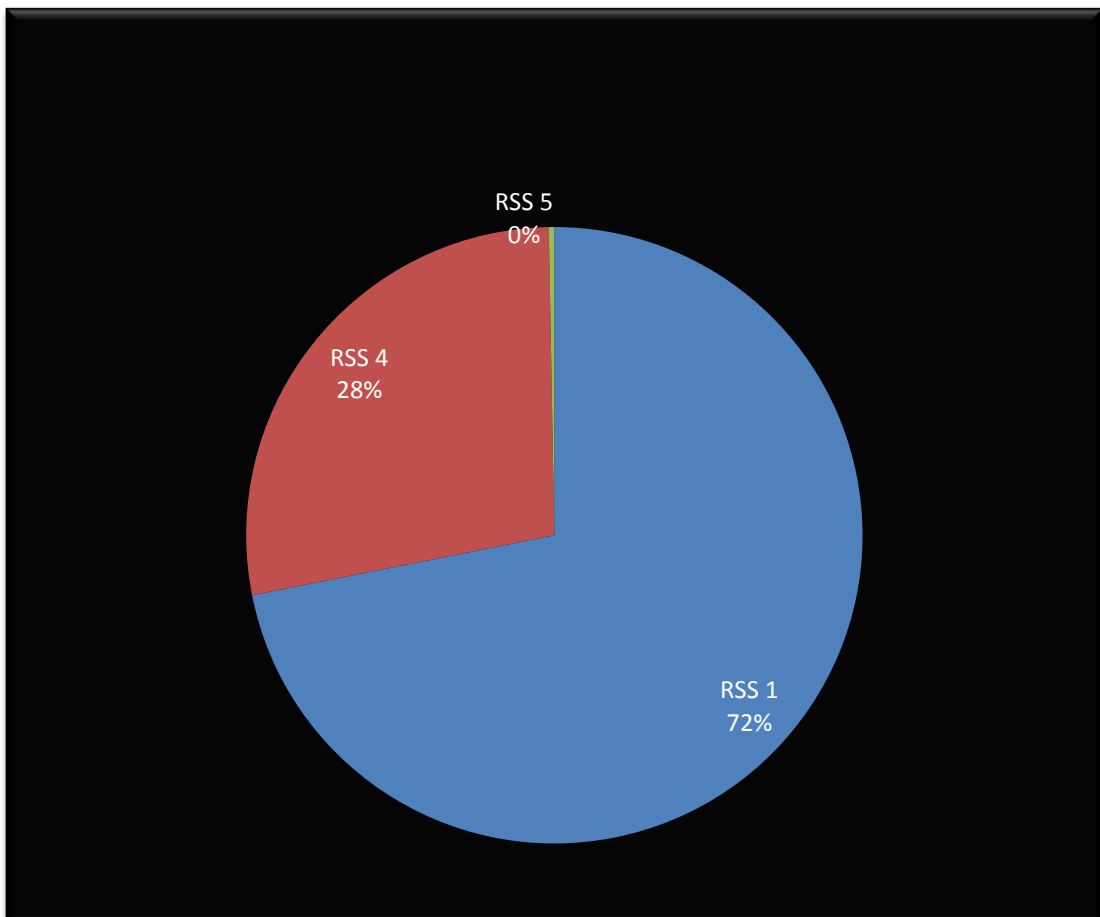


Table 6.5 Percentage Contribution of Different Grades of Sheet (kg) in RPSs (2010-11)



functioning of RPS after the implementation of the scheme for model RPS and a large number of RPS has started group processing and marketing. However out of total functioning RPSs only a few are working efficiently and a large number of them have to improve significantly if they are to be of service to the rubber growers (Rani, 2003).

6.3.3.1.2 Price realisation

The members of the RPSs whose latex is processed in the centre received better price than that received by the non-members who processed in the homestead. The improvement in quality coupled with their bargaining capacity has enabled RPSs to obtain better price than the ordinary sheets produced by the individuals of the locality. The societies could thus give their members a better price than what was obtained by the individual processors, after meeting the processing cost. The average price realised by the members of the RPSs and the non-members during 2010-11 and the difference between the two are shown in Table 6.2.

Table 6.2 Comparison of price realized by members and non-members during 2010-11 (Average Rs /kg)

RPS (Rs/kg)	Individual processor (Rs/kg)	Difference (Rs/ kg)
92.325	89.85	2.475*

* Significant at 5% level

(Source: Field Survey)

It can be seen that highest average price of Rs 93.20 per kg was disbursed in Kunnackal South region because of the higher share of RSS 1 in the total rubber produced. On an average around Rs 2.475 per kg marginal difference is there between members and non members in the realised prices.

6.3.3.1.3 Production of export quality sheets

The analysis of the quality of the sheets produced by the individual processors indicated a very high degree of variation in the grades of sheets produced in the homesteads. The RPSs guided by the Rubber Board's extension officers are adopting almost the same procedure for processing which results in uniformity in shape, colour etc. which is essential for acceptance in the international market.

6.3.3.2 Supplying inputs

The inputs distributed include fertilizers, polythene and adhesive for rain guarding, plastic cups, head light, hand sprayers, panel-protecting materials, fungicides, spray oil and

power sprayers. The RPSs procure various estate input items through the trading companies direct from the manufacturers or principal dealers inviting sealed tenders and conduct further negotiations to bring down the purchase price to the minimum. This ensures the supply of quality materials to the small growers at a considerably cheaper rate.

6.4 CONCLUSION

Small holders contribute to more than 90 per cent of total natural rubber production. Low productivity, poor quality of processing and weak marketing system was identified as the major constraints faced by small holders. In order to overcome this problem Rubber Board suggested the formation of a grass root level organisation in the villages called Rubber Producer Societies (RPS) in 1986. Marketing channels were identified for rubber farmers who were members of RPSs. Marketing channels for non-members were also traced. A comparison revealed that RPSs help its member farmers to get better prices. Group processing facilities was found to be effective in improving sheet quality, uniformity and in reducing individual farmer's drudgery. Community smoke houses were also provided by RPSs which reduce the cost of building individual smokehouses. RPSs were found to be effective in delivering input services to its member farmers.

Discussion

Chapter 7

DISCUSSION

Natural Rubber is an important plantation crop backing the agricultural economy of Kerala considerably. More than 90 per cent of the natural rubber production is coming from the small holders. Wide fluctuations in prices adversely affect the income stability of small farmer and hence his production decisions. In order to provide a better price realisation mechanism and efficient marketing channel, Rubber Board suggested the formation of Rubber Producers Societies. Hence the present attempt was (i) to study the existing scenario of natural rubber production and marketing in Kerala (ii) to analyse the price dynamics of natural rubber and (iii) to study the role of Rubber Producers Societies in the marketing of natural rubber in Kerala.

Kerala accounts for 90 per cent of the production as well as 78 per cent area of natural rubber in the country. In Kerala, around 40 per cent of the area and 45 per cent of production of rubber come from three districts *i.e.* Kottayam, Ernakulam and Pathanamthitta. This accumulation might be due to favourable climatic conditions and historical reason of starting of rubber plantations in these regions for the first time and the subsequent market development in and around this area and experience gaining, promoting the acceptance of this by more and more people within the region as a livelihood measure with better returns. It was observed that over the years percentage contribution of small holders to the total natural rubber production is increasing and which was 93 % during 2008- 09 (Rubber Board).

The area, production and productivity of natural rubber in Kerala were showing an increasing trend for the last few decades. Compound Growth rate in area was low nearly 1.4 %. This indicates that area expansion under the crop has almost attained the peak due to geographical limitations. There was a slowdown in the pace of growth in area during 1999 to 2004, because during the period, there was sharp decline in the price of natural rubber and the people were reluctant to expand the cultivation due to lower earnings. The trend analysis also showed that there was a sudden jump in the production during 2003-2004, which led to increase in productivity. This was mainly due to the better agro management scientific practices adopted by the farmers under the expert guidance of Rubber Board. The productivity of natural rubber in Kerala is lower compared to the national average, and this can be understood with the fact that the farmers of Kerala were following the cultivation traditionally, whereas in other parts of the country, they started the plantations recently with

high yielding, highly resistant varieties with good management scientific practices under institutional guidance.

The natural rubber production in Kerala grew annually by 5.40 % and was contributed more by growth in productivity (3.95 %) than in area (1.36 %). The instability in area, production and productivity during the period were 2.56, 5.84 and 6.37 per cent respectively. Decomposition analysis on change in total production also showed that yield effect (54 %) contributed much more compared to area effect.

Out of different forms of products, small holders mainly produce sheets of lower grades RSS 4 & RSS 5. Rubber marketing structure of the state consists of three separate sectors viz. individual sector, co-operative sector and corporate sector. Private sector enjoyed a prominent role in the Indian rubber market. Rubber Dealers are the significant intermediaries, who are acting as the connecting link between the producers and consumers of natural rubber. The co-operative sector entered into the field of rubber marketing in 1960 with the active support of the Rubber Board. This sector has emerged with a view to minimise the number of intermediaries and to limit the influence of the individual sector. Later Rubber Producers Societies were established with the objectives of group processing and marketing. RUBCO has been in operation in the Indian rubber market since 1997 as an intermediary between rubber growers and manufacturers. Under the corporate sector, big rubber goods manufacturing companies directly purchase rubber from the growers, by opening collection depots in the important rubber producing areas.

The product mix of small rubber growers includes Ribbed Smoked Sheet (RSS), latex and Field Coagulum (FC). Sheet rubber is the main produce of small holders. They are using the village level dealers (primary dealers) as the most common channel for marketing sheet rubber. It is the second important constituent of the product mix of the small growers. They sell this product without any processing to the agencies like latex collection centres operated by RPS, latex collection centres operated by co-operative rubber marketing societies and private dealers and processors. Among these various channels, unlicensed dealers are the main agents through whom the bulk of Field Coagulum channel into the market in the rural areas. It is noticed that estate holders are in a better position to market their produce than that of small holders.

Agricultural production is risky and uncertain in nature. Ambiguities associated with production as well as prices are having negative effect on agricultural growth and case of natural rubber is not an exception. Productive life span of natural rubber (*Hevea brasiliensis*) is around 10-20 years. Price fluctuations have got lag effect on farmer's decisions. Unexpected and wide variations in prices may result in lower production. It would affect the

income stability of the small holder adversely. Hence the price dynamics of natural rubber was analysed using daily price data on domestic and international reference market prices for a time period of 2005-06 to 2011-12. For comparison purpose the entire study period was divided in to two *i.e.* 2005-06 to 2007-2008 and 2009-10 to 2011-12. The secondary data on price of specific grades of natural rubber was obtained from Rubber Board.

Deflated price data of Kottayam, Bangkok and Kuala Lumpur was used to find out instability using Cuddy Della Valle Index. Price instability arises mainly out of supply shocks. Instability is one of the most important decision parameters in development dynamics and so in the context of agricultural production. The index showed that 11 % and 14 % instability was found in the prices of Kottayam and Bangkok markets for the period of 2005-2008 for RSS 4. It was observed that during the second phase of the study the instability indices were comparatively high *i.e.* 13 % and 20 % respectively for the domestic (Kottayam) and international market (Bangkok) for the same grade.

While comparing Kuala Lumpur and Kottayam markets for prices of latex 60, it was observed that the international market was having higher instability as expected. It can be observed that the instability is getting reduced while moving from first phase to the second phase of study against to that of RSS 4 grade. For the domestic market Kottayam the instability index got slightly reduced from 15 % to 14 %. International market (Kuala Lumpur) had also shown the similar trend.

It can be observed that latex 60 grade was showing more instability to that of RSS 4 for all the study period except for Bangkok market (2009-12). It is found that the instability in prices of RSS 4 is getting widened for both Kottayam and Bangkok market. Since there existed comparative inefficiency in the Kottayam market, prices were got partially insulated. Effect of Price Stabilisation Fund Scheme which was launched during 1990's also helped domestic market to remain comparatively stable. Oscillations in global demand and supply circumstances are more uncertain to that of domestic conditions. Hence higher instability indices for international markets were expected.

Johansen's test revealed the long run equilibrium between the market prices of natural rubber for domestic and international markets, justifying the use of a vector error correction model (VECM) for showing the short run dynamics. The error correction coefficients suggested that sustainable long run equilibrium is achieved by bridging the gap between international and domestic market prices. The results of VECM in natural rubber market prices indicated that most of the coefficients turned positive for both domestic Kottayam and Bangkok market. The vector error correction coefficient was -0.017 and

-0.004 for Bangkok and Kottayam markets (2005-2008). This indicated that how quickly the dependent variables such as domestic and international market prices absorb and adjust themselves for previous period disequilibrium errors. In other words, the coefficient measures the ability of the prices to incorporate shocks in the prices. Kottayam and Bangkok market absorb only 1 and 0.33 per cent respectively to bring about the equilibrium in prices. The information flow is more in Kottayam market compared to Bangkok. For the period 2009-12 the rate of adjustment was 0.05 and 1.44 per cent respectively.

Similar kind of interpretations of the Kottayam- Kuala Lumpur markets showed that the error correction coefficients in Kuala Lumpur and Kottayam markets were 0.51 and 0.006 respectively. This indicated that 51 per cent of disequilibrium is corrected each day by changes in the international reference prices. Similarly only 0.6 % of disequilibrium is corrected each day by changes in the Kottayam market prices. It implies that there exists an influence of international price on domestic market of rubber. During 2009-2012 the error correction coefficients were 0.005 and 0.044 respectively *i.e.* only 0.5 per cent disequilibrium is corrected each day by changes in international reference prices of Kuala Lumpur. Whereas 4.4 per cent of the disequilibrium is corrected each day by changes in the Kottayam market price *i.e.* the information flow in the Kottayam market is high.

The $(\alpha_i + \beta_i)$ coefficients for Bangkok and Kottayam markets were 1.04 and 0.90 respectively for the period 2005-2008. It can be inferred that the price volatility is getting widened over the period of time since during the 2nd phase (2009-2010) of study the $(\alpha_i + \beta_i)$ coefficients for Bangkok and Kottayam markets were 1.06 and 0.96 respectively. The international market prices were showing very high volatility of 1.04 and 1.06 during the above mentioned period. In domestic (Kottayam) market also prices were highly volatile but slightly low compared to that of Bangkok market. This is due to the effect of Price Stabilisation Fund Scheme launched in domestic markets (2003).

Comparison of both periods under study indicated only a miniscule change in the GARCH model $(\alpha_i + \beta_i)$ coefficients. The extent of volatility ranges from 0.90 to 1.06. The higher volatility of international market is caused by the fluctuating global demand and supply conditions which are mainly affected by crude oil and petroleum prices.

The seasonal indices for the prices of RSS 4 grade natural rubber was calculated using monthly data collected from Rubber Board. The ratio to moving average method was employed to separate out seasonality from the price data collected. The results revealed that January was the month showing lowest price index. July was found as the month having peak seasonal price index. Production of the rubber is maximum in winter season and it is getting

reduced with the onset of monsoon. Hence the prices exhibit the reverse trend. This explains the behaviour of seasonality indices.

The nominal protection coefficients of export of natural rubber were found to be higher than unity (1.09) for the month June 2012 under exportable hypothesis. This implies that natural rubber grade RSS 4 is not a competitive exportable product. NPC calculated was found to be marginally higher than unity (1.02) for the month of January 2012 also. The foregoing results revealed that natural rubber was not competitive in the international market for both lean and peak production periods.

Small holders contribute to more than 90 per cent of total natural rubber production. Low productivity, poor quality of processing and weak marketing system was identified as the major constraints faced by small holders. In order to overcome this problem Rubber Board suggested the formation of a grass root level organisation in the villages called Rubber Producer Societies (RPS) in 1986.

Marketing channels were identified for rubber farmers who were members of RPSs. Marketing channels for non-members were also traced. A comparison revealed that RPSs help its member farmers to get better prices. Group processing facilities was found to be effective in improving sheet quality, uniformity and in reducing individual farmer's drudgery. Community smoke houses were also provided by RPSs which reduce the cost of building individual smokehouses. RPSs were found to be effective in delivering input services to its member farmers. Uniformity and export quality of sheets produced in RPSs make it internationally acceptable.

Summary and Conclusion

Chapter 8

SUMMARY AND CONCLUSION

Rubber is an important commodity from the standpoint of living of humankind. Kerala is the nearly monopolistic contributor with 90 % of the total production and 78 % of the area under natural rubber cultivation in the country. Rubber plantations have profound influence in economic and social life of people in Kerala.

Trend analysis of the time series data for the period 1987-2012 showed that area, production and productivity has increased considerably. The natural rubber production in Kerala grew annually by 5.40 per cent which was mainly due to growth in productivity (3.95 %) than in area (1.36 %). The instability in area, production and productivity during the period were 2.56, 5.84 and 6.37 per cent respectively. Further expansion in area under rubber would be difficult due to the geographical limitations and reduced land availability. Constant efforts of Rubber Board created awareness about high yielding varieties in rubber. Quality planting material is very important since rubber is a perennial crop with a life span of 10-20 years.

Productivity of the state is comparatively lower to that of the country. Most of the rubber plantations in the state are now in their replanting stage. Conscious efforts should be there from the part of Government and Rubber Board to provide quality high yielding planting materials so that productivity could be improved. During 2002-03 period there was a jump in production without considerable increase in area. This was mainly attributed to the better management practices followed by farmers as per the directions of Rubber Board. Hence good agricultural practices should be followed to improve the productivity level so that increasing demand can be met and to compete with cheap imports from competitive countries.

Natural rubber marketing system denotes the whole band of activities aiding the movement of rubber from the primary producers to the end consumers. Rubber marketing structure of the state consists of three separate sectors *viz.* individual sector, co-operative sector and corporate sector. Sheet is the major produce. For small holders and Estate holders separate marketing channels were identified.

Analysis showed that small holders' contribution to the total rubber production has increased considerably over the years. The income stability of the small holder is at risk due to the wide fluctuations in natural rubber prices. In order to examine the extent of price fluctuations, instability index and price volatility was used. GARCH (1, 1) model was applied to analyse the magnitude of volatility in prices of natural rubber for RSS 4 grade. Results

indicated that the markets experienced high level of volatility during the study period (2005-06 to 2011-12). Price in the international markets was observed to be more volatile compared to domestic markets. Global supply shocks and demand situations are rather unpredictable. Weather conditions in major producing countries, crude oil price as well as synthetic rubber prices has got considerable impact on prices of natural rubber.

Cointegration analysis revealed the long run equilibrium between the market prices of natural rubber for domestic and international markets, justifying the use of a vector error correction model (VECM) for showing the short run dynamics. The error correction coefficients suggested that sustainable long run equilibrium is achieved by integrating the domestic and international markets.

Seasonality indices revealed that January was the month showing lowest price index. The month with maximum price instability index was July. Production of the rubber is in its high in winter season and it is getting reduced with the onset of monsoon. Therefore the prices exhibit the reverse trend. And this explains the behaviour of seasonality indices. In order to examine the competitiveness of domestic rubber, Nominal Protection Coefficient was calculated for both peak and lean seasons. It was concluded that domestic rubber is not having export competitiveness. Marketing margin and insurance charges were found to be the major contributors to the transaction cost. By reducing marketing inefficiencies, the marketing margin could be reduced. In the peak production season *i.e.*, lowest domestic price, NPC was 1.09. Competitiveness of market could be achieved by taking suitable export enhancing measures by the Government. From the study it was revealed that Rubber Producer societies could effectively reduce market margin. Sheets produced by RPS was found to be of exportable quality (RSS 1) and since they follow group processing methods, uniformity was also there. More RPSs can be brought under expert guidance and training could be given to improve the production of good export quality sheets.

From the very beginning the private traders enjoyed the monopoly in trading of natural rubber in Kerala. Rubber Producer Societies (RPS) was formed with a view to overcome the problems that the small rubber growers experienced in marketing. The concept of such an initiation was that, it could help in empowering the rubber sector even by ensuring the transfer of latest technologies. Natural rubber processing standards are now on par with the domestic requirement of the country. The quantitative restriction in import of rubber was removed since 1 April, 2001. Hence the domestic rubber sector was increasingly under compulsion to face the challenges posed by the potential cheap imports. In this situation, dependence on domestic market alone won't sustain the rubber plantation industry. Therefore it is imperative to get established in the international market for which one has to ensure

regular supply line of reasonable quantity of good quality rubber. The situation also calls for empowering the small holder to face the challenges of the WTO mandated regime. Infrastructure will have to be developed in the rural areas for cost effective and quality processing, which requires training to the needy and ensuring access to the essential information. RPS provide an effective marketing channel, better price, improved input services, group processing and community smoke house facilities to member farmers. Therefore more model RPSs are to be promoted and more fund is to be allocated to provide storage and marketing facilities.

Abstract

ABSTRACT

Economics of Natural Rubber Production and Marketing in Kerala

Natural rubber (NR) is regarded as an important raw material. India is the fourth largest producer as well as second largest consumer of natural rubber (NR) with 8.2 % and 8.8 % respective shares on global production and consumption in 2010. Natural rubber cultivation in India has been traditionally concentrated in Kerala which accounts for 78 % area and 90 % of production. Natural rubber is one of the important commercial crops of Kerala and rubber plantations have profound influence in economic and social life of people. Around 40 % of the area as well as 45 % of production of rubber comes from three districts *i.e.*, Kottayam, Ernakulam and Pathanamthitta. Small holders contributed 92.53 % to the total production. The natural rubber production in Kerala grew annually by 5.40 % during 1971-2011 and was contributed more by growth in productivity (3.95 %) than in area (1.36 %). The decomposition analysis showed that the yield effect is contributing nearly two fold to the total production compared to the area effect. Area, production as well as productivity showed an increasing trend over the years. The instability in area, production and productivity during the given period were 2.56 %, 5.84 % and 6.37 % respectively. Fluctuations in natural rubber market prices is a major concern for the small rubber producers since it would affect the income stability and has multifaceted effect on the area, productivity and hence the production of the crop. From the present study it is concluded that rubber price are showing considerable instability in both domestic and international price behaviour. Short run as well as long run integration between domestic and international market was analysed using Johansen's co-integration tests and it was found that the markets are having significant positive integration. To analyse the extent of volatility, GARCH (1, 1) model was applied on domestic and international market prices of natural rubber for RSS 4 grade. The results indicated that the markets experienced high level of volatility during the study period. It can also be concluded that the price volatility is getting widened over time and found to be higher in international markets. Seasonality indices showed that natural rubber price was maximum in the month of July and minimum in January. Export competitiveness measured using Nominal Protection Coefficients (NPC) revealed that export of domestic rubber was not competitive during both peak and lean seasons.

In order to provide support to the small rubber farmers to compete in the present market scenario, Rubber Board initiated Rubber Producer Societies in 1986. The role of RPS became significant considering the exploitation of growers by private procurement agencies. The results revealed that RPSs were helpful in improving quality of the sheet produced, better price realisation and input services. Marketing channel involving RPSs were found to be more efficient due to low price spread and marketing margins.

केरल में प्राकृतिक रबर उत्पादन एवं विपणन का अर्थशास्त्र

प्राकृतिक रबर एक महत्वपूर्ण कच्चा पदार्थ होता है। भारत का विश्व में प्राकृतिक रबर उत्पादन में चौथा स्थान तथा उपभोग में द्वितीय स्थान है। सन 2010 के अनुसार विश्व में प्राकृतिक रबर के उत्पादन तथा उपभोग में भारत का भाग क्रमशः 8.2 प्रतिशत तथा 8.8 प्रतिशत है। परम्परागत रूप से भारत में प्राकृतिक रबर का उत्पादन मुख्य रूप से केरल में होता है। यहाँ भारत के कुल प्राकृतिक रबर उगाने वाले क्षेत्र का 78 प्रतिशत तथा कुल उत्पादन का 90 प्रतिशत उत्पादन होता है। प्राकृतिक रबर केरल एक महत्वपूर्ण व्यावसायिक फसल है। रबर रोपण का केरल के लोगों पर महत्वपूर्ण आर्थिक प्रभाव है। केरल के तीन जिलों जैसे कोट्टायम, एर्नाकुलम, पतनमहिट्टा में कुल क्षेत्र का लगभग 40% क्षेत्र तथा कुल उत्पादन का 45% होता है। लघु कृषकों द्वारा कुल उत्पादन का 92.52% उत्पादन किया जाता है। केरल में 1971-2011 के दौरान प्राकृतिक रबर उत्पादन में 5.40 % की वृद्धि दर्ज की गयी। उत्पादन में वृद्धि दर (3.95%) क्षेत्रफल में वृद्धि दर (1.36%) तथा उत्पादन में वृद्धि दर (3.95%) क्षेत्रफल वृद्धि दर (1.365%) से अधिक दर्ज की गई। विघटन विश्लेषण द्वारा विदित हुआ कि उपज प्रभाव का कुल उत्पादन पर क्षेत्र प्रभाव के सापेक्ष लगभग दोगुना प्रभाव रहा। पिछले वर्षों में क्षेत्र, उत्पादन तथा उत्पादकता में बढ़त की प्रवृत्ति पाई गई। क्षेत्र, उत्पादन तथा उत्पादकता में परिवर्तन दर, दिये गये समय के दौरान क्रमशः 25.65 %, 5.84% तथा 6.75% रही। प्राकृतिक रबर के बाजार भाव में उतार चढ़ाव का लघु रबर उत्पादकों पर बहुत प्रभाव होता है। क्योंकि इनका आय स्थायित्व तथा क्षेत्र उत्पादकता और अंततः फसल उत्पादन पर चतुर्दिक प्रभाव पड़ता है।

मूल्यों के मौसमी सूचक विश्लेषण से प्राप्त हुआ कि जुलाई में अधिकतम एवं जनवरी में न्यूनतम मूल्य होता है। नोमिनल प्रोटेक्सन कोफिसिपेंट (NPC) के द्वारा निर्यात प्रतिस्पर्धा विश्लेषण दिखाता है कि भारत रबर का निर्यात प्रतिस्पर्धात्मक नहीं है। वर्तमान अध्ययन से यह निष्कर्ष निकलता है कि रबर के राष्ट्रीय तथा अंतर्राष्ट्रीय बाजार भाव में काफी परिवर्तन हुआ है। घरेलू तथा अंतर्राष्ट्रीय बाजार के मध्य लघु एवं दीर्घ संयोजन का जोहंसन सह संयोजन परिक्षण विधि द्वारा विश्लेषण करने पर यह पाया गया कि बाजारों के मध्य धनात्मक संयोजन रहा है। प्राकृतिक रबर (RPS) 4 श्रेणी के घरेलू एवं अंतर्राष्ट्रीय बाजार भाव की वाष्पशीलता के विस्तार का विश्लेषण करने के लिए जी ए आर सी एच (1) माडल का प्रयोग किया गया। अध्ययन के दौरान बाजार में उच्च स्तर की वाष्पशीलता पाई गयी। समय उपरांत भाव वाष्पशीलता बढ़ती गई एवं अंतर्राष्ट्रीय बाजारों में अधिक रही।

लघु रबर उत्पादक कृषकों की आज के बाजार के संदर्भ में प्रतियोगिता के लिए रबर बोर्ड द्वारा 1986 में रबर उत्पादक समिति का गठन किया गया। व्यक्तिगत अभि प्राति संस्थाओं द्वारा कृषकों के शोषण को रोकने में इन रबर उत्पादक समितियों का सराहनीय प्रयास रहा। परिणामों से विदित हुआ कि स्तरित रबर के उत्पादन, कृषकों के उचित मूल्य दिलाने तथा लागत मूल्य के लिए रबर उत्पादक समितियाँ सहायक रही। कम लागत तथा बाजार लाभ पर बाजार स्तर पर इन समितियों की साझेदारी अधिक प्रभावशाली रही।

Bibliography

BIBLIOGRAPHY

- Abraham, K. K. (2003). Role of co-operatives in natural rubber marketing and processing; 100 years of commercial rubber cultivation in India. Rubber Board, Kottayam, India, pp. 66-68.
- Abeysekera, R. (2011). Impact of natural rubber price volatility on tyre industry: a study based on bicycle tyre industry in Sri Lanka. Proceedings of international conference of business management, Vol (8). Retrieved on 28.05.2012 from www.journals.sjp.ac.lk/index.php/icbm/article/view/234
- Acharya, S.S. and Agarwal, N.L. (1991). Agricultural Prices: Analysis and Policy. Oxford and IBH Publishing Co., New Delhi, India, 346 p.
- Achyuthankutty, P. and Arunkumar, S. (2009). Cluster Development in natural rubber production, processing and marketing: The Indian experience. Towards inclusive rubber development (Ed. C. Kuruvilla Jacob). Rubber Board, Kottayam, India, pp. 190-199.
- Ajjan, N., Senthilnathan, S., Selvam, S. Shivkumar, K.M. and Rohini, A. (2009). Project proposal on establishing and networking of agricultural market intelligence centres in India. Centre for Agricultural and Rural Development Studies, Tamil Nadu Agricultural University, Coimbatore, 118 p.
- Anon., (2001). Hand Book of Natural Rubber Cultivation, Rubber Board, Kottayam P.108
- Badiane, O. and Shively, G. E. (1998). Spatial Integration, transport costs and the response of local prices to policy changes in Ghana, *Journal of Development Economics*, 56: 411-431
- Buakaew, S. (2005). Processing and marketing of smallholders' rubber in Thailand. Proceedings of the ninth ANRPC seminar on the progress and development of rubber smallholders. Cochin (India), 9-11 November 2005, pp. 64-66
- Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroscedasticity, *Journal of Econometrics*, 31:307-327

- Chandy, B., George, T.K. and Raj, S. (2010). Trends in farm income and wages in the era of market uncertainty: An exploratory analysis of natural rubber sector in Kerala. Rubber Research Institute of India, Retrieved on 28.04.2012 from www.cds.edu/admin/homeFiles/Binny%20Chandy%20Paper.pdf
- Chang, T.K, Tansuchat, R. and McAleer, M. (2009). Modelling Conditional Correlations in the Volatility of Asian Rubber Spot and Futures Returns. Center for International Research on the Japanese Economy (CIRJE), Faculty of Economics, University of Tokyo. Retrieved on 13.03.2012 from repub.eur.nl/res/pub/17297/EI2009-34.pdf
- Croxton, E.F., Cowden, D.J. and Klien, S. (1979). Applied General Statistics. Prentice Hall of India, New Delhi, India, 745p.
- Cuddy, J .D. A. and Della Valle, P. A. (1978). Measuring the Instability in Time Series Data. *Oxford Bulletin of Economics and Statistics*, 41(3): 247-248.
- Cyriac, P.C. (1986). The progress and development of Rubber Small Holders in India. Country Report. Proceedings of the Sixth Seminar of ANRPC. pp 126.
- Datta, S.K. (2001). How to judge global competitiveness of Indian agri-buisness methodological issues and lessons to India. In: Datta, S.K. and Deodhar, S.Y. (eds.) Implications of the WTO Agreements for Indian Agriculture. Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, pp. 631-649.
- Dickey, D. and Fuller, W.A. (1979). Distribution of the estimators for auto regressive time series regressions with unit roots. *Journal of American Statistical Association*. 74: 427-431.
- Edirisinghe, J. and Perera, D. (2005). Role of Price on Replanting Decisions of Rubber: An Application of Almon Lag Model. Retrieved on 18.03.2012 from www.slageconr.net/sjae/sjae71f/sjae07102.pdf
- Economic Review, 2011.(2012). Department of finance, Govt. of Kerala, Thiruvananthapuram
- Economic Survey, 2011-12. (2012). Ministry of finance, Govt. of India, New Delhi

- Fackler, P. (1996). Spatial Price Analysis: A methodological Review. Mimeo. North Carolina State University.
- Farm Guide, 2012.(2012). Farm Information Bureau, Department of Agriculture, Govt. of Kerala.
- Fathoni, Z. (2009). Evaluation of market system and market integration for rubber cultivation in Jambi province- Indonesia. Retrieved from www.edepot.wur.nl/14301, on 21.03.2012
- Geeveergees, P.V., Mathews, T.J. and Achuthankutty, P. (2003). Impact of processing and marketing of natural rubber through rubber producers' societies. In: Global Competitiveness of Indian Rubber Plantation Industry: Rubber Planters' Conference, India 2002. (Ed. C. Kuruvilla Jacob). Rubber Research Institute of India, Kottayam, India, pp. 374-379.
- Geeveergees, P.V., Achyuthankutty, P. and Sudhi, M. N. (2009). Impact of people's participatory programme in marketing of natural rubber. Towards inclusive rubber development, (Ed. C. Kuruvilla Jacob). Rubber Board, Kottayam, India, pp. 225-234.
- George, K.T. and Chandy, B. (1996). Market intervention, Value addition and Consolidation: The interface between Rubber Small Growers and the Co-operative Sector in Kerala. In: Rajagopalan R. (Ed.), Rediscovering Co-operation, Vol. III, Institute of Rural Management, Anand, India, pp. 1-13.
- Gulati, A., Sharma, A., Sharma, K., Das, S. and Chhabra, V. (1994). Export Competitiveness of Selected Agricultural Commodities. National Council of Applied Economic Research, New Delhi, India, 140p.
- Haridasan, V. and Pillai, K.K.R. (1988). Dissemination of scientific knowledge and the role of co-operative societies, *Rubber Board Bulletin*, **24**(2): 5-7.
- Honggokusumo, S. (2005). Recent development in processing and marketing of smallholder rubber in Indonesia. Proceedings of the ninth ANRPC seminar on the progress and development of rubber small holders. Cochin, 9-11 November 2005, pp. 76-79.
- Indian Rubber Statistics.(2009). Rubber Board, Govt. of India, Kottayam, Kerala.
- Indian Rubber Statistics.(2010). Rubber Board, Govt. of India, Kottayam, Kerala.

- Ipe, C. V. (1988). Seasonal fluctuations in the price of natural rubber in India. *Indian Journal of Natural Rubber Research*, **1**(1): 31-34.
- Ipe, C.V. (1992). An analysis of Indian natural rubber market. Placrosym IX, 1990, Bangalore, India. *Journal of Plantation Crops*, **20**(Supplement): 414-416.
- Jacob, G. (1999). Evolution of the marketing system for natural rubber in India. 100 years of commercial rubber cultivation in India. Rubber Board, Kottayam, India, pp. 69-74
- Jacob, G. and Chandy, B. (2000). Marketing. In: Natural Rubber: Agro management and Crop Processing. (Eds. P. J. George and C. Kuruvilla Jacob). Rubber Research Institute of India, Kottayam, India, pp. 493-506.
- Jacob, J., Sebastian, T. and Nair, M.K.B. (2003). A status report of processing and marketing of technically specified rubber in India. In: Global Competitiveness of Indian Rubber Plantation Industry: Rubber Planters Conference, India 2002. (Ed. C. Kuruvilla Jacob). Rubber Research Institute of India, Kottayam, India, pp. 202-206.
- Johansen, S. (1991). Estimation and hypothesis testing of Cointegration vectors in Gaussian Vector Autoregressive models. *Econometrica*, **59**: 1551-1580.
- Kalamkar, S.S. Shende, N. V. and Atkare V.G. (2002). Coarse Cereals and Pulses Production in India: Trends and Decomposition Analysis. Agricultural Situation in India: pp 581-587.
- Khin, A.A., Mohamed, Z., Shamsudin, M.N., Chong, E. C. F., Arshad, F. M. (2011). A comparison of forecasting abilities between univariate time series and market model of natural rubber prices. 2nd International conference on business and economic research (2ndicber 2011) proceeding 2233. Retrieved on 14.03.2012 from www.internationalconference.com.my/.../425.
- Krishnakumar, A.K. (1998). How to make Indian rubber internationally competitive. *The Planters' Chronicle*, 474-475.
- Krishnakumar, A. K. (2003). Professionalise to flourish. *Rubber Asia*, **17**(5): 53-56.
- Kunjappan, V.P., Rani, U.S. and Nair, R.B. (2009). Rubber Self-help groups: A new perspective of micro- institutional development. Towards inclusive rubber development. (Ed. C. Kuruvilla Jacob). Rubber Board, Kottayam, India, pp. 143-156.

- Lekshmi, S., Mohanakumar, S. and George, K.T. (1996). The trend and pattern of natural rubber price in India: An exploratory analysis. *Indian Journal of Natural Rubber Research*, **9**(2): 82-92.
- Mathews, A.S. (2011). Prices to stay high on ongoing tight supply. *Rubber Asia*, (March/April):75-76.
- Mani, K.T. (2004). Rubber co-operative sector in Kerala: Past, present and the future. Proceedings of workshop on Rubber Processing and Marketing by the Co-operatives, 6-7 April 2004, National Co-operative Development Corporation and Rubber Board, Avenue Centre Cochin, India, pp. 50-63.
- Mesike, C.S., Okoh, R.N. and Inoni, O.E. (2010). Supply response of rubber farmers in Nigeria: an application of Vector Error Correction Model. *Journal of American Science*, **6**(9):52-56.
- Minhas, B.S. and Vidhyanathan, A. (1963). The component analysis of the growth of crop output in India, Op cit: 234.
- Mohankumar, S. and Babu, V.I. (1994). SR plays a major role in fixing NR price. *Rubber Asia*, **8**(3): 55-57.
- Mohankumar, S. (2011). Rubber growers need proper marketing strategy. *Rubber Asia*, (September/October): 55-56.
- Mushtaq and Khalid. (2006). Market integration for price stability, *Economic Review*, **37** (8/9): 57-58.
- Narayanan, P. K. (1990). Rubber producers' societies: Agents of Change. *Rubber Board Bulletin*, **25**(3): 25-29.
- Philip, A. (2008). An analytical study of market integration hypothesis for natural rubber cultivation of Kerala. *ICFAI University Journal of Agricultural Economics*. **5**(2): pp. 31-40.
- Porter, M. E. (1990). *The Competitive Advantage of Nations*. Free Press, New York, 862p.
- Ramasundaram, P. (2004). Forward market and future trading in cotton, *Agricultural Spectrum*, **1**(3): 11-13

- Rajeevan, B., Natarajan, E. G., Nair, U.K.G. and Nair, R.B. (2006). Rubber based rural development in Malabar region of Kerala. Towards inclusive rubber development. (Ed. C. Kuruvilla Jacob). Rubber Board, Kottayam, India, pp. 157-162.
- Rani, S.U. (2003). A preliminary study on the impact of marketing natural rubber through producers' societies. In: Global Competitiveness of Indian Rubber Plantation Industry: Rubber Planters' Conference, India 2002. (Ed. C. Kuruvilla Jacob). Rubber Research Institute of India, Kottayam, India, pp. 350-358.
- Rani, S.U. (2005). Capacity Building in the small holding sector: A study on the role of rubber producers' societies. In: Global Competitiveness of Indian Rubber Plantation Industry: Rubber Planters' Conference, India 2005. (Ed. C. Kuruvilla Jacob). Rubber Research Institute of India, Kottayam, India, pp. 288.
- RRII.(2001). Hand Book of Natural Rubber Cultivation. Rubber Research Institute of India, Kottayam, p.86.
- Romprasert, S. (2010). Cointegration and error correction model of agricultural futures in Thailand: the case of rss3 futures. International Conference On Applied Economics – ICOAE, pp:649. Retrieved on 12.03.2012 from kastoria.teikoz.gr/icoae2/wordpress/wp-content/uploads/.../074.pdf
- Sexton, R., Kling, C. and Carman, H. (1991). Market integration, efficiency of arbitrage and imperfect competition: methodology and application to US celery, *American Journal of Agricultural Economics*, **73**:568-580.
- Santhakumari, K. and Pillai, B. V. (2009). Impact of rubber processing and trading companies on rubber producers' societies in Kerala. *Rubber Board Bulletin*, **29**(3):18-26.
- Sen, P.(1989). Growth and Instability of Indian Exports to USSR. *Economic and Political Weekly*, **24**(14): 867-892
- Sreekumar, B., Haridasan, V. and Rajasekharan, P. (1990). Farmgate price of natural rubber. *Indian J. Nat. Rubb. Res.*, **3**(2): 111-115.
- Tiyo. (2011). Poor replanting, adds to short supply and high price. *Rubber Asia*, (March/April):77-79.

Thomas, K.K. (2003). Indian rubber plantation industry in retrospect. Part 2, Price control, marketing and product manufacture. *Indian Rubber Journal*, **73** (September/October): 58-61.

Varghese, S., Claramma, P. V., Geethakutty, P. S. and Nair, R. B. (2006). Impact of group processing centres on marketing with a focus on socio-economic development. *Rubber Board Bulletin*, **28**(4):17-23.

Appendix

DIVISION OF AGRICULTURAL ECONOMICS
INDIAN AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI - 110022
QUESTIONNAIRE FOR COLLECTING INFORMATION FROM RUBBER CULTIVATORS

Name of Researcher: Anuja A.R.

1.0 PERSONAL DETAILS

- 1.1 Name of the rubber grower :
- 1.2 Where is your plantation situated? : Village
- District
- 1.3 Are you a full-time cultivator? :
- 1.4 If not, what is your main occupation? :
- 1.5 Do you have any other main cultivation? :
- 1.6 Have you got Rubber Board Registration for
your plantation? : Yes/No
- 1.7 How long have you been in rubber cultivation? :
- 1.8 Have you been practising intercropping method
of plantation ? : Yes/No

2.0 RUBBER PRODUCTION

- 2.1 Area under Rubber cultivation :
- 2.2 How do you own the land under rubber
cultivation? : Inherited
 Purchased
 Leased in
- 2.3 How many rubber trees are under tapping? :
- 2.4 How many years have been elapsed since you
started the tapping of present rubber trees? : Less than 5 years
 6 to 10 years
 More than 10 years
- 2.5 What is the quantity of rubber you produce
annually :
- 2.6 In which month do you yield the highest and
lowest production ? : Highest
- Lowest
- 2.7 What is your annual expenditure on Rubber
cultivation other than tapping charges ? :
- 2.8 How many tappers are employed? :
- 2.9 What is the rate of labour charges? : Rate for 100 trees
- 2.10 Do you use rain guard for tapping during
rainy seasons? : a) No tapping
b) Yes / No
- 2.11 Are you maintaining a separate smoke house for drying rubber? : Yes /No
- 2.12 Do you possess your own rubber roller for processing purpose? : Yes/ No
- 2.13 Do you have the facility to store your produce for more than

- 3 months without deteriorating its quality? : Yes / No
 2.14 Are you giving timely care, nursing and protection of rubber trees? : Yes / No
 2.15 Credit facility :

3.0 RUBBER MARKETING

- 3.1 What is the main saleable form of rubber you produce? : Sheet rubber
 Latex
- 3.2 If you are producing both, state the ratio of them? :
- 3.3 Do you know grading of rubber? : Yes / No
- 3.4 Which do you sell, graded or ungraded rubber? : Graded /Ungraded/Both
- 3.5 To whom do you sell the following produce?
- a) Latex RPS
 Co-operative rubber Marketing Societies
 Crumb factory
 Any other
- b) Sheet rubber Village level rubber dealer
 Medium level rubber dealer
 Large level rubber dealer
 Directly to manufacturers
 Unlicensed rubber dealer
 RUBCO
 Co-operative rubber marketing societies
 Any other
- c) Field coagulum (Scrap rubber)
 Village level rubber dealer
 Medium level rubber dealer
 Large level rubber dealer
 Directly to manufacturers
 Unlicensed level rubber dealer
 RUBCO
 Co-operative rubber marketing societies
 Any other
- 3.6 When do you sell your produce? : Frequently
 Weekly
 Monthly
 When the price rises
- 3.7 Are you aware of the quality you to be maintained for rubber for the marketing ? : Yes/No
- 3.8 Are you satisfied with the quality of rubber, now you maintained? : Yes/No
- 3.9 Do you have any special problem for marketing? :

4.0 RUBBER PRICE

4.1 What is the price at which you sell rubber under the following situations?

- a) When price is steady : At the news paper rate
: Less than news paper rate
: More than news paper rate
- b) When price is decreasing : At the news paper rate
: Less than news paper rate
: More than news paper rate
- c) When price is increasing : At the news paper rate
: Less than news paper rate
: More than news paper rate

4.2 Do you think that the present price is remunerative? : Yes /No

4.3 Do you think that the Bench Mark price is sufficient to meet your cost of production? : Yes /No

4.4 Do you receive the MSP for your rubber : Yes/No

4.5 In your opinion, what is the reason for the fluctuations in price of rubber?

- Import of NR
 Import of SR
 Import of rubber goods
 Low consumption due to low economic activity
 Liberalisation and globalisation policies of the Govt.
 Cyclical price fluctuations
 Production fluctuations
 Any other

5.0 GENERAL INFORMATION

5.1 Do you think that the Rubber Board contributes to the benefit of rubber growers? : Yes/ No

5.2 Any suggestions for improvement :

5.3 What is your opinion about the working of the RPS? :

5.4 What is your opinion about the working of the Co-operative Rubber Marketing Societies? :

5.5 What is your opinion about the RUBCO? :

6.0 RUBBER PRODUCER SOCIETY

6.1 Rubber Board Regional Office :

Socio – Economic status of the Members of RPS

6.2 Specify the nature of your participation in various organisations

Sl. no	Organisation	Active member	Passive member	Office Bearer	Non member
1	Other co-operatives				
2	Panchayats				
3	Political parties				
4	Religious organisation				
5	Cultural organisation				

6.3 Specify the nature of house owned by you:

6.4 State the type and number of vehicles if any owned by you:

Evaluation of the Benefits of the RPSs and their Effectiveness

6.6 Economic Benefits

Items	Aware and availed	Aware but not availed	Aware but not provided
Supply of Inputs			
Fertilisers			
Rain guarding materials			
Tapping Accessories & cultivation equipments			
Planting materials			
Spraying facility and spray oil			
Ethepone			
Copper Sulphate			
Taping panel protection materials			
Acid			
Taping Shades			

6.7 Marketing benefits and general services

Items	Aware and availed	Aware but not availed	Aware but not provided
Marketing benefits			
Collection of Latex			
Collection of Sheet			
Collection of Scrap			
Other General Services			
Financial grant			
Soil and leaf analysis			
Community smoke house			
Demonstration activities			

6.8 Social Benefits Rendered by RPS

Sl no	Benefits	Aware & Effective	Aware but not effective	Aware but not provided
1	Act as a forum for discussion			
2	Managerial qualities			
3	Helping to uplift the standard living			
4	Honouring the best rubber growers and tappers			
5	Acting as a nodal agency between members Government and rubber board			
6	Empowering women			
7	Providing study aids to the children of members			
8	Supplying necessary information			
9	Local area development			
10	Providing help to generate subsidy income from Rubber Plantation			

6.9 Have you availed Training in the areas mentioned below?

Sl. No.	Area of Training	Availed and effective	Availed but not effective	Availed but not effective
1	Training in Rubber Planting			
2	Training in Rubber Tapping			
3	Training in Subsidiary income generation			
4	Training in Quality sheet production			
5	Training in fertiliser application			
6	Training in value addition			

Performance of the Board of Directors of RPS from members view point

6.10 Is the Personality based performance of the Board of Directors effective or not in your opinion?

No	Personality based Performance	Effective	Not Effective
1	Organisational skill		
2	Marketing skill		
3	Experience		
4	Leadership skill		
5	Developmental activities undertaken		
6	Accountability		

6.11 Rank the following variables related to the board of directors of your RPS on the basis of the effectiveness.

1	Organisational skill	
2	Marketing skill	
3	Experience	
4	Leadership skill	
5	Developmental activities undertaken	
6	Accountability	

6.12 Mark your opinion on the activity based performance of the Board of Directors

No	Activities	Very Good	Good	Average	Poor	Very Poor
1	Providing necessary information to growers					
2	Resolving disputes					
3	Identifying fund raising projects					
4	Providing training					
5	Mode of functioning					
6	Attendance in various programmes of RPS					
7	Interest in agricultural activities					
8	Interest in Social activities					
9	Innovations					
10	Helping mentality towards members					