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CHAPTER I

INTRODUCTION

The lush green virgin forest of the Western Ghats of India have been the natural rubber. The cultivation trade of natural rubber in India has a hoary past. It is as old as the human civilization itself. Christopher Columbus discovered rubber in the tropical forest of Amazon in the 15th century. Till the end of 18th century, its uses were known only to scientists of England used it as an eraser1. The first European to describe the elastic gum was PictroMartyred2.

Rubber may be obtained from a large number of plants, but 95 to 98 percent comes from the rubber trees3. Some of the properties and uses of rubber were discovered by the Indians of tropical South America, long before the voyages of Columbus made

the knowledge available to the old world⁴. Budded seedlings are transplanted at the rate of about 100 to 150 per acre (250 to 370 per hectare). They grow rapidly, and at about six year of planting, when their trunks are about six inches (15 cm) in diameter, they can be tapped⁵. The seedlings, which have been raised in a nursery, are planted in even rows. Density varies from 100 to 300 trees per acre and the trees are gradually thinned out over seven or eight years⁶. The rubber tree provides by for the largest source of natural rubber, more than 400 species of plants can yield a rubber like material⁷. Although certain species of rubber trees can be grown at higher elevations, 1500 ft is thought to be the highest altitude for Heved plantings⁸. There are infact, no fundamental differences between the basic manufacturing processes of natural rubber used in 1990’s and those of the 1960s. All the separate stages, preparing, cleaning, cutting, masticating, compounding, milling, vulcanizing, hardening, moulding and finishing-are still essentially what they were in 1990s. Although the machinery has been continuously refined and improved.⁹

⁹ ibid., p.604.
Since 1979, under the new scheme for promotion of rubber plantation is very high yielding, capable of producing 1.5 - 2 tonnes per hectare\textsuperscript{10}. With effect from 1985, every year an additional output of over 15,000 tonnes of natural rubber is likely to materialise, as the material used for new planting and replanting.\textsuperscript{11} The world today uses as many as 50,000 different rubber products. India occupies a prominent position in rubber goods manufacturing and produces over 35,000 individual items\textsuperscript{12}. Rubber is emerging in India as an export crop with a great promise. It provides not only livelihood security, but a decent life to one million families in the country. Globally, natural rubber provides security cover to over thirty million small farmers families. Among the rubber producing countries, India ranks first in the case of productivity\textsuperscript{13}.

\textbf{1.1 Natural Rubber}

Natural rubber is a high molecular weight polymeric substance with viscoelastic properties. Natural rubber shows all the reactions of an unsaturated polymer. It gives addition compounds with halogens, ozone, hydrogen chloride and several other reactants that react with olefins. An interesting reaction is its combination with

\textsuperscript{10} Ibid., p.604.
\textsuperscript{11} Thomas, P.J., \textit{op.cit.}, p.121.
sulphur. This is known as vulcanisation. This reaction converts the plastic properties of raw rubber into elastic properties. Vulcanised rubber will have very high tensile strength and a comparatively low elongation. Its hardness and abrasion resistance also will be high compared to raw rubber. Because of these natural rubber finds application in the manufacture of a variety of products.

The main use of natural rubber is in automobiles. In developed countries nearly sixty percent of all rubber consumed is for the automobile tyres and tubes. In heavy duty tyres, the major portion of the rubber used is Natural rubber. In addition to tyres a modern automobile has more than 300 components made out of rubber. Many of these are processed from Natural rubber. Use of Natural rubber hoses, footwear, battery boxes, foam mattresses, balloons and toys are well-known. In addition to this, Natural rubber now finds extensive use in soil stabilisation, in vibration absorption and in roadmaking. A variety of NR based engineering products are developed for use in these areas.\textsuperscript{14}

\textbf{Nature of the Tapping Operation}

The rubber tree becomes tappable when it attains a particular girth at the height at which tapping cut is to be opened. This girth is normally attained by the 6\textsuperscript{th} year of planting the tapping cut

slopes down at a specified angle along one side of the trunk of the tree in a half spiral fashion. From the lower end of the tapping cut a shallow vertical channel is opened to allow the latex flow down for a distance of six to nine inches from where aspont fixed on the tree will lead it to account shell cup held in place below it with the help of a loop of wire tied round the trunk. Tapping consists of cutting a thin slice of bark about one pone and a half millimetres thick to a depth of about one to one and a half millimeter outside the world with a special implement called the tapping knife. Latex immediately begins to exude and flow along the cut and through the spot in the cup.

Production and Consumption of Natural rubber

During the period under review, production of natural rubber in India witnessed slow and steady growth even though price collapse continued its onward journey after the price boom during 1995-96. However consumption had grown during the period, but not in pace with the growth of production as is evident in table No. 1.1. India had to depend on international market to meet its consumption requirement except during 1998-99, which shows the excess domestic production.

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## TABLE No. 1.1

PRODUCTION AND CONSUMPTION OF NATURAL RUBBER IN INDIA

(in tonnes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Consumption</th>
<th>Excess (+)/Deficiency (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990 – 91</td>
<td>329615 (100)</td>
<td>364310 (100)</td>
<td>- 34695</td>
</tr>
<tr>
<td>1991 – 92</td>
<td>366745 (111)</td>
<td>380150 (104)</td>
<td>- 13405</td>
</tr>
<tr>
<td>1992 – 93</td>
<td>393490 (119)</td>
<td>414105 (114)</td>
<td>- 20615</td>
</tr>
<tr>
<td>1993 – 94</td>
<td>435160 (132)</td>
<td>450480 (124)</td>
<td>- 15320</td>
</tr>
<tr>
<td>1994 – 95</td>
<td>471815 (143)</td>
<td>485850 (133)</td>
<td>- 14035</td>
</tr>
<tr>
<td>1995 – 96</td>
<td>506910 (154)</td>
<td>525465 (144)</td>
<td>- 18555</td>
</tr>
<tr>
<td>1996 – 97</td>
<td>549425 (167)</td>
<td>561765 (154)</td>
<td>- 12340</td>
</tr>
<tr>
<td>1997 – 98</td>
<td>583830 (177)</td>
<td>571820 (157)</td>
<td>- 12010</td>
</tr>
<tr>
<td>1998 – 99</td>
<td>605045 (184)</td>
<td>591545 (162)</td>
<td>+ 13500</td>
</tr>
<tr>
<td>1999 – 00</td>
<td>622265 (189)</td>
<td>628110 (172)</td>
<td>- 5845</td>
</tr>
<tr>
<td>2000 – 01</td>
<td>630405 (191)</td>
<td>631475 (173)</td>
<td>- 1070</td>
</tr>
<tr>
<td>2001 – 02</td>
<td>631400 (192)</td>
<td>638210 (175)</td>
<td>- 6810</td>
</tr>
</tbody>
</table>

### NOTE:
Figures in parenthesis indicate growth index with base year 1990-91.

### SOURCE:

### Total Demand for and Supply of Natural rubber

Even if the total indigenous production was less than the indigenous consumption, the total supply as a whole during the period
were higher than the total demand except a few years as shown in table no. 1.2. The price decline after 1995-96 could be attributed due to the excess supply of natural rubber in the Indian market because of uncontrolled import policy. As Indian economy began to melt its borders with global economy since 1991, India could not restrict import to bail the Indian farmers especially Keralites out of the price decline of natural rubber.

**TABLE No. 1.2**

**TOTAL DEMAND FOR AND SUPPLY OF NATURAL RUBBER IN INDIA**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Supply (Production + Import)</th>
<th>Total Demand (Consumption + Export)</th>
<th>Excess (+) Deficiency (-) Compared to Total Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990 – 91</td>
<td>378628</td>
<td>364310</td>
<td>+14318</td>
</tr>
<tr>
<td>1991 – 92</td>
<td>381815</td>
<td>385984</td>
<td>-4169</td>
</tr>
<tr>
<td>1992 – 93</td>
<td>411374</td>
<td>420104</td>
<td>-8730</td>
</tr>
<tr>
<td>1993 – 94</td>
<td>455100</td>
<td>450666</td>
<td>+4434</td>
</tr>
<tr>
<td>1994 – 95</td>
<td>479908</td>
<td>487811</td>
<td>-7903</td>
</tr>
<tr>
<td>1995 – 96</td>
<td>558545</td>
<td>526595</td>
<td>+31950</td>
</tr>
<tr>
<td>1996 – 97</td>
<td>569195</td>
<td>563363</td>
<td>+5832</td>
</tr>
<tr>
<td>1997 – 98</td>
<td>615900</td>
<td>573235</td>
<td>+42665</td>
</tr>
<tr>
<td>1998 – 99</td>
<td>634579</td>
<td>593385</td>
<td>+41194</td>
</tr>
<tr>
<td>1999 – 00</td>
<td>642478</td>
<td>634099</td>
<td>+8379</td>
</tr>
<tr>
<td>2000 – 01</td>
<td>639375</td>
<td>644831</td>
<td>-5436</td>
</tr>
<tr>
<td>2001 – 02</td>
<td>680990</td>
<td>645205</td>
<td>+35785</td>
</tr>
</tbody>
</table>

Comparison of Export and Import of Natural rubber

India’s export during the period under study were meagre except during 2000-01 when it managed to touch a five-digit figure. The balance of trade, as far as Indian natural rubber industry is concerned was unfavourable throughout the period except during 2000-01. The quantitative restrictions on import of natural rubber was included in the negative list as a restricted item of import. As a result, 49,590 tonnes of NR were imported during 2001-02, which was the second highest import during the study period. The following factors contributed to the dismal performance of export despite the removal of restrictions on export since 1992. (a) India is not a regular player in the export market of natural rubber, (b) dearth of information about overseas markets of natural rubber, (c) inefficiency of existing marketing system and (d) insufficient infrastructure.
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TABLE No. 1.3
IMPORT AND EXPORT OF NATURAL RUBBER IN INDIA (in tonnes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Import (1)</th>
<th>Export (2)</th>
<th>Favourable (+) / Unfavourable (-) Balance of Trade (2 − 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990 − 91</td>
<td>49013</td>
<td>-</td>
<td>- 49013</td>
</tr>
<tr>
<td>1991 − 92</td>
<td>15070</td>
<td>5834</td>
<td>- 9236</td>
</tr>
<tr>
<td>1992 − 93</td>
<td>17884</td>
<td>5999</td>
<td>- 11885</td>
</tr>
<tr>
<td>1993 − 94</td>
<td>19940</td>
<td>186</td>
<td>- 19754</td>
</tr>
<tr>
<td>1994 − 95</td>
<td>8093</td>
<td>1961</td>
<td>- 6132</td>
</tr>
<tr>
<td>1995 − 96</td>
<td>51635</td>
<td>1130</td>
<td>- 50505</td>
</tr>
<tr>
<td>1996 − 97</td>
<td>19770</td>
<td>1598</td>
<td>- 18172</td>
</tr>
<tr>
<td>1997 − 98</td>
<td>32070</td>
<td>1415</td>
<td>- 30655</td>
</tr>
<tr>
<td>1998 − 99</td>
<td>29534</td>
<td>1840</td>
<td>- 27694</td>
</tr>
<tr>
<td>1999 − 00</td>
<td>20213</td>
<td>5989</td>
<td>- 14224</td>
</tr>
<tr>
<td>2000 − 01</td>
<td>8970</td>
<td>13356</td>
<td>+ 4386</td>
</tr>
<tr>
<td>2001 − 02</td>
<td>49590</td>
<td>6995</td>
<td>- 42595</td>
</tr>
</tbody>
</table>


Natural rubber in Post Quantitative Restrictions (QRs)

In 2001-200, there has been apparently a prevailing uncertainty in the domestic market confounded by a surge in imports consequent to the removal of quantitative restrictions on major form of natural rubber. Though the domestic natural rubber prices have been moving in tandon with world prices since 1991-92 mainly due to major policy shifts on external trade and the removal of quantitative
restrictions on natural rubber import is unprecedented as imports had been subject to quantitative restrictions from 1947 to March 31, 2001.\footnote{Tharian George, K., et.al., \textit{Economic and Political Weekly}, Vol.XXXVII, No.32, August 10, 2002, p.3319}

**Future of Natural rubber**

According to a report of the International Study Group, the estimate of world consumption of natural rubber in 1978-79 was about 3.825 million tonnes and that of synthetic rubber was 6.825 million tonnes. But world production of natural rubber was only about 3.750 million tonnes and that of synthetic rubber was 8.378 million tonnes.\footnote{Mukundan Menon, P., “Washington Assembly of the International Rubber Study Group”, \textit{Rubber Board Bulletin}, February 1977, p.10} Thus less rubber was available for consumption. International agencies such as the World Bank have already forecast a million shortage of natural rubber by 1980.\footnote{Sekhar, B.C., “Future of Natural rubber”, \textit{The Planters Chronicle}, Vol.5, No.7, January 1977, p.35}

Another factor is that, over 60 percent of natural rubber goes into tyres and it has many other uses in automotive products. Natural rubber retains its use in heavy duty applications in aeroplanes, in earthmovers, in large truck and bus tyres. Here natural rubber is required for its technical properties its low heat build up, high plex resistance. Superior adhesion to tyre cord and superior strength. Although almost chemically identical with natural rubber, synthetic rubber developed over the past 20 years does not match natural
rubber's overall performance. Natural rubber shows higher green strength and lack qualities important during the manufacture of tyres.\textsuperscript{19}

Plantations in India have been employing a large number of workers. To regulate the conditions of employment for plantation workers, the Government of India has enacted the Plantations Labour Act in November 1951. Only India has a separate legislation exclusively for plantation workers. Indian Plantations Labour Act contains in addition to provisions on conditions of employment and various provisions on living conditions.\textsuperscript{20}

The demand for rubber is bound to increase steadily in the coming years. The net deficit is to be met by limited imports of special purpose synthetic rubber. The experience in the traditional rubber growing areas of Kerala and adjoining Kanyakumari district of Tamil Nadu have shown that development of rubber production can bring about effective land utilisation, improvement of overall economic status of the region and above all, generate sufficient employment opportunities in rural areas.\textsuperscript{21}

\textsuperscript{19} Leonard Mullins, "Expanding use of Natural rubber", \textit{The Planters Chronicle}, Vol.11, No.9, Tamil Nadu, February 1977, p.61.


1.2 World Supply of Natural rubber

The supply of natural rubber from all producing countries is the total supply of natural rubber in world market. The price of rubber in the world market will influence the supply schedule. A rightward shift of the export supply schedule will shift the total world supply to the right, which causes a decrease in the price of rubber in the world market, other things remaining unchanged. All countries' export supplies of natural rubber are treated as a function of the world rubber price, its supply lagged, a time trend, and a random disturbance.

Supply will be constrained by a number of factors.

(i) Inferior financial returns to rubber, compared with oil palm, over the last 30 years have led to rubber areas being replanted with oil palm in the main producers of Thailand, Indonesia and Malaysia.

(ii) Supply growth has already slowed to 1-1.5 percent per annum compared with 3 percent over the previous 20 years.

(iii) Even governments that previously promoted rubber such as Malaysia, Thailand and Indonesia are encouraging the switch to oil palm.

(iv) No subsidized capital is available for rubber as in the past when the world bank, governments and other developments agencies provided long-term funding.
(v) Indonesia, the most promising source of new planting

(vi) Thailand, the world’s leading producer, is wall-to-wall rubber in the south and hence has no new areas available for planting.

(vii) Labour availability: this has been a problem in Malaysia since the 1980s. in Thailand and Indonesia it could become a factor over the 30 year-life of a new rubber investment.

(viii) Slaughter tapping: currency weakness in Indonesia and Thailand stimulated the recent increases in production through slaughter tapping. This will take its toll on the trees and supply over the next few years.22

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### TABLE No. 1.4

#### WORLD NATURAL RUBBER OUTPUT 2002-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Consensus in tonnes</th>
<th>Total in tonnes</th>
<th>Malaysia</th>
<th>India</th>
<th>Indonesia</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>2,58</td>
<td>6.92</td>
<td>2.56</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2003</td>
<td>2.58</td>
<td>6.92</td>
<td>2.57</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2004</td>
<td>2.58</td>
<td>6.92</td>
<td>2.58</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2005</td>
<td>2.58</td>
<td>6.92</td>
<td>2.58</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2006</td>
<td>2.58</td>
<td>6.92</td>
<td>2.58</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2007</td>
<td>2.58</td>
<td>6.92</td>
<td>2.58</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2008</td>
<td>2.58</td>
<td>6.92</td>
<td>2.58</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2009</td>
<td>2.58</td>
<td>6.92</td>
<td>2.58</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>2010</td>
<td>2.58</td>
<td>6.92</td>
<td>2.58</td>
<td>0.45</td>
<td>0.30</td>
<td>0.15</td>
</tr>
</tbody>
</table>

From Table 1.4 it could be seen that world natural rubber production shows an increasing trend. In the year 2000, the natural rubber production was the highest in Thailand with 2.58 million tonnes and the lowest in Vietnam with 0.26 million tonnes. During the year 2001 Thailand still leads with 2.59 million tonnes and it was lowest in Vietnam with 0.29 million tonnes. In the year 2002, Thailand produced 2.62 million tonnes whereas China produced only 0.5 million tonnes of rubber. In the year 2003, 2004 and in 2005 it was estimated that the production of natural rubber in Thailand would be 2.64, 2.66 and 2.68 million tonnes respectively. In the year 2003 Malaysia stands behind with the output of 0.5 million tonnes, in 2004 and 2005 it is Vietnam where the natural rubber production is 0.38 million tonnes and 0.41 million tonnes respectively. In the years 2006, 2007, 2008, 2009 and 2010 it was estimated that production of natural rubber will be the highest in Thailand with 2.69, 2.71, 2.72, 2.73 and 2.73 respectively. During 2006 the output of natural rubber will be the lowest in Vietnam with 0.44 million tonnes. In 2007, 2008, 2009, 2010 Malaysia will produce the least amount of 0.44, 0.43, 0.42, 0.41 million tonnes respectively.
TABLE No.1.5
CONSENSUS SUPPLY OUTLOOK

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Rubber deficit 2001-10 (m. tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>@ 2.5% demand growth</td>
<td>01</td>
</tr>
<tr>
<td>Demand</td>
<td>6.89</td>
</tr>
<tr>
<td>Supply</td>
<td>6.96</td>
</tr>
<tr>
<td>Deficit</td>
<td>(0.07)</td>
</tr>
<tr>
<td>% of demand</td>
<td>(1.0)</td>
</tr>
<tr>
<td>@ 3.0%</td>
<td>01</td>
</tr>
<tr>
<td>Demand</td>
<td>6.89</td>
</tr>
<tr>
<td>Supply</td>
<td>6.96</td>
</tr>
<tr>
<td>Deficit</td>
<td>(0.07)</td>
</tr>
<tr>
<td>% of demand</td>
<td>(1.0)</td>
</tr>
</tbody>
</table>

The Table 1.5 shows the clear picture about the consensus supply outlook of natural rubber. Regarding the demand for natural rubber at 2.5 percent demand growth it is seen that the demand increases from year to year. It was 6.89 million tonnes during 2001 and it is estimated to be 8.62 million tonnes during 2010. Correspondingly the supply also increased from 6.96 million tonnes in 2001 to 7.87 million tonnes in 2010. The deficit of natural rubber supply was 0.07 million tonnes in 2001 and it is estimated to be 0.75 million tonnes in 2010.

Considering at 3.0 percent demand growth, the demand for natural rubber was 6.89 million tonnes in 2001 and it will be 8.92 million tonnes in 2010. The supply of natural rubber was 6.96 million tonnes in 2001 and is estimated to cross 8.92 million tonnes in 2010. The deficit of natural rubber is increasing year after year and it is estimated to be 1.05 million tonnes in 2010.
### TABLE No. 1.6

**A MORE REALISTIC SUPPLY OUTLOOK**

<table>
<thead>
<tr>
<th>Scenario 2</th>
<th>Rubber deficit 2001-10 (m. tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01</td>
</tr>
<tr>
<td>@ 2.5% demand growth</td>
<td>6.89</td>
</tr>
<tr>
<td>Demand</td>
<td>6.96</td>
</tr>
<tr>
<td>Supply</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Deficit</td>
<td>(1.0)</td>
</tr>
<tr>
<td>% of demand</td>
<td></td>
</tr>
<tr>
<td>@ 3.0%</td>
<td>6.89</td>
</tr>
<tr>
<td>Demand</td>
<td>6.96</td>
</tr>
<tr>
<td>Supply</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Deficit</td>
<td>(1.0)</td>
</tr>
<tr>
<td>% of demand</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.6 shows a more realistic supply outlook of natural rubber. At 2.5 percent demand growth, the demand of natural rubber in 2001 was 6.89 million tonnes and it is estimated to cross 8.62 million tonnes in 2010. The supply was 6.96 million tonnes in 2001 and it will be 6.96 million tonnes in 2010. The deficit shows an increasing trend and it is estimated to be 1.66 million tonnes in 2010.

At 3.0 percent demand growth, the demand of natural rubber was 6.89 million tonnes and it will increase to 8.92 million tonnes in 2010. The supply of natural rubber shows slight fluctuations and it is estimated to be 6.96 million tonnes. The deficit of natural rubber increases year after year and it will be 1.95 million tonnes in 2010.

1.3 Importance of Rubber Cultivation in India

- Early History

There are about 900 species of natural rubber, but only a few are fit for cultivation and among these, 'heves' or 'para rubber' is the most commercially exploited variety. The attempt to introduce rubber in India took the form of raising it as a forest crop. In 1879, 28 hevea plants received from Ceylon were planted in the teak plantations of Nilambur Valley in Kerala. In 1886, experimental plantings were made on behelf of the then Madras government at Calicut and at
Punaloor. Also, rubber planting was undertaken in the Shevoroy hills near Salem and at Nilgries. The next move was made by G. Anderson who planted a few hevea plants in Shalliaoary Estates in the then South Travancore in 1887. (part of the then South Travancore is now known as Kanyakumari District of Tamil Nadu, which was the reference to the present study). The first commercial rubber cultivation was started in 1902 at Kerala. The next eight years saw considerable activity in hevea rubber planting\textsuperscript{23}.

The Economic Depression during 1929-33 and the consequent fall in prices dealt a severe blow to rubber economy all over the world. In 1934, India and other important rubber producing countries formed an “International Rubber Regulation Agreement” by which new plantings were prohibited and quotas were imposed for export. But the second world war changed the situation. A strategic commodity like rubber was indispensable in any war and its demand shot up considerably. The allied nations lost most of the rubber producing south-east Asian countries to Japan and had to depend entirely on India and Sri Lanka for their raw rubber requirements.

\textsuperscript{23} Velayutha Perumal, S., \textit{op.cit.}, p.6.
Available rubber plantations were indiscriminately exploited, for rehabilitation and development of the industry.\textsuperscript{24}

1.4 Present Position of Rubber in Indian Economy

During the post-independence period, the industry recorded a phenomenal growth. The area under rubber increased from 60,500 hectares in 1951-52 to 1,91,000 hectares in 1977-78 and domestic output for the same period increased from 18,067 tonnes to 1,46,987 tonnes\textsuperscript{25}. The yield per hectare in 1951-52 was 298 kilogram as against 770 kilogramas in 1977-78\textsuperscript{26}. According to a report of the International Rubber study group, the rate of increase in production in India is the highest in the world, and as a result, India has become the fourth largest rubber producer in the world\textsuperscript{27}.

Rubber plantations are labour-intensive. They provide direct employment to nearly 1.7 lakh workers and sustain their dependants. The sixteen hectare rubber estate can provide employment to about 100 workers-half of them on a permanent number of persons depend on processing, transporting, marketing and other related activities\textsuperscript{28}.

\begin{footnotesize}
\textsuperscript{25} Velayutha Perumal, S., \textit{op.cit}, p.8.  
\textsuperscript{26} Velayutha Perumal, S., \textit{op.cit}, p.2.  
\textsuperscript{27} Velayutha Perumal, S., \textit{op.cit}, p.8.  
\end{footnotesize}
Natural rubber is essentially a small grower’s crop; of the 13,700 plantations in India, 90 percent is in the small sector. A planter owning 20 hectares or less is classified as a small grower and the unit is called a small holding. Petty small growers whose units do not go beyond two hectares form about 85 percent of the total units.\(^29\)

Consumption of rubber has shown steady progress during the post-independence period from 19,000 tonnes in 1947 to 6,38,210 tonnes in 2002. These include both natural and synthetic rubber. In order to meet the consumption requirements, synthetic rubber is being produced to supplement natural rubber factory at Barielly in Uttar Pradesh with an annual capacity of 30,000 tonnes. A second unit is designed to produce annually 20,000 tonnes at Baroda. The rapid increase in rubber production has turned India from an importer of natural rubber to a marginal exporter. During 1975-76 production exceeded consumption by about 12,000 tonnes per year. The marginal surplus was exported. Annual exports during 2000-2001 were 13,356 tonnes and during 2000-2001 were 8,990 tonnes had to be imported.

So there is no reason for the natural rubber industry to be approach ensure about competition from synthetic rubber. Moreover, the production of synthetic rubber has become highly uncompetitive

\(^{29}\) Velayatha Perumal, S., *op.cit.*, p.9
due to the high cost of petroleum products and the high cost of new synthetic rubber factories\textsuperscript{30}.

1.5 Rubber Cultivation in India

Rubber cultivation was introduced in India on a commercial scale in the year 1902. In terms of expansion of area, production and productivity, natural rubber has achieved the highest growth among the major crops in the country\textsuperscript{31}. Rubber cultivation in India had been traditionally continued to a narrow belt extending from Kanyakumari district of Tamil Nadu in the south to Dakshin Kannada and Kodagu districts of Karnataka in the north and lying in general west of the Western Ghats and parallel to them for approximately 400 km, later it was extended to non traditional regions. The climatic conditions in the rubber tract are vary from region to region and from year to year, particularly in case of rainfall. The average rainfall varies from about 2000 to 4500 mm\textsuperscript{32}. Figures of India’s production, consumption, stock export and import of natural during 2002-03 shows that the production achieved a growth of 2.9 percent to 649,435 tonnes. Substantially ahead of the previous years growth of 0.2 percent to

631,400 tonnes. Consumption made a healthy growth of 9 percent rising to 695,425 tonnes compared to 6,38,210 tonnes in 2001-02\textsuperscript{33}.

Rubber cultivation in India is overwhelmingly small holder oriented. The average size of small holdings is less than 0.50 hectare. The level of adoption of technology among them is quite appreciable. The average yield per hectare which is higher than that of major producing countries illustrates their better status in internalising frontier technologies\textsuperscript{34}. Over 90 percent of the area under rubber in India is in Kerala. The rest is in Tamil Nadu, Karnataka, Tripura, Goa, Andamans.\textsuperscript{35} Rubber is a long gestation crop which takes about 7 years to come into yielding stage. Expansion of area under rubber during 1950s, 60s and 70s has been at an average of around 8,000 hectares per year which increased to 20,000 hectares per year during the 1980s\textsuperscript{36}. Rubber plantations registered phenomenal growth in the country since independence and they had spread to over an area of 2,90,000 hectares by 1982-83 yielding 1,66,000 tonnes of rubber valued at Rs.2,300 million\textsuperscript{37}. Effect from 1985 every year an additional output of over 15,000 tonnes of natural rubber is likely to

\textsuperscript{33} Thomas, P.J., op.cit., p.121.
\textsuperscript{34} Mathew, K.J., The Hindu Survey of Indian Agriculture, Hindu Annual Publication, Chennai, 1997, p.81.
\textsuperscript{35} Ibid, p.121
\textsuperscript{37} Ibid, p.121.
materialise as the material used for new planting and replanting since 1979 under the new scheme for promotion of rubber plantations in very high yielding, capable of producing 1.5 to 2 tonnes per hectare. The anticipated production may reach an all time high of 3,00,000 tonnes by 1990. During 2001-2002 the natural rubber production was 6,31,400 tonnes.38

The total area of cultivation, tappable area, production, average yield per hectare of rubber in India is illustrated in the following table.

---
TABLE No. 1.7
AREA, YIELD AND PRODUCTION OF NATURAL RUBBER
PLANTATION IN INDIA
1992 to 2002

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Area Under Cultivation (ha)</th>
<th>Total Area Under Tapped (ha)</th>
<th>Total Production (in Tonnes)</th>
<th>Average Yield per Hectare (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992 – 93</td>
<td>499374</td>
<td>330500</td>
<td>393490</td>
<td>1191</td>
</tr>
<tr>
<td>1993 – 94</td>
<td>508420</td>
<td>338550</td>
<td>435160</td>
<td>1285</td>
</tr>
<tr>
<td>1994 – 95</td>
<td>515547</td>
<td>346270</td>
<td>471815</td>
<td>1362</td>
</tr>
<tr>
<td>1995 – 96</td>
<td>524075</td>
<td>356444</td>
<td>506910</td>
<td>1422</td>
</tr>
<tr>
<td>1996 – 97</td>
<td>533246</td>
<td>365580</td>
<td>549425</td>
<td>1503</td>
</tr>
<tr>
<td>1997 – 98</td>
<td>544534</td>
<td>376970</td>
<td>483830</td>
<td>1549</td>
</tr>
<tr>
<td>1998 – 99</td>
<td>533041</td>
<td>387100</td>
<td>605045</td>
<td>1563</td>
</tr>
<tr>
<td>1999 – 00</td>
<td>558592</td>
<td>394800</td>
<td>622265</td>
<td>1576</td>
</tr>
<tr>
<td>2000 – 01</td>
<td>563000</td>
<td>400000</td>
<td>630405</td>
<td>1576</td>
</tr>
<tr>
<td>2001 – 02</td>
<td>566558</td>
<td>400713</td>
<td>631400</td>
<td>1576</td>
</tr>
</tbody>
</table>


The table No. 1.7 explains the total area under cultivation, total area under tapped, total production and average yield per hectare of rubber cultivation. The total area under cultivation has increased from 4,99,374 hectare to 5,66,558 hectare and the tapped area has increased from 3,30,500 hectare to 4,00,713 hectare between 1992 to 2002. The total area has expanded due to increase in number of plant in per hectare. As a result, the production has increased from 3,93,490
tonnes to 6,31,400 tonnes during 1992 to 2002. The average yield per hectare has been increased from 1191 kg. in 1992 to 1576 in 2002. Though there is slow progress in yield per hectare, the production trend has been increasing tremendously mainly due to increase in area under cultivation and area under tapping of rubber latex.

Rubber production increased by four percent in 2002-03 as against the 0.6 percent growth recorded in the previous year. Consumption, however, shot up by an impressive 9.5 percent in 2002-03. In spite of the sharp hike in consumption, imports declined by 16 percent during the year. This helped prices shoot up by nearly 21.5 percent during the year.39

**TABLE No. 1.8**

PRODUCTION, CONSUMPTION AND IMPORT OF RUBBER

<table>
<thead>
<tr>
<th>Month</th>
<th>Produ (Tonnes)</th>
<th>Produ (%) chg</th>
<th>Consuption (Tonnes)</th>
<th>Consuption (%) chg</th>
<th>Import (Tonnes)</th>
<th>Import (%) chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 2002</td>
<td>45772</td>
<td>1.21</td>
<td>69395</td>
<td>3.68</td>
<td>10677</td>
<td>20.25</td>
</tr>
<tr>
<td>May 2002</td>
<td>48797</td>
<td>0.47</td>
<td>71570</td>
<td>4.30</td>
<td>11049</td>
<td>38.16</td>
</tr>
<tr>
<td>Jun 2002</td>
<td>50425</td>
<td>13.26</td>
<td>72285</td>
<td>3.98</td>
<td>12286</td>
<td>37.15</td>
</tr>
<tr>
<td>Jul 2002</td>
<td>51740</td>
<td>5.96</td>
<td>75290</td>
<td>12.36</td>
<td>15071</td>
<td>3.37</td>
</tr>
<tr>
<td>Aug 2002</td>
<td>58665</td>
<td>3.01</td>
<td>74625</td>
<td>14.68</td>
<td>18246</td>
<td>2.01</td>
</tr>
<tr>
<td>Sep 2002</td>
<td>65045</td>
<td>5.11</td>
<td>73750</td>
<td>13.64</td>
<td>10024</td>
<td>-41.39</td>
</tr>
<tr>
<td>Oct 2002</td>
<td>69460</td>
<td>0.66</td>
<td>75115</td>
<td>13.67</td>
<td>8152</td>
<td>-32.92</td>
</tr>
<tr>
<td>Nov 2002</td>
<td>81771</td>
<td>0.62</td>
<td>75630</td>
<td>11.78</td>
<td>11981</td>
<td>-20.28</td>
</tr>
<tr>
<td>Dec 2002</td>
<td>87705</td>
<td>2.49</td>
<td>76315</td>
<td>10.23</td>
<td>6689</td>
<td>-56.65</td>
</tr>
<tr>
<td>Jan 2003</td>
<td>82925</td>
<td>5.23</td>
<td>76990</td>
<td>9.73</td>
<td>12194</td>
<td>-25.41</td>
</tr>
<tr>
<td>Feb 2003</td>
<td>41695</td>
<td>10.22</td>
<td>75140</td>
<td>10.70</td>
<td>9676</td>
<td>-28.75</td>
</tr>
<tr>
<td>Mar 2003</td>
<td>45150</td>
<td>7.82</td>
<td>74170</td>
<td>6.44</td>
<td>9098</td>
<td>-32.79</td>
</tr>
<tr>
<td>Apr 2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jun 2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001 – 02</td>
<td>Apr – Mar 700324</td>
<td>Apr – Mar 0.62</td>
<td>Apr – Mar 812740</td>
<td>Apr – Mar 1.32</td>
<td>Apr – Mar 161572</td>
<td>Apr – Mar 36.19</td>
</tr>
</tbody>
</table>

Figures includes natural rubber and synthetic rubber. Monthly figures may not add up to the total due to revisions.

Rubber consumption is estimated to have increased by nine percent during 2002-03. This buoyant growth comes from a rise in demand from the tyre industry, which in turn derives its growth from the spurt in the automobiles industry official statistics available till January indicate 9.7 percent growth.

Rubber production grew by 3.4 percent during the period April-January 2002-03. In spite of the sharp rise in demand and consumption, imports declined by 13.5 percent during this period. This was because of restrictions imposed against imports.

Investment in new rubber over the last two decades by the main producers, when in many places more rubber was pulled out of production than planted, will finally show up in the price equation. Even assuming that demand grows at 2.5 percent a year, which is below its 20 year average of 3.0 percent there will be a gap between supply and demand of 3.4 percent by 2005 and of 8.7 percent by 2010.

1.6 Significance of Rubber in Tamil Nadu Economy

Rubber in Tamil Nadu is in the hands of small and marginal rubber planters. It is basically a homestead crop and commercial crop having profound influence of the socio-economic security of high level farm households. The average size of holding devoted to rubber farming is as small as 18,704 ha which accounts for 60
percent of the total area under cultivation. The crop are in the category of marginal holdings not capable of generating adequate income for the dependent households.

Among the major rubber growing states in India, Tamil Nadu enjoys the pride of place both in the area under cultivation and the production of rubber. However, over the last four decades, the importance of the state has been consistently on the wane. The contribution of Tamil Nadu was 3.30 percent of the total production in the country in 2001-2002. Rubber production has been increasing in other states at much faster rates than in Tamil Nadu. There has also been a corresponding change in the country. The situation in Kerala is a good example. Over the period since 2002-03 this state has emerged as major producer of NR by increasing the share to over 91.91 percent from just 8.0 percent of the total output in the country. As a result the share of Tamil Nadu in rubber production has plummeted to 3.43 percent. Tamil Nadu has not made tangible progress in product diversification and by-product utilization in rubber industry except for the traditional activities such as oil milling and coir processing. As a result, an estimated 45,000 tonnes of rubber seeds oil are produced during 2003. The Rubber sheet prices continue to rule low as a result of the increasing competition from rubber market. The downward
pressure on the price of domestic rubber sheet is causing a destabilizing effect on the household economy of the rubber farmers in the state.\textsuperscript{40}

The rubber based economy of Tamil Nadu can expect a revival from the negative impact of liberalized imports only when the profitability of rubber farming is delinked from the price behaviour of Rubber sheet. This is possible to be achieved through efficient utilization of the land under rubber and also the products at the on-farm and community levels. As rubber farming has close linkage with other aspects of rural life, it is not to be treated in isolation but only as a component of integrated rural development, the strategy for rural development. The strategy for rubber development must, therefore, be multifaceted and at the same time people centred with farm-households forming the target group. The primary objectives of such a strategy shall be 1) to create opportunities for enhanced on-farm income and employment. 2) to promote efficient product and bye product utilization both at the on-farm and community levels. 3) to strengthen marketing infrastructure for domestic and export marketing and 4) to direct research on varietal improvement for higher output of primary products from Rubber and technology development.

\textsuperscript{40}Varkey, K.V., \textit{op.cit.}, p.11.
Natural rubber Production in Tamil Nadu

In Tamil Nadu, natural rubber is cultivated in the evergreen forests of the Western Ghats and North-Eastern regions. The trend in natural rubber production during the period under study, the relative share of the area under cultivation and productivity in relation to the world are discussed here.

Trend in Natural rubber Production in Tamil Nadu

Production of Natural rubber in Tamil Nadu, the absolute as well as percentage increase or decrease of natural rubber production over the previous years and the trend values are presented in table 1.9

<table>
<thead>
<tr>
<th>year</th>
<th>Production (in tones)</th>
<th>Increase / Decrease</th>
<th>Percentage of increase/decrease</th>
<th>Trend value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992-93</td>
<td>14250</td>
<td>-</td>
<td>-</td>
<td>14089.749</td>
</tr>
<tr>
<td>1993-94</td>
<td>14720</td>
<td>470</td>
<td>3.29</td>
<td>15050.827</td>
</tr>
<tr>
<td>1994-95</td>
<td>15065</td>
<td>345</td>
<td>2.34</td>
<td>16011.905</td>
</tr>
<tr>
<td>1995-96</td>
<td>17335</td>
<td>2270</td>
<td>15.06</td>
<td>16972.985</td>
</tr>
<tr>
<td>1996-97</td>
<td>18505</td>
<td>1170</td>
<td>6.74</td>
<td>17934.061</td>
</tr>
<tr>
<td>1997-98</td>
<td>19175</td>
<td>670</td>
<td>3.62</td>
<td>18895.139</td>
</tr>
<tr>
<td>1998-99</td>
<td>20263</td>
<td>1088</td>
<td>5.67</td>
<td>19856.217</td>
</tr>
<tr>
<td>1999-00</td>
<td>21134</td>
<td>871</td>
<td>4.29</td>
<td>20817.295</td>
</tr>
<tr>
<td>2000-01</td>
<td>21611</td>
<td>477</td>
<td>2.25</td>
<td>21778.373</td>
</tr>
<tr>
<td>2001-02</td>
<td>22088</td>
<td>477</td>
<td>2.20</td>
<td>22739.451</td>
</tr>
</tbody>
</table>

From table 1.9 it is observed that the production of natural rubber in Tamil Nadu ranged from minimum of 14,250 tonnes in 1992-93 to a maximum of 22,088 tonnes in 2000-01. The production increased to 21,611 tonnes in 2000-01, being 2.25 percent increase in the annual growth rate over the previous year. Expansion of area under cultivation to the tune of 40 hectares (vide table 1.2) and congenial climatic conditions that prevailed contributed to the increase in rubber production.

The production of natural rubber increased substantially to 22,088 tonnes in 2001-02 from 21,611 tonnes in 2000-01, registering 2.25 percent increase over 2000-01 and to 21611 tonnes in 2000-01 from 14720 tonnes in 1993-94, registering 3.29 percent increase over 1993-94. The increase in production in these years was mainly due to favorable climatic conditions.

It is also inferred from the table that the trend value for natural rubber had an increasing trend. The trend value increased from 14089.749 tonnes in 1992-93 to 22739.451 tonnes in 2001-02.

Area under Natural rubber Cultivation

The total area under natural rubber cultivation in TamilNadu increased significantly from the mid-eighties. It got extended from 17,260 hectares in 1992-93 to 18,710 hectares in 2001-
registering a remarkable increase over a decade. The area under Natural rubber cultivation in India for the past ten years is given in table 1.10. The table also shows the trend values and the percentage of changes in the area of natural rubber cultivation over the previous year.

**TABLE No. 1.10**

**AREA UNDER RUBBER CULTIVATION IN TAMILNADU**

1992-93 TO 2001-02

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (in hectares)</th>
<th>Increase/decrease</th>
<th>Percentage (+)/(-)</th>
<th>Trend value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992-93</td>
<td>17260</td>
<td>-</td>
<td>-</td>
<td>17277.025</td>
</tr>
<tr>
<td>1993-94</td>
<td>17300</td>
<td>40</td>
<td>+0.23</td>
<td>17467.175</td>
</tr>
<tr>
<td>1994-95</td>
<td>17430</td>
<td>130</td>
<td>+0.75</td>
<td>17657.325</td>
</tr>
<tr>
<td>1995-96</td>
<td>17948</td>
<td>518</td>
<td>+2.97</td>
<td>17847.475</td>
</tr>
<tr>
<td>1996-97</td>
<td>18209</td>
<td>261</td>
<td>+1.45</td>
<td>18037.625</td>
</tr>
<tr>
<td>1997-98</td>
<td>18470</td>
<td>261</td>
<td>+1.43</td>
<td>18227.775</td>
</tr>
<tr>
<td>1998-99</td>
<td>18631</td>
<td>161</td>
<td>+0.87</td>
<td>18417.925</td>
</tr>
<tr>
<td>1999-00</td>
<td>18659</td>
<td>28</td>
<td>+0.15</td>
<td>18608.075</td>
</tr>
<tr>
<td>2000-01</td>
<td>18710</td>
<td>51</td>
<td>+0.27</td>
<td>18798.225</td>
</tr>
<tr>
<td>2001-02</td>
<td>18710</td>
<td>0</td>
<td>+0</td>
<td>18988.375</td>
</tr>
</tbody>
</table>


From table 1.10, it could be seen that the area under Natural rubber cultivation in Tamil Nadu was the highest in 2001-02 and the lowest in 1992-93. The area under natural rubber cultivation
has gone up from 17,260 hectares in 1992-93 to 18,710 hectares in 2001-02.

The area under natural rubber increased remarkably by 518 hectares in 1995-96 and 261 hectares in 1997-98, registering 2.97 percent and 1.43 percent increase in respective years annual growth rate over the previous years.

It is also observed from the table that the area under natural rubber cultivation remains stagnant in 2001-02 and 2000-01. It is also found from the table, trend value for area under natural rubber cultivation had increased from 17,277.025 hectares in 1992-93 to 18,988.375 hectares in 2001-02.

**Productivity of Natural rubber**

The average yield of natural rubber per hectare, the percentage of increase or decrease and the trend values are exhibited in the following table 1.11.
TABLE No. 1.11

PRODUCTIVITY OF NATURAL RUBBER IN TAMILNADU

FROM 1992-93 TO 2001-02

<table>
<thead>
<tr>
<th>Year</th>
<th>Productivity (kg/ha)</th>
<th>Increase/ decrease</th>
<th>Percentage of increase/decrease</th>
<th>Trend Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992-93</td>
<td>1177</td>
<td>-</td>
<td>-</td>
<td>1269.32</td>
</tr>
<tr>
<td>1993-94</td>
<td>1205</td>
<td>28</td>
<td>2.4</td>
<td>1302.56</td>
</tr>
<tr>
<td>1994-95</td>
<td>1200</td>
<td>-5</td>
<td>-0.41</td>
<td>1335.08</td>
</tr>
<tr>
<td>1995-96</td>
<td>1396</td>
<td>196</td>
<td>16.33</td>
<td>1369.04</td>
</tr>
<tr>
<td>1996-97</td>
<td>1454</td>
<td>58</td>
<td>4.15</td>
<td>1402.28</td>
</tr>
<tr>
<td>1997-98</td>
<td>1475</td>
<td>21</td>
<td>1.44</td>
<td>1435.52</td>
</tr>
<tr>
<td>1998-99</td>
<td>1533</td>
<td>58</td>
<td>3.93</td>
<td>1468.76</td>
</tr>
<tr>
<td>1999-00</td>
<td>1580</td>
<td>47</td>
<td>3.06</td>
<td>1502.00</td>
</tr>
<tr>
<td>2000-01</td>
<td>1583</td>
<td>3</td>
<td>0.18</td>
<td>1535.24</td>
</tr>
<tr>
<td>2001-2002</td>
<td>1586</td>
<td>3</td>
<td>0.18</td>
<td>1568.48</td>
</tr>
</tbody>
</table>


It is inferred from table 1.11 that the productivity of natural rubber per hectare had registered a fluctuating trend during the period under study. The table reveals that the productivity of Natural rubber per hectare ranged from 1177 kilograms to 1586 kilograms. The productivity per hectare increased from 1177 kilogram in 1992-93 to 1205 kilogram in 1993-94, registering 2.4 percent increase in annual growth rate over 1992-93. The yield per hectare decreased from 1200 kilograms in 1994-95 resulting in a negative annual growth rate of -0.41 percent when compared to 1993-94.
The productivity levels of natural rubber output had also experienced a negative annual growth of 0.41 percent respectively during 1994-95. The reasons attributed to the negative annual growth rate of productivity are unfavorable climatic conditions, severe attack of diseases and fluctuation in the price of natural rubber. It is also observed from the table that the annual growth rate of natural rubber productivity increased 16.33 percent in 1995-96 when compared to the previous years because of conducive climatic conditions during these periods. It is observed from the table that the trend value of productivity of natural rubber in Tamil Nadu registered an increase trend. It had increased from 1269.32 kilograms in 1992-93 to 1568.48 in 2001-02 kilograms.

**Compound Growth Rate**

The Compound Growth Rate of area, production and productivity of Natural rubber in Tamil Nadu are presented in table 1.12.
TABLE No. 1.12

COMPOUND GROWTH RATE OF RUBBER IN TAMIL NADU

<table>
<thead>
<tr>
<th>Particular</th>
<th>Cultivated Area</th>
<th>Production</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compound Growth Rate</td>
<td>1.093</td>
<td>5.53</td>
<td>3.89</td>
</tr>
</tbody>
</table>

SOURCE: Computed data.

Growth Rate

It could be observed from table 1.12 that natural rubber production in India increased significantly by 5.53 per cent per annum. The area under cultivation and productivity had also increased by 1.093 percent and 3.89 percent per annum respectively. Thus, it is observed that the increase in production was the result of increase in both area and productivity of rubber.

Enhance On – Farm Income and Employment

As the average size of rubber holding in Tamil Nadu is only 18,704 ha in over the period since 2002-03, monocropping models when practiced will not support the livelihood security of the dependent families. In the context of the declining on-farm income caused mainly by the liberalized imports of synthetic rubber, it is important to restructure the small holdings in to economically viable operational units by promoting intensive integrated farming. The rubber plantation owners are earning additional income through
dairying, poultry and apiculture. It will also create opportunities for gainful employment to the women members of the participating households and facilitate efficient resources conservation. The economic advantages of practicing rubber based integrated farming system have been brought to light by a recent study conducted by Rubber Producers Societies in Tamil Nadu.

Potential districts are to be identified with technical and institutional support for dispensing integrated farming units. The participating farmers should be encouraged to organize themselves into self-help groups or co-operatives for the purpose of availing technical support, procuring inputs and its processing, and marketing of surplus farm output. The proposed integrated farming units linked with farmers organizations can trigger a process of changing in the farming sector of the state. It leads to rural prosperity and sustained growth in the agricultural economy. It is, however, important that the farmers receive effective extension education on resource conservation, appropriate cropping models, nutrient management, integrated pest and disease control and product utilization for achieving lasting progress in the desired direction.
Integrated farming should aim at achieving optimum productivity by stimulating the underlying productivity of the soil. In India the first quality rubber is produced in Kanyakumari District. The Kanyakumari soil is one of the most suitable soil for rubber plantation in India. Prevention of soil loss is one of the more essential prerequisites for sustaining optimum levels of production. Integration of miscellaneous woody species on rubber holdings, use of biological barriers and mechanical devices against rapid surface flow of water, conservation tillage and adoption of appropriate agronomic propagated among the farmers. The conservation of locally available organic wastes should be promoted as community activity as the village, block and district levels in order to generate substantial amounts of organic sources of nutrients and to improve the quality of local environment by preventing pollution of soil and water bodies.

The promotion of integrated farming in rubber holdings with emphasis on resources conservation holds promise for the growth of the agricultural economy of the state by generating marketable surplus of organically grown foods which enjoy considerable consumer demand in many states in the country as well as in other countries. Global demand for rubber products as against of chemical contaminants is steadily on the increase. This trend could be taken
advantage of by devoting special attention to the organization of organically maintained rubber gardens. It would be necessary to create institutional set up for labeling and certification of organically grown rubber and other farm produces like spices, fruits, derived from the farming system.\textsuperscript{41}

**Efficient Product Utilization**

Tamil Nadu has not achieved noticeable progress in the utilization of the multiple products of rubber palm for value addition both at the farm household and community levels. This has happened mainly because of the low priority assigned to technological research in the national and state level research establishments. As compared to the tardy growth recorded by the state in the processing sector, most of the rubber growing countries in the world are profiting from the production and export of diverse rubber products. Rubber sheet and honey are the export items. Although possibilities are wide, it is possible for Tamil Nadu to concentrate on selected products which could compete price-wise and quality-wise both in the domestic and foreign markets.\textsuperscript{42}

**Production of Rubber Honey**

Consumer preference around the world is changing in

\textsuperscript{41} Ibid., pp.1-43.
\textsuperscript{42} Ibid., pp.1-43.
favour of natural rubber as 35,000 varieties of useful beverages are produced. Rubber tree is a rich source of nectar. It is found at the extra-floral nectary glands at the end of the petiole where the leaflets join. The estimated production of honey from rubber plantations is 4,500 tonnes during 2001-2002. Studies show that about 15 hives can be placed in a hectare of rubber plantation. In a normal year about 10 kg of honey can be obtained from one hive.

Honey is a saturated solution of sugar, rubber honey contains mainly glucose and fructose that are easily digestible. The content of sucrose is less. So honey does not have the bad effect of cane sugar to human system. Proteins and all essential amino acids required by the human body are present in honey. It also contains several vitamins which supplement human diet. Enzymes in honey originate from the glandular secretion of worker honey bees. Diatose is a strong digesting enzyme. Glucose oxide and cataloes enzymes help to improve the digestive system. Honey contains about 11 minerals and 17 trace elements. The minerals, particularly iron, help in blood circulation. Honey is sweeter than cane sugar, so it can substitute sugar in food recipes. The honey demand as a natural health food and medicines is consistently on the increase in both the developing and developed countries.
Honey production from rubber plantation is also generated additional income and employment to a sizeable section of the rural community in the state. It is possible to provide training facilities to selected village youth for palm climbing, tapping and manufacture of honey and related products. The production and making of rubber honey become a cottage industry in the rural parts of the country. It will ensure direct employment to the village youth without gender differences. An adequate quality control could be enforced in different states regarding collection of wood, seed oil and honey.

Technologies for the canning of fresh honey are available which are only to be pilot tested for adopting the most appropriate one under local situations. The farmer's Y.M.C.A and co-operatives which organize honey tapping and production or even individual entrepreneurs may be permitted to undertake the activity under proper control.

In Tamil Nadu, income from honey will register a sharp increase with the direct involvement of registered farmer's organizations in honey tapping and the subsequent processing of sweet honey. Registered farmer's societies may also be permitted to dispense
licensed honey parlors in their respective operational areas. The membership of these societies should comprise both rubber farmers and tappers. For facilitating the honey based processing, adequate availability of honey is essential. This could be ensured by granting the societies the right to tap up-to 90 percent of the tree in a garden for a period not exceeding three months in a year on rotation basis.43

Production of Rubber Seed Oil

Rubber seed is a minor source of non-edible oil in Tamil Nadu. The rubber seed production is not stable every year. The availability of seed will be more if there is no continuous and heavy rain and severe attack of phytophthora disease. An estimated 45,000 tonnes of rubber seeds are produced during a normal year in India. Around 10 percent of the seeds are used in the plantations for rising planting materials. Oil content is about 14 to 16 percent of the total weight of the seed. The rubber seed oil producing industry is concentrated in Tamil Nadu and more particularly in Virudhunagar. The annual production of rubber seed oil and cake is placed around 1600 and 2600 tonnes respectively during 2000-2001. This study reveals that rubber seed cake can be used up to 20 percent of the total weight of the cattle feed.44

43 Rubber and its Cultivation, Published by The Rubber Board, Kottayam, 2003, pp.78-80.
44 Ibid., pp.75-76.
Rubber Wood

In recent years rubber wood has emerged as an alternate source of timber in Tamil Nadu. Since it is obtained from sustainably managed plantations. Processed rubber wood has been used to make furniture, panelling, table top and flooring household.

The current estimated production of rubber wood per ha is 150 and 180m$^3$, in small holdings and estates respectively. The stem wood which forms 60 percent of the total is used for industrial purposes and the branch wood as firewood. Packing case sector consumes 62.5 percent of the stem wood plywood veneer sector 22.5 percent and match sector a negligible 3 percent. The secondary processing sector consumes 10 percent of the stem wood. At present there are 50 units in the country for the processing of rubber wood. Some of the units use imported technology. Some are exporting their products to other countries. The objective of setting up the laboratory is to make available the testing facilities to the processors, consumers, researchers. The decision and policy makers can evaluate the suitability of rubber wood for various applications and to improve the quality.\textsuperscript{45}

\textsuperscript{45} Ibid., pp.8-83.
Rubber Based Product Processing

The people engaged in rubber based product processing are active in countries like Vietnam, Thailand, India and some other countries. From the rubber latex 35,000 variety of useful household objects and decoration items are produced. Therefore, through bank loan people can be given to start activities based on this marketing the finished products can also be arranged. These products are displayed on the shelves of super markets in many countries. The progress in this direction is sluggish in Tamil Nadu.

Registered people are to be organized in Tamil Nadu for product and marketing support, which are essential to sustain their activities. Training facilities presently available with organization like Rubber Development Board should be kept open for the benefit of the members. The processing could be organized, Tamil Nadu people are encouraged to produce in households for subsequent procurement by specialized agencies. It is usually shipped in bulk for final processing in the importing countries in accordance with the local preference. In Thailand, Indonesia, India and some other courtiers some types of varieties of confections are produced and marketed in organized scale.

The self help groups in Tamil Nadu are to be involved in product processing and can organize the production at individual
households depending on the nature of the product. The products that are amenable for production at household level are produced. At the common location facilities are to be developed for the processing of diverse products, through these activities the people can find gainful employment at the local levels. The farmers will also be benefited through increased demand for rubber. Attractive rubber based articles are now available in the produce of many countries particularly Thailand, Indonesia, India and some other countries. The countries in the export trade assign importance to design and product quality.

In Tamil Nadu many rural artisans are engaged in handicrafts for their livelihood. The activities are mostly confined to households barring a few large units. Household women have a significant presence in the small production units as women from outside sources are engaged in the larger units. There are many small-scale handicraft units in the state managed entirely by people. Although rubber based handicraft has been in existence as a traditional activity in the state, its development into a viable and flourishing enterprise has been inhibited because of the absence of facilities for design and training. New designs in accordance with changing consumer preference and training in the production of modern artificer

are essential pre-requisites for competing with quality products emanating from other countries.

Handcrafts could be developed in the state as an economically viable and export oriented activity. The units which are presently functioning are dependable sources of income and employment for the rural artisans. This is also an area where people’s participation insignificant. Although one or two units covered in the study could make use of the export opportunities on a few occasions the activity could not be sustained for long for want of institutional and other forms of support at the local level. The study also brought out the extent of benefit the rubber farmers are deriving in areas where handicraft units are located. Here the farmers receive over Rs. 500/- for a fully matured tree cut and removed by the concerned handicraft unit as against less than Rs.2000/- with the charges for cutting to be borne by the farmer in other areas in one year.

**Project Facilitation in Selected Processing Areas**

The importance of Tamil Nadu as the major Rubber producing state in India is confined to the production of latex and not in processing them for value addition. The lack of investment opportunities as well as poor entrepreneurial response to modern advances in rubber processing have been instrumental for the lacklustre
performance of the sector. The main reason for both the limiting sectors could be traced to the absence of the project facilitating. Infrastructure devoted to transferring viable technologies and providing support to entrepreneurs in project formulation and efficient implementation facilities for developing appropriate processing technologies and for encouraging prospective entrepreneurs to make investment with confidence are yet to be created in the state.

The rubber products show potential for organized production in the state. The main use of natural rubber is in automobile industries. In many developed countries nearly sixty percent of all rubber consumed is for the automobile tyres and tubes, in heavy duty tyres. The major portion of the rubber used is natural rubber. In addition to tyres a modern automobile has more than 300 components made out of rubber. Many of these are processed from natural rubber. Use of natural rubber in hoses, footwear, battery boxes, foam mattresses, balloons and toys are well known. This natural rubber now finds extensive use in soil stabilization in vibration absorption and in road construction. A variety of natural rubber based engineering products are developed for use in these fields.\footnote{Varkey, K.V., \textit{Rubber and its Cultivation}, The Rubber Board, Kottayam, 2002, pp.85-86.} The product has also export opportunities.
1.7 Rubber Plantations in Kanyakumari District

Kanyakumari district is predominantly an agricultural district. About 63 percent of the total geographical area of this district is under cultivation. The forest area covers 29 percent of the total geographical area. Paddy, coconut, rubber, tapioca, palmyrah, tamarind, banana, mango, cashew and areca nut, which are the major crops of this district.48

Rubber cultivation covers 20,000 hectares in Kalkulam, Vilavancode and Thovalai taluks in the district, in which around 3,000 hectares of lands under the government owned Rubber Plantation Corporation. Since 1950, many have taken up rubber cultivation in view of the plantation not needing large quantities of water like other crops.

This industry provides employment directly and indirectly to 50,000 persons in the district. About 100 tonnes of sheet rubber are exported to other states everyday from here. Besides, timber from the trees is used for making match sticks.

In Tamil Nadu, the major areas of rubber plantation are in Kanyakumari district and about 95 percent of natural rubber production in Tamil Nadu is carried out in this district. Rubber plantations are

located in the northern parts of the three taluks namely, Kalkulam, Vilavancode and Thovalai. The climate is conducive for the growth of rubber plantations in this district. The soil is also very fertile and is suitable for rubber plantations. This district also receives good rainfall and the annual average rainfall varies from about 1456.8 mm to 1877.4 mm\(^4\) both from South-West monsoon and North-East monsoon. In Kanyakumari district, 35,000 varieties of rubber based products are produced through various self-help groups.

In developing countries, marketing of rubber is still in its infancy. An effective marketing system alone can bring the fruits of production to the people. Economic growth in the less developed nations of the world depends greatly on their ability to design effective marketing system, to produce global customers for their raw materials and industrial output\(^5\).

The National Commission on Agriculture (the first commission which suggested measures for the development of agriculture in the post independence period) report reveals that “there is an increasing awareness that it is not enough to produce a crop or animal product, it must be marketed well. Increased production,


resulting in a greater percentage increase in the marketable surplus accompanied by the increase in demand from urban population, calls for a rapid improvement in the existing marketing system". This statement emphasizes the increasing importance of marketing of agricultural commodities51.

The Importance of Rubber Plantations in Kanyakumari District

Rubber is one of the important cash crops in the district. Kanyakumari is the only district in Tamil Nadu where rubber production exists on a large scale and the country's best rubber producing areas are in this district52. While Kerala accounts for 92 percent of the area and rest by other states. Kanyakumari district accounts for 95 percent of area under rubber cultivation in Tamil Nadu.

In view of the rich potentialities for the cultivation of rubber, a number of rubber based industries were recommended for the district by the Central Small Industries Organisation, Madras in 196153. The recommended industries were latex, automobile rubber moulded and extruded goods, cycle rubber parts and rubber tyre, balls and balloons.

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53 District Census Hand Book, Kanyakumari, op.cit., p.50.
Tamil Nadu government took a keen interest in rubber cultivation and planting was started in the district in 1960. Since the initial efforts were successful, planting was extended to large areas and it is still continuing. From the very beginning, the best planting material has been used and the clones are of high yielding varieties. Over 80 percent of the plantations contain but grafts and less than 20 percent contain seedlings. Government created nine forest divisions for the cultivation of rubber of which four divisions are now under tapping.

In its efforts to rehabilitate some of the Indian nationals being repatriated from Sri Lanka, the Tamil Nadu government has introduced a scheme for raising rubber in about 800 hectares. During 1976-77, the government have sanctioned a sum of Rs.11.10 lakhs for raising rubber over an area of 200 hectares in its Maruthamparai.

In short, Kanyakumari district contributes nearly 95 percent of natural rubber production of Tamil Nadu. The area under rubber cultivation is steadily increasing when compared to other major crops like paddy, banana, and tapioca. Area under rubber cultivation has increased from 16,132 hectares in 1985-86 to 17,430 hectares in 1994-95. The rubber production has also gone up from 11,000 tonnes
in 1985-86\textsuperscript{54} to 22,088 tonnes in 2001-2002.

Rubber is extensively cultivated only in the three taluks of the district, namely Thovalai, Kalkulam and Vilavancode out of four taluks in the district. The Rubber Board has launched various incentive programmes to bring additional areas under cultivation of rubber. The yield rate in the district is also good.

**Grading of Rubber**

Natural rubber in sheet form is the oldest and the most popular type. Two types of sheet rubbers are produced and marketed in the international market, namely the Ribbed Smoked Sheets (RSS) and the Air Dried Sheets (ADS). Among these, RSS is the most popular and is available for volume consumption.

Ribbed Smoked Sheet is used as raw material in industrial sectors such as tyre industry, which is the biggest consumer. The second biggest users are rubber elastics, rubber erasers, rubber tubes and shoes and rubber soles. RSS can be divided into following 6 categories.

\textsuperscript{54} Compiled from Statistics and Planning Division, Rubber Board, Kottayam.
Ribbed Smoked Sheet No. 1 (RSS 1), this category of rubber sheet must be wholly flawless and totally not mouldy.

Ribbed Smoked Sheet No. 2 (RSS 2) can sustain mottled and rust on the surface, in the sheet and on the package but mouldy condition must not exceed 5 percent of the samples.

Ribbed Smoked Sheet No. 3 (RSS 3) accounts for more than 80 percent of all RSS productivity mouldy condition of this category is the same as that of RSS 2 but must not exceed 10 percent of the samples.

Ribbed Smoked Sheet No. 4 is the same as RSS 2 and RSS 3 but must not exceed 20 percent of the samples.

Ribbed Smoked Sheet No. 5 (RSS 5) is the same as RSS 2, RSS 3 and RSS 4 but must not exceed 30 percent of the samples55.

1.8 Functions of Rubber Board

General

The functions of the department consist of development activities licensing and registration of estates, undertaking of advisory, and extension services, carrying out economic research and controlling the management of the rubber plantation projects in the Andaman and Nicobar islands. The Central Organisation of the Rubber Production

Department comprises of development as well as advisory and extension wings and also the economic research section. The department had its own accounts cell functioning at the central office with effect from June 1976. The field establishments under the department consist of 17 regional officers, 38 field officers and 40 Junior field officers. The Rubber Research cum Development station in South Andamans, one central nursery and 8 regional nurseries were also administered by this department. The Katchal Rubber Plantation Project in Nicobar group of Islands also continued to be managed by the department for and on behalf of the Ministry of Agriculture, Government of India\(^5\).

**Development Activities Using the Following Schemes**

a. Licensing and Registration of Rubber Estates  
b. Implementation of Replanting Subsidy Scheme  
c. Implementation of Loan Scheme  
d. Rubber New Planting Subsidy Scheme 1979  
e. Rubber Plantation Development Scheme  

**Extension and Development Activities of the Board**

The rubber production department of the rubber board has implementing a variety of schemes aimed at the over all development

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of the rubber plantation sector. As a result of the impact of various schemes, implemented systematically on a need based manner, with appropriate extension and development strategies in the rubber plantation sector in India achieved commendable progress as evidenced by the growth rates achieved in expansion of area, production and productivity during the last five decades. In 1957, the first major development scheme was introduced by the board aimed at promoting replanting of old and uneconomic plantations. This was followed by a host of other schemes covering technical services, supplies new planting, replanting, productivity improvement, processing, marketing, promoting gross roots levels organizations and labour welfare measures. The extension and development aims at ensuring economic viability of rubber plantations and equipping the former to be globally competitive.\textsuperscript{57}

**Rubber Plantation Development Schemes**

From 1980, the board has given equal importance to replanting, new planting and promoted both alike under common integrated schemes. These are called rubber plantation development schemes phase I to IV under phases I to III. The participants who were small growers owning up to 5 ha. of rubber in traditional rubber

growing areas and all categories of growers in non traditional areas were entitled to receive planting grant at the rate of Rs 5000 per hectare in annual instalment spread over 6 to 7 years of immature phase of the plantation phase IV of the rubber plantation development scheme is currently under implementation from 1993. During the first four years, the planting grant had been Rs 8000 per hectare. But in view of the higher planting cost now prevailing, the rate has been enhanced from 1997 replanting and new planting target fixed under phase IV scheme for the first 8 years from 1993 to 2000 are Rs.13350, 13730, 13400, 14070, 15950, 17750, 12000 and 6315 hectares respectively. The achievements recorded as on 31-3-01 are Rs.11578, 11309, 12271, 14757, 18061, 11419, 7755 and 6304 hectare respectively payment made under phase IV as on 31-3-01 is 11987 crores.

Replanting and New Planting

The replanting subsidy scheme introduced in 1957 provided for grant of technical and financial assistance for undertaking replanting of old and uneconomic plantations in both estate and holding sectors. Subjected to improvements from time to time the scheme had been implemented upto 1979 over the 23 years period, replanting got caused out in a total extent of 53,605 hectare under

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58 Ibid, pp.76-77.
34,822 replanting permits. The total financial assistance granted under the scheme in the shape of cash assistance and subsidised supplies of material input and others amounted to Rs 19.35 crores. As many as 10984 growers participated and undertook new planting in 65,322 hectares. They received from the Board a total of Rs. 462 crores worth of financial benefits.

1.9 Marketing Infrastructure

Evaluation and Promotion of New Enterprises

The functional coverage should be 1) formulation of assistance programmes. 2) entrepreneurial development programmes. 3) advisory services 4) pilot testing of new processing technologies, 5) linking small producers with traders and exporters and, 6) setting up of model processing units for demonstration.

Market Information and Consultancy

The functional areas should be 1) organization of farmers groups for production, processing and marketing, 2) collection and dissemination of market information covering domestic and global markets especially for non-traditional products. 3) seminars for marketing awareness and 4) consultancy and investment promotion.

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59 Ibid, p.76
**Marketing Research and Surveys**

This should cover 1) creation of database, 2) production forecasts, 3) collection of statistical information and periodical release and, 4) maintenance of research documentation centre with web site.

**Market Promotion**

The major coverage should be 1) participation in and sponsoring of trade fairs, 2) targeted advertisement through visual media, 3) product display through foreign missions, 4) labeling and certification of products and 4) release of promotional literature for natural rubber products.

**Research Support**

Research support is needed in two specific areas. One is in crop improvement for evolving and popularizing varieties that will yield natural rubber with a higher out-turn of processed products. The other is in technology development for the efficient utilization of natural rubber and its products. Despite protests from tyre manufactures who say that subsidy has led to soaring rubber prices in the domestic market, the government is understood and have decided to continue with the scheme in 2004-05 according to official sources. The amount of subsidy given per kg and the total volumes for which the subsidy will be applicable are to be worked out per kg was likely to
be less than what was offered in 2003-04. In the current fiscal, a subsidy of Rs.3.5 per kg is given for the RSS4 and Rs.5 for block rubber, for exports up to 50,000 tonnes. These rates are likely to go down in the next financial year. The government offered the subsidy in abid to boost exports when rubber prices were ruling low besides improving the prospects in the global commodity markets. At the time of introducing the subsidy, the target was to achieve exports of one lakh tonnes during the 10th five-year plan.

Rubber is traditionally grown in India in the hinterlands of the south west coast comprising of the state of adjoining Kanyakumari district of Tamil Nadu this tract is however, now reaching a level of saturation for rubber cultivation and the scope of further expansion of the crop is very much limited. In the traditional area, progress in production will have to largely come from productivity improvement achieved through replanting of old and low yielding areas and better agro-management of mature plantations.

Tamil Nadu has lagged behind most of the natural rubber growing countries in developing appropriate technologies for profitable utilization of the diverse products and bye products of the plam. This has happened because of the research focus on crop production and protection ever since natural rubber research commenced in the state
and the low priority assigned to post harvest technology. It was only after the Rubber Development Board came into existence in 1981 that technological research received a fillip. Through the efforts of the Rubber Development Board, appropriate technologies could be developed and released to entrepreneurs in a few selected areas technological research needs further strengthening for enabling the entrepreneurs of the state to produce and market diverse products that could compete price-wise and quality-wise with similar ones emanating from the traditional exporting countries.60

1.10 Problem Formulation

There will be a wide gap between demand and supply of raw rubber in the immediate future. As a rubber tree takes seven to eight years to start giving yield, the only solution for the immediate future is to import the requirements of rubber as are in excess of domestic production. That will involve a heavy drain on our foreign exchange resources steps should, therefore, be taken urgently to step up domestic production so as to catch up with demand that will develop in future. There are two methods by which this could be done on along term basis. The first is new planting with high yielding planting materials on a large scale and the second is replanting of old and low

yielding trees with high yielding materials. It should be remembered that to bring down the cost of production of rubber in the country in line with costs elsewhere planting and replanting with high yielding materials cannot be delayed. Otherwise, the high cost of indigenous raw rubber will remain a drag on our manufacturing industry. Against this background of the need for large scale replanting and new planting the price policy of this industry has to be viewed61.

The main problem is the cost of labour. Since Rubber cultivation, maintenance and yield depend upon labour force, it is their ultimate problem. The other problems are cost of manure, climatic conditions, quality of seedling, water and disease62.

Natural rubber in Kanyakumari district is first both in area under cultivation and production of natural rubber among the rubber producing districts in the country. Even though Kanyakumari is the largest producer of natural rubber in the country, productivity of natural rubber in Kanyakumari is the medium among the natural rubber producing districts. This calls for an indepth study of the factors which contribute to the problems in the production of natural rubber, in order to suggest possible steps to be taken to improve production and

62 Darling Selvi, V., opcit., p.61.
productivity of natural rubber in the country. In this regard, a study on the determinants of yield would be useful for evaluating the resource use efficiency and identifying the constraints in realising the potential yield. Thus, an analysis of resource use efficiency in natural rubber farms would help in formulating policy packages to improve the cultivation of natural rubber.

Natural rubber is an important foreign exchange earner in the natural rubber basket of the district. Kanyakumari's share in the Indian market was 3.42 percent during 2000-01. This is due to stiff competition from other producing countries in the Indian market. Considering the vital role that natural rubber plays in the economy of Kanyakumari district, there is need to analyse the export competitiveness of Kanyakumari district natural rubber in the major importing destinations. Agribusiness calls for strengthening of markets, for making them more competitive than at present and for protecting the interest of growers by ensuring reasonable price for their produce.

The price behaviour in markets has been widely fluctuating during the last two decades. Especially, in the recent past, the prices of natural rubber fluctuated to an unimaginable level. Despite these price fluctuations, there seems to be no government
intervention in the marketing procedure or in the maintenance of price. A detailed study on the economics of production and the marketing of natural rubber in Kanyakumari district would help the policy makers and others to solve many problems connected with natural rubber production and marketing.

1.11 Objectives of the Study

1. To study the production practices of natural rubber growers in the Kanyakumari district.

2. To analyse the cost and returns of rubber production.

3. To analyse market arrivals, price behaviour and market integration of natural rubber.

4. To offer suitable suggestions on the basis of findings of the study.

5. To analyse the problems encountered in the cultivation and marketing of natural rubber.

1.12 Hypotheses formed

The following hypotheses have been framed to indicate the direction in which the research study should progress:

1. As the production alone determines to the major extent the net profit, the different marketing channels have minimal differences and as such are similar and hence their ranking is more the result
of random variables and is not statistically ranked. If this hypothesis is invalidated then the different marketing channels have characteristic variance between the marketing channels. Hence they differ highly in the various parameters regarding their functional components at various stages.

2. The source of price information is not random and hence there will be statistically significant variation between the kind of sources of information preferred by the growers in the market-wise distribution. As the price information obtained by newspaper has a higher proportion it is hypothesized that the comparison of the patterns of distribution of various sources of information within a particular market area will show statistical significance and that the various sources will have specific relation to the net profit realized by the grower.

3. The mode of transportation plays a crucial role in determining the net profit obtained by the rubber growers. Hence it is hypothesized that the kind of transport selected by the rubber growers have a significant and strong relation to the kind of price obtained by the rubber growers. This hypothesis can be tested by statistical tools like ANOVA analysis for testing the variance
between the distribution of the different modes of transports in different markets and also by correlation analysis.

1.13 Chapter Scheme

The present study is undertaken in the following chapters:

The **first chapter** entitled "Introduction and design of the study" introduces the topic and traces the development of rubber trade. The chapter includes problem formulation, objectives, hypotheses and chapter scheme.

The **second chapter** provides various concepts and review of related earlier studies.

The **third chapter** consists of "methodological strategies of the study" includes signification of the study, choice of the study area, selection of samples, collection of data, statistical tools and techniques used, period of study, and limitations of the study.

The **fourth chapter** is devoted for the analysis of production and profitability of rubber.

The **fifth chapter** comprises "Marketing of rubber", the channels of distribution, price-spread, price analysis and the problems of marketing of rubber growers are discussed.
The sixth chapter deals with “summary of findings, suggestions and conclusion” emphasises the relevance of the study and presents the findings. A few suggestions have been made for increasing productivity and improving marketing strategies.