CHAPTER VII

Summary and Conclusions

Rubber is a major plantation crop in Kerala. Since the early decades of this century, Kerala’s natural rubber sector had shown positive growth trends in area, production and productivity. At present, the State holds a dominant position in the production of natural rubber in India. During the year 1996-97, Kerala accounted for more than 80 percent of the total area under cultivation and nearly 90 percent of the total production of natural rubber in India. Also, Kerala’s rubber is significant for the national economy as it is an important import substitute.

A note-worthy feature of the natural rubber sector in Kerala is the unprecedented increase in the per hectare productivity since the early 80’s. During the period, 1980-81 to 1996-97, the per hectare productivity increased from 780 Kg. to 1529 Kg. registering an annual growth rate of 4.04 percent. It can be attributed to the improvement in technology. Hence, the main objective of the study is to examine the origin and development of technology and rate of its adoption in the production of natural rubber in Kerala.

On the basis of neo-classical view, while the progress of technology provides a basis of resource augmentation, it is promoted by purposive resource using activities. The change in resource endowments induces change in technology. This is called the theory of “Induced Technological Innovation”. Theory encompasses mainly the cost-minimizing behaviour among producers. But for implementing these innovations in technology, a combination of the technological innovations with institutional innovation is required.

In Kerala the adoption of new technology in the production of natural rubber is manifested as changes in the selection of planting material, spacing and density of planting, the usage of manures and fertilizers, various plant protection measures, stimulation process and different types of tapping and processing systems.
In this study, both primary and secondary data were used. Depending on the size of cultivated area under rubber, rubber growers are divided into small growers, medium growers and large growers. The one important feature of Kerala’s Rubber Economy is that it is overwhelmingly small holder oriented. Hence the study covered samples of 300 small growers using a simple random sampling technique. For this, the study has covered all the important rubber growing regions in the South, Central and North Kerala. The field surveys were carried out in 6 taluks under 5 districts. From each taluk, 50 samples were randomly selected for intensive study.

Along with small growers, 8 estates under plantation companies and 8 estates under private individuals from various regions of the state were also selected and surveyed. The selected growers were interviewed using a structural pre-tested interview schedule. Important sources of secondary data used in this study are the various publications of the Rubber Board and other various government reports and some of the Research Papers.

Natural rubber is nature’s most versatile vegetable product and this material was first introduced to the world by the Europeans during the early 16th century. In India, rubber was introduced in the teak plantations of Nilambur Valley during the late 18th century. Rubber cultivation had its beginning in Kerala during the first decade of the present century and now it occupies a predominant position among all the plantation crops in the state. The first commercial plantation of rubber in Kerala was started by the Europeans at Thattakkad near Alwaye in 1902.

The two turning points in the history of rubber cultivation of Kerala during the pre-independence period were the Great Depression of 1930’s and the Second World War of 1939 to 1944. Later, from 1960’s to 90’s, the area under rubber in Kerala has shown a tremendous increase of more than 5 fold and production has increased to more than 20 fold. Meanwhile, the per hectare productivity increased by more than 4 fold. As compared to other major plantation crops like tea, coffee, and cardamom, the performance of rubber in area under cultivation and production surpasses all crops in growth rates. As a special feature of Kerala rubber economy, the area under rubber of smallholdings has increased from 65 percent in 1960-61 to more than 90 percent in 1996-97.
The production has increased from 0.13 to more than 4 lakh tonnes. The per hectare yield thus has increased from 215Kg in 1960-61 to 1510Kg in 1996-97.

The adoption of improved technology has enabled the small holders to enhance productivity of their farms. But this adoption and diffusion of improved technology has a close relation with the institutions relating to rubber. The role played by the Rubber Board which was established in 1947 as the apex controlling body of rubber plantation industry and to help and encourage the growers, has been crucial. The first major development scheme taken up by the Rubber Board was the Replanting Subsidy Scheme of 1957. Later a modest scheme for giving interest free loan assistance to small holders for expanding their holdings by new planting was introduced. This was followed by a package of measures to popularise the scientific cultivation and production of rubber with technical assistance and limited financial support.

The research and extension activities of Rubber Board and the innovative efforts of farmers were mainly responsible for the promotion of technology among holders in Kerala. Besides, the Rubber Growers Co-operatives, Rubber Producers Societies and even some charitable societies or institutions were the prime agents in the diffusion of technology.

The growth of a rubber tree basically depends on many factors such as, lie of land, type of soil, climatic changes, etc. From early decades, the rubber plantations in Kerala have been mostly situated on sloppy and undulating lands. Flat lands are easy for working but such lands suitable for rubber are limited in Kerala. The sample survey shows that in Central Kerala, rubber cultivation is more on plain lands and in Northern and Southern regions of the state, the lie of land of rubber plantations is more sloppy. The majority of our rubber growing soils belong to the laterite and lateritic types which exhibit only little variations in the fertility status. The present study shows that the new generation is generally averse to take up cultivation of rubber as an avocation. Again, all of the sample growers are found to be literate but the depressing fact is that around 45 percent of them had dropped out at the primary level itself.
In Kerala, early plantations were raised from unselected seedlings. The yield of these seedlings were very low and showed substantial variability. During the beginning of 60’s most of the areas were planted with clonal seedlings, which gave relatively better yields. Later during the early 70’s bud material was introduced. The budded material consists of several clones. The modern clones are found to be very high yielders as compared to old conventional clones. The important clones recommended by the Rubber Board are RRII-105, RRIM-600, PB 235 and PB 311 and the sample growers in Kerala have now adopted these bud clones especially RRII 105 almost completely. Apart from these, the only advanced planting material used at present is poly-bag plants which is now widely used in preference to budded stumps. Tissue culture propagation of plants is relatively a new development and some rubber plants raised by tissue culture are planted at the Experiment Station of the Rubber Research Institute of India.

Specific norms regarding spacing and density of planting were not commonly adopted during the early years. After the introduction of RRII 105 in mid 70’s, these practices have been almost strictly followed by the growers i.e., 170-180 plants per acre for bud trees and 180-210 plants per acre for seedlings and the spacing followed commonly are 22’ * 11’ for bud plants in hilly areas and 16’*16’ for flat lands.

The role of cover crop and weed control in rubber plantation is very important. The establishment of cover crop and its maintenance in rubber plantation is mainly for the purpose of conserving and improving the soil structure and fertility. During the period of the early plantations, there was only one type of cover crop and growers were not fully aware of its benefits. Now around 60 percent of the sample growers have established the cover crop. Mulching with dry leaves, grass cutting and cover crop lopings around the plant is a necessary and essential cultural practice for the healthy growth of the tree. But in Kerala only around 40 percent of the growers have followed this practice. This non-adoption is mainly due to the high cost needed for this practice. Similar to cover crop, weed control also is an important cultural practice in rubber cultivation.

In recent years, some changes have occurred in the attitude of growers towards weeding. Clean weeding over the whole estate has become a thing of the past. Now
clean weeding is carried out only along the rows and in circles around the plants, especially in the early years. In the rest of the area the cover crops help in suppressing the weeds if established in time. Usually weeds can be controlled by manual weeding or by the use of chemical herbicides. In Kerala, hand weeding is very popular and more than 80 percent of sample growers are following this practice.

For the efficient and economic use of fertilizer, it is necessary to assess its requirements for rubber plants. Discriminatory fertilizer application is usually recommended by the Rubber Board. This improved method of the application of fertilizers is being followed only after the introduction of the high yielding varieties like RRII 105. Prior to it there were general recommendations but growers applied fertilizers without following any time schedule or method. Even now, wide disparity is observed in the method of application of fertilizers. The adoption of the practice of testing of soil and leaf is very poor in the northern region of Kerala and as a whole only more than two-third of the sample growers are interested in it. A very low percent of sample growers are using only organic manures like cowdung, bone-meal etc according to availability. The use of bio-fertilizers has not become popular among the rubber growers.

A major constraint of high-yielding varieties like RRII 105 is their proneness to various diseases. Different types of root, stem and leaf diseases are affecting the productivity of rubber mainly in the case of small holders. A warm, humid equable climate and a well-distributed annual rainfall of 2000mm are ideal for good growth and optimum yield of the tree. Unfavourable climatic conditions adversely affect the growth and yield of the tree and act as a pre-disposing factor for various diseases. The common diseases seen in Kerala are Pink and Brown bast. The percentage of trees damaged is relatively very high in Central Kerala compared to other regions.

Timely plant protection measures ensure healthy growth and economic production. The traditional method of protection measures like bordeaux mixture spraying and pasting, are effective even now and around 60 percent of sample growers are following this practice. But the improved method of micron spraying for preventing abnormal leaf fall is not popular in Kerala and only around 25 percent of the sample growers follow this practice. Another important factor is that around 15 percent of the
sample growers have not adopted any of these protection measures due to various reasons.

Some of the physiological disorders of rubber trees are mainly due to unscientific tapping practices followed by unskilled tappers. The recommended average girth of 20” is followed by 60 percent of the sample growers. Almost all the tappers and owners of holdings are unaware of the correct slope and direction of tapping. Even though early morning tapping is recommended by the Rubber Board, the time commonly observed in the state is 6.30 to 7 am. In Kerala, even now, the knife used is only the Michie Golledge type and various improved knives like Gooje, Jebong, etc are not familiar to the tappers. The general trend observed is that even with a small land area, growers are hiring tappers and all the work relating to tapping and processing of latex are fully under the control of tappers.

Response to tapping system adopted vary from clone to clone. During the early years, daily tapping was going on especially for unselected clones. Later, with the introduction of clonal seedlings, alternate daily system came into existence and for bud trees even now, this half-spiral alternate daily system is recommended. To ward-off the incidence of panel dryness in certain clones like RR11 105, PB 235, etc the Rubber Board has recommended the improved system of third daily. Now the controlled type of upward tapping (CUT) system is also recommended but has not been popular in Kerala. Around 80 percent of the sample growers are following alternate daily tapping system and only around 7 percent of them are following the third daily system. The unawareness of growers on the improved technology with improved tapping knife is generally observed.

The lack of sufficient number of skilled tappers in Kerala is a serious problem. Skilled tapping is necessary for the good health of the rubber tree and for maintaining the longevity of its production period. The other important technique suggested for enhancing production is rainguarding of trees, which was introduced during mid 70’s. Even though profitability from rainguarding revolves around rainfall pattern and price of rubber, distributed income throughout a year can be assured by adopting this practice. In Kerala, only 45 percent of sample growers have now adopted this practice. The wide
acceptance of rainguarding is observed in Central Kerala (62.70 percent) while its adoption rate is very poor in southern region of Kerala (6 percent). Again around 45 percent of sample growers have adopted the use of plastic cups in place of coconut shell for collecting latex.

Scientific processing of the crop consists of many stages. The latex collected from the trees in cups is transferred to clean buckets. An anticoagulant is added to the latex to prevent pre-coagulation. Then for coagulation, formic or acetic acid is generally used. The quantity of acid depends on many factors like the amount and type of anti-coagulant used, the duration of coagulation, the season and nature of the latex, etc. After that, the coagulum is removed from the pans and thoroughly washed in running water. Then they are sheeted either in sheeting battery, which is a new technique, or in smooth rollers to a thickness of 3 mm and finally passed through the grooved roller.

In Kerala this type of scientific processing practices are not followed even by a very low percent of small growers. At present, around 78 percent of sample growers are aware of the need of these improved practices but not interested in adopting it mainly due to the high cost needed for this. Formic acid is widely accepted as coagulant and more than 90 percent of the sample growers are not using PNP, golden touch, sodium-bisulphite etc for making the product of good quality.

Usually, the thickness of sheet is adjusted at the time of rolling it. But the non-availability of sufficient sheeting rollers is the one important constraint. Around 50 percent of the sample growers have their own rollers and 6 percent of them have rollers in their family. After rolling, the other important problem is smoking. The quality of sheets finally depends on smoking. Only around 20 percent of the sample growers have their own smoke houses though not of the recommended type. Majority of the remaining small growers follow the practice of drying in the sun or kitchen smoking.

Because of the adoption of unscientific processing practices, small growers in Kerala are also facing the problem of low quality of marketable forms of their product. More than two-third of sample growers are marketing their product as sheets of
ungraded or lot variety. Around 20 percent of growers are producing sheets of IV grade. The change in the forms of product as sheets or latex depends on the demand of the product. In Kerala, licensed private rubber dealers are popular. The unpopularity of marketing societies in Kerala is mainly due to their strict grading systems. At present, for ungraded sheets, growers are getting only 10 paise to 50 paise less per kilogram than the daily price quoted in newspapers. The RPSs have also been introduced to collect the latex from small growers at reasonable price. But due to price crash, at present, they are unable to collect the latex.

As compared to small growers, the technology package adopted by estates is more advanced. In the case of estates, the rate of adoption of improved technologies is higher in plantation estates as compared to estates under private individuals. The marketing systems of estates are very different and their forms of product also differ. All the sampled estates under plantations have their own factories producing all the marketable forms of rubber like PLC, EBC, CENEX, etc. In the case of private estates, their forms of product change with the fluctuations in the price of natural rubber.

Depending on seasonal variations in productivity, yield giving season of rubber trees can be divided into peak, lean and moderate seasons. Tapping days is a crucial factor in the analysis of yield. In Kerala, among small growers, average of 41 additional tapping days could be obtained due to rainguarding of trees. The average season-wise yield per 100 trees per day in Kerala is 4.50Kg (peak season) 1.58 Kg (lean season) and 2.54 Kg (moderate season). In Central Kerala, the productivity is comparatively much higher. The percentage change in yield between seasons shows that the change in yield from peak to lean season is high in Kanjirappally taluk and very low in Meenachil taluk. The difference in yield between lean and moderate season shows that the difference is high in Pathanamthitta and low in Meenachil taluk. On an average, the difference in productivity of natural rubber before and after replanting is found to be 45 percent. The average yield of plantation estates, estates under individuals and small growers shows that the average yield of plantations is very high. They obtain the average yield of 4.58 Kg per 100 trees per day, while it is 4.17 Kg in private estates and 3.35 Kg in small holdings.
In the case of small growers, the non-adoption of improved technologies is mainly due to high cost needed for cultivation practices, especially in manuring, disease protection measures and tapping. For private estates, the non-availability of skilled tappers, lack of knowledge about the benefit of advanced technologies and the non-availability of modern factory processing techniques are the causes for the weak marketing operations with fluctuations in the price of natural rubber.

Along with these factors, the cost of cultivation and wages of tappers have played a key role in the rate of adoption of improved technology. In Kerala, the labour and fertilizer cost account for more than 75 percent of the paid out cost of cultivation of rubber. The wages of tappers always depend on the system of tapping followed by the owner and the price of natural rubber. So the cost of mature rubber plantations depend on many factors. The sample survey shows that the cost of mature rubber planting is higher than that of immature planting and in both cases, the cost is very high in small holdings compared to private and plantation estates. The per acre production cost of estates and smallholdings clearly shows this. To the small growers, this cost is Rs 14140.42/-. It is Rs 20908.58/- and Rs 24052.15/- for private and plantation estates respectively. For examining this cost, the study excluded land cost and maintenance (capital) cost needed for maintaining the processing facilities, because these costs are varying according to its use by growers.

The analysis of different cost components shows that tapping cost constitutes as the highest in the all categories of cultivators. The other two major items of costs are processing and manuring costs. Among the three categories of cultivators, the cost is varying and in all cases, the cost of small holdings is the highest. This difference is mainly due to the difference in the adoption of technology in all stages—cultivation, harvesting and processing.

Again, the average cost of producing one kilogram of natural rubber in small holding is Rs 15.08/- which is relatively lesser than that of private (Rs 17.41/-) and plantation estates (19.31/-). The increased cost of estate is mainly due to the increased wages for labourers, high cost needed for spraying, increased transportation cost and
are, lack of interest of available tappers in adopting improved tapping systems, lack of efficiency or mismanagement in the functioning of RPSs who have the provision of giving inputs in the subsidy rate at the time it is needed.

Profitability is the final word of any agricultural crop cultivation. In the case of rubber, the nature of profit always depends on the productivity, quality and price of the product. Inspite of per acre higher costs, plantation estates obtain higher profit because of higher productivity, quality and price. Due to this, wide variations occurs in profit among the three categories of rubber cultivators and it is high in the case of plantation estates and low in regard to small holdings. Only through a better adoption of improved technologies the gap in profit between estates and small holdings could be reduced.

Thus both the adoption of improved technology and remunerative price are important for the development of the rubber economy of the state. After the establishment of Indian Rubber Board in 1947, a remunerative price for rubber was made available to small holders for the first time. Later, the introduction of Bench Mark Price by the Tariff Board in 1951 was considered as a significant point in the development of the rubber economy. After the introduction of liberalization policies in India, the trade factors in natural rubber economy, tended to face various difficult situations. Though there are no restrictions on export, the quantity exported was nominal. Thus, after 1991, the import of natural rubber has tended to rise at a rate of $+16.24\%$ and export has tended to fall at a rate of $-19.41\%$. Similarly, net import showed an upward trend of $25\%$ within a period of 6 years. Thus, the impact of the present policies of liberalization and globalization have affected adversely the natural rubber industry.

In rubber, a periodical change in price is a common phenomenon. Price may change cyclically, seasonally or on the basis of quality of the product. During the peak production period from September to January, price may decline and it may be high during the lean season of March and April. If the final product is not of a good quality, the price may decline. Similarly the short term fluctuations in the price of natural rubber is a serious problem as far as small growers in Kerala are concerned.
conducted a sample survey among small rubber growers and rubber dealers in Kottayam District. The study revealed that the rubber dealers are in an optimistic belief that the price of natural rubber may go up by the near future, while small growers in general are now forced to shift to other crops mainly due to the huge financial crisis. Most of the sample growers severely criticised the irresponsible actions of the Government, the Rubber Board and related institutions in solving the problem.

In brief, the diffusion and adoption of modern advanced technology in rubber cultivation have played a crucial role in the development of the rubber economy of Kerala and especially for solving the problems faced by small growers. Even though the productivity of small holdings has been increasing continuously, there are many problems which are currently affecting adversely the progress of rubber economy of the state. These problems only discourage growers who are now engaged in rubber cultivation and if suitable remedial measures are not adopted in time, the trend of rising productivity may in course of time be reversed. The basic requirement for the steady progress of the rubber industry, of which the small holding sector is an important and integral part, is to bring into existence a consistent marketing and organizational setup. Then only the growers get a profitable and steady price for their product. Hence, the Central and State Governments, the Rubber Board, the RRRI and other responsible institutions which help to transplant advanced technology among small rubber growers have to find out suitable and effective solutions to these problems for the sustained progress of the rubber economy of Kerala.