CHAPTER- I

INTRODUCTION
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This chapter presents the background for the study under investigation, the statement of the problem and the objectives of the study, its significance, outline of the methodology and scope as well as limitations of the study.

1.1 Importance of agriculture
Agriculture plays a significant role in the existence of human beings all over the world. The growth and development of agricultural sector is fundamentally regarded as a prerequisite for economic development. Even the much developed countries have not achieved the industrial revolution without the development of agricultural sector. Agriculture is the foundation on which the entire structure of the growth and development of the country is built. Agriculture in India is considered to be a primary occupation for a major segment of population. The sector not only provides employment, it supplies raw materials to the major industries. The producers who are engaged in the agricultural activities need steady and fairly good income. The success of any agricultural activities is to be measured generally in terms of the net returns to the farmer. It is well known that in the agricultural sector, a steady and economic returns to the farmer producers, are the most important criteria for the development of the sector. In the case of plantation crops particularly in natural rubber plantation industry in India, small and marginal farms cover the major area under rubber and contribute significantly to the rubber production, occupy a very important position. There is a greater need for ensuring steady and reasonable returns to the farmers for the development of the sector. It is very essential to process and market the crop from the rubber plantations as value added rubber products for ensuring higher income to the producers on a continuing
basis. This would motivate the farmers to produce incremental output as it provides livelihood.

1.2 Importance of Rubber industry

Rubber industry is one of the emerging industries in India as well as in other rubber producing countries. Nature has not provided any other industrial raw material of plant origin other than natural rubber. This unique material has changed the life style of human beings. At present a world without rubber is not imaginable. Processing and marketing of value added forms of natural rubber can ensure good returns to the producers which can motivate them to produce it regularly and in larger quantity as it provides regular income to the family by which they can have better living standard than that of other producers who cultivate crops other than rubber. The rubber producers have good faith in the industry. The rubber crop provides the basic raw material for making more than 35,000 products from eraser to the air craft tyre. Natural rubber is the most preferred raw material because of its unique qualities, when compared to other elastic materials of synthetic rubber.

The use of rubber is widespread, ranging from household to industrial products. The manufacturers of tyres and tubes are the largest consumers of natural rubber accounting for more than fifty percent of the production. This industry not only supplies raw materials to processing industries but provides employment to the growing population in rubber producing countries. Cultivation of rubber is the main source of livelihood of millions of people in rubber producing countries of the Far East, who depend upon this industry either for wages or for income generation from cultivation. Natural rubber forms the raw material for a large number of both big and small industries which produce umpteen rubber products useful to human beings. Natural rubber is used to fabricate hard, strong,
structural materials; soft, yielding comfortable materials, resilient, elastic materials; conductors and non-conductors of electricity; shock absorbers; mounting for motors and other machineries; transmission belts, gaskets; hoses for transporting gases and liquids; transparent materials; translucent materials; articles of clothing to keep out rain to control the fire; sports goods, cements, paints, plastics, pharmaceuticals; tyres and many more such products which are the chief outlets of rubber. The rubber products are not only sold in the domestic markets but a good number of value added products of rubber are exported to international markets. In India civil, aviation, aeronautics, railways, agriculture, transport, textile engineering industries, pharmaceuticals mines, steel plants etc sectors are served by Indian natural rubber industry.

1.3 Importance of rubber industry in Indian economy

India is emerging as one of the principal producers of natural rubber and the chief consumer of natural rubber in the world. The rubber plantation occupies hardly 0.4 per cent of the gross cropped area and contributes to 0.19 per cent to the GDP. Despite not being a very favourable region for growing natural rubber, India continues to record the highest productivity among the major natural rubber producing countries. Kerala accounts for about 78 per cent of the area and about 92 per cent of the production of natural rubber in the country. Natural rubber is the backbone of commercial agricultural activity of the state and rubber plantations play an important role in the economic and social status of the people. Most of the rubber plantations are located in remote village areas and they play a vital role in rural development of the country. In employment generation, rubber manufacturing industry also plays an equally important role for both males and females. Though rubber is traditionally grown in Kerala and parts of Tamil Nadu and Karnataka, this rubber cultivation has now
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gained acceptance among the people of non-traditional regions as well, especially the North-eastern states. Natural rubber recorded remarkable growth rate in area, production and productivity in comparison with the other major crops in the country. Rubber plantations provide regular and direct employment to about 0.4 million people in the country by way of cultivation, farm management operations and crop harvesting. Apart from this, various activities such as processing, trading, packing, transporting, shipping etc. give employment to a large number of people.

1.4 History of Natural Rubber

The natural rubber tree was found by Christopher Columbus during his visit to South America in 1493. Mr Austine Coate first defined it in 1500 as milk-like juice, which is found in the bark of Hevea tree that becomes golden brown and thicker on exposure to air. One of the first uses of rubber was to rub off graphite or charcoal marks on paper, hence the name ‘RUBBER’ was coined to the substance. Presently, natural rubber is one of the important and emerging industries in the world. Cultivation of natural rubber was started in 1876 and spread to the other parts of the world by 1913. Sir Henry Wickhan, a Singaporean, was the first one to plant natural rubber in his garden. He selected about 70,000 rubber seeds from Brazil and introduced in his garden in Singapore. In the year 1903, there were many established rubber estates and small rubber farm holders in the world. Nigeria was the first country to develop rubber estate at Saponba. The Britishers started collecting the seeds of rubber trees from Brazil for planting in the then “British India”. The prime source of natural rubber was commonly introduced in India by the Britishers.
1.5 **World natural rubber production scenario**

Natural rubber is a very important product for the people in the world. The demand for the natural rubber is increasing due to the increase in the world technology especially in the automobile industries which require of natural rubber for manufacturing of tyres and other products. As the demand for natural rubber increases in the global markets, the rubber producing countries can generate sizeable income by exporting rubber globally. The growth of a country is in line with the rate of export, an increase in the export rate is an indication of economic development.

Thailand is the largest producer of natural rubber in the world followed by Indonesia, Malaysia, India, China and Vietnam. The other countries which are producing rubber in the world are Libea, Brazil, Sri Lanka, Philippines, Nigeria and Cambodia.

Asian countries dominate the natural rubber sector occupying 93 percent of the total area under rubber cultivation in the world. Indonesia is having the largest area under rubber cultivation followed by Thailand, Malaysia and China. India is in fifth position with an area of 6.55 lakh hectares during the year 2008-09. Globally about 81 percent of the world's natural rubber production is in South East Asia, i.e; Thailand, Indonesia, Malaysia, India, China and Vietnam.

**Table: 1.1 Country- wise Production of Natural Rubber**

<table>
<thead>
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<td>996</td>
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<td>826</td>
<td>668</td>
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<tr>
<td>India</td>
<td>852</td>
<td>825</td>
<td>864</td>
<td>831</td>
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<td>800</td>
<td>900</td>
<td>900</td>
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<td>605</td>
<td>660</td>
<td>711</td>
<td>751</td>
<td>789</td>
<td>877</td>
<td>949</td>
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<td>China</td>
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<td>547</td>
<td>618</td>
<td>690</td>
<td>750</td>
<td>802</td>
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<td>1372</td>
<td>1301</td>
<td>1189</td>
<td>1742</td>
<td>1471</td>
<td>1558</td>
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<tr>
<td><strong>Total</strong></td>
<td>9791</td>
<td>9801</td>
<td>10036</td>
<td>9702</td>
<td>10399</td>
<td>10974</td>
<td>11327</td>
<td>12251</td>
<td>12115</td>
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</table>

(Source: FAOSTAT -2015 & Rubber Board, Kottayam-2015)
Thailand is the world’s principal producer of natural rubber which produced 4473 thousand tons in the year 2015. Thailand's rubber production has increased from 3070 thousand tons in 2006 to a record mark of 4473 thousand tons in 2015. Indonesia, the second largest producer in the world, recorded highest production of 3175 thousand tons in the year 2015. In Malaysia there was an increasing production trend up to 2006, but from 2007 onwards the production declined. The production which was 1283 thousand tons during 2006 declined sharply to 722 thousand tons in the year 2015. Table 1.1 shows that India has also experienced a steady fall in rubber production from 852 thousand tons in 2006 to 575 thousand tons in 2015. The global production was 12314 thousand tons in the year 2015, which is up from 9791 thousand tons in 2006.

1.6 Indian natural rubber production scenario

India is the fifth largest producer of natural rubber at present and fourth largest consumer in the world. The rubber producing regions in India are classified under two major zones, traditional and non-traditional, on the basis of agro-climatic conditions.

**Traditional Regions:** Rubber cultivation in India has been traditionally confined to the hinterlands of southwest coast, mainly in Kanyakumari district of Tamil Nadu and Kerala. Kerala and Tamil Nadu together constitute the traditional rubber growing regions in the country. Kerala alone contributes about 92 percent of the total rubber produced in India and Tamil Nadu contributes about 3 percent.

**Non-Traditional Regions:** These are the hinterlands of coastal Karnataka, Goa, Konkan Region of Maharashtra, hinterlands of coastal Andhra Pradesh and Orissa, the northeastern states (mainly Tripura), and Andaman and Nicobar Islands where rubber is now being grown.
The natural rubber has been commercially cultivated since 1902 in Kerala. An attempt to grow rubber in Calcutta failed and the need for a change in the location of planting was also felt. Thus rubber cultivation moved to the areas of Malabar, Travancore, Canara and other parts of India. The growth of Indian rubber plantation industry has been mainly through the expansion of rubber cultivation in Kerala. The rubber trees were first introduced as a crop in the teak plantations of Nilambur forest division in Kerala. Later an experimental planting of rubber trees started in different districts of Kerala. Planting the first rubber plantation in Travancore (Kerala) was done in 1902 at Thattekad on the banks of Periyar River. In 1904 planting began in Yendayar and Mundakayam areas aggregating to a total of 240 acres (97.17 ha.) with the aim of establishing an assured source of industrial raw material. By the year 1910, Travancore became the leading state for rubber planting in India with 18,252 acres (7390 ha.) and Mundakayam became one of the main centers of rubber planting with about 10,000 acres (4048 ha.).

**Table 1.2 Area, Production and Productivity of Natural Rubber in India**

<table>
<thead>
<tr>
<th>Year</th>
<th>Area in hectares</th>
<th>Production in tons</th>
<th>Productivity in Kgs/hectare</th>
</tr>
</thead>
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<td>2002-03</td>
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<td>2003-04</td>
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<td>2004-05</td>
<td>584090</td>
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</tr>
<tr>
<td>2005-06</td>
<td>597610</td>
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</tr>
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<td>2006-07</td>
<td>615200</td>
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<td>2007-08</td>
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<td>2008-09</td>
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<tr>
<td>2009-10</td>
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<td>831400</td>
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<td>2011-12</td>
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<td>2012-13</td>
<td>757520</td>
<td>913700</td>
<td>1813</td>
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<td>2013-14</td>
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<td>774000</td>
<td>1629</td>
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<td>2014-15</td>
<td>795135</td>
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<tr>
<td>2015-16</td>
<td>811000</td>
<td>562000</td>
<td>1437</td>
</tr>
</tbody>
</table>

**Source:** Rubber Board, Kottayam-2016

**Note:** Area (both tapped and untapped) and productivity is based on total area.
The area under rubber in India was 5,69,667 hectares in the year 2002-03 and increased to 6,15,200 hectares in the year 2006-07. The area under crop increased significantly to 7,57,520 hectares in 2012-13 and to 8,11,000 hectares in 2015-16.

India’s natural rubber production has been increasing progressively over the past decade. The production grew at the rate of 4.8 percent in 2011-12. The production of natural rubber in 2011-12 was 903700 tons which increased to 9,13,700 tons in the year 2013. The production drastically decreased to 5,62,000 tons in 2015-16.

India stands first in productivity of natural rubber in the world. The productivity of natural rubber during 2011-12 was 1841 Kgs/hectare when compared to 1806 Kgs/hectares in 2010-11 and slightly increased to 1813 Kgs/hectare. The productivity decreased to 1437 Kgs/hectare in 2015-16.

1.7 Soil and Climatic conditions appropriate for cultivation of natural rubber

The farming activities of natural rubber in India started as a crop in the year 1878. The trees developed during this period ensured regular supply of seeds and thus the introduction of Hevea trees became possible. The economic life of rubber trees is around 32 years - up to 7 years of immature phase and about 25 years of productive phase. These plants generally have 32 years of economic life but they may live up to 100 years or even more. The soil requirement of the plant is generally well drained weathered soil consisting of laterite, lateritic types and sedimentary type, non-lateritic red or alluvial soils.

The climatic conditions for optimum growth of rubber tree consist of a) rainfall of around 250 cm evenly distributed without any marked dry season and with at least 100 rainy days per annum, b) temperature range of about 20°C to 34°C with a monthly mean of 25°C to 28°C, c) High atmospheric humidity of around 80 percent, d) bright sunshine amounting
to about 2000 hours per annum at the rate of 6 hours per day throughout the year and e) absence of strong winds.

The geographical and climatic suitability proved that Kerala is good for rubber cultivation. Hevea spruceana, Castilla elastic, Manihot glaziovii, Landolphia and Funtumia elastica are the other species of natural rubber and Hevea brasiliensis took place as natural rubber in the modern world.

### 1.8 Natural rubber production in Kerala

Kerala State accounts for about more than 78 percent of the area under rubber plantations and about more than 90 percent of total rubber produced in the country. But it consumes only about 20 percent because of less rubber based industries. In Kerala 40 percent of the area and 45 percent of natural rubber production comes mainly three from districts, i.e.; Kottayam, Ernakulum and Pathanamthitta. These districts are the leading producers of natural rubber and have major share in the total production in Kerala.

#### Table.1.3 Area, Production and Productivity of Natural Rubber in Kerala

<table>
<thead>
<tr>
<th>Year</th>
<th>Area in hectares</th>
<th>Production in tons</th>
<th>Productivity in Kgs/hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td>4,85,610</td>
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<td>2005-06</td>
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<tr>
<td>2014-15</td>
<td>5,49,955</td>
<td>5,07,700</td>
<td>923</td>
</tr>
</tbody>
</table>

Source: Rubber Board, Kottayam-2016
The area under Natural Rubber in Kerala was 485610 hectares in the year 2004-05 and shown positive trend in area under crop between 2004 and 2015. The area under Rubber in Kerala increased to 5,39,565 hectares in 2012-13. The similar trend was observed in production also during this period. The rubber production in the state increased from 6,90,768 tons in the year 2004-05 to 8,00,050 tons in 2012-2013. The productivity in rubber was 1481 Kgs/hectare in 2013 declined to 923 Kgs/hectare in 2015.

1.9 Collection of Natural Rubber
The process of harvesting rubber in places like Kerala, where coconuts are in abundance and the shell of half a coconut is used as collection container for the latex but glazed pottery or plastic cups are more common elsewhere. The cups are supported by a wire that encircles the tree. This wire incorporates a spring so that it can stretch as the tree grows. Rubber is a constituent of latex, a milky substance produced from trees by a process of controlled wounding called tapping. Tapping is the process of controlled wounding of the bark to extract latex. When a tree is tapped for the first time, only a very small quantity of the latex exudes and later consecutive tapping produces more and more quantity of latex and rubber content. Trees are usually tapped alternate days although there are many variations in timing, length and number of cuts. The milky white latex is processed either into dry forms of rubber or as concentrated latex depending on the facilities available in the rubber plantations. In conventional methods, latex is processed to sheet or crepe rubber. The sheet or crepe rubber produced by processing the crop from rubber plantation is graded by the visual comparison method.
1.10 Various forms of Natural Rubber

Latex and scrap rubber (coagulum) constitute the main crop from rubber plantation. These are further processed into different forms as required by the manufacturing industry to meet the varying demands in the markets. Latex can be processed into the following forms;

1.10.1 Ribbed Smoked Sheet (RSS) or Air Dried Sheet (ADS)
1.10.2 Pale Latex Crepe (PLC)
1.10.3 Technically Specified Rubber (TSR)
1.10.4 Preserved field latex and latex concentrate

1.10.1 Ribbed Smoked Sheet

Ribbed Smoked Sheets (RSS) are coagulated rubber sheets processed from fresh field latex sourced from well managed rubber plantations adopting modern processing methods. The higher grades RSS- 1x to RSS- 3 is mainly used for manufacture of products for medical, pharmaceutical and engineering. The lower grades of RSS -4 and RSS- 5 are generally used for the manufacture of automobile tyres, re-threading materials and all other general products. RSS- 3 and RSS- 4 are the ideal raw materials for radial tyres.

1.10.2 Pale Latex Crepe

Pale Latex Crepe (PLC) is produced from latex especially under controlled conditions. After preliminary treatments and passing through a set of crepe making machines, pale latex crepe is produced. Different grades of PLC are used to produce quality pharmaceutical items, adhesives, tapes, tubes etc. PLC is marketed in different sizes and thicknesses. Four different grades of PLC available in the market are PLC- 1x, PLC -1, PLC -2 and PLC- 3.
1.10.3 Technically Specified Rubber

Technically Specified Rubber (T.S.R.) is used for making tyres, tubes, rubber mats and various other rubber products. It was in the late 1960's that the rubber industry started to produce rubber with exactly known properties. Presently, TSR grading helps the industry in manufacturing rubber that meets exact standards.

1.10.4 Preserved field latex and latex concentrate

Latex shall be packed in drum contains 200+ or – 5 liters. Processing of natural rubber latex into high quality latex concentrate of 60% dry rubber content is done through centrifugation. Centrifuging involves the separation of preserved field latex into two fractions, one containing the concentrated latex of more than 60% dry rubber and the other containing 4-6% dry rubber. Centrifuged latex is today available commercially in two different verities with high ammonia (min.0.7% of ammonia) and low ammonia (max. 0.3% of ammonia). The former is preserved solely with ammonia and later contains one or more preservatives besides ammonia. LA latex has several advantages which include better quality, lower cost of production by way of savings in preservatives, acid and low cost of effluent treatment.

1.11 Uses of rubber

The use of rubber is widespread ranging from household to industrial products, entering into the production stream at the intermediate stage or as final products. Tyres and tubes are the largest consumers of rubber accounting an average of around 70 percent of total consumption for the past 20 years. The development of radial tyres and the increased use of natural rubber latex products have caused this share to drop rapidly and currently estimated to be around 60 percent. Other significant uses of rubber are indoor stadium tiles, speed brakers on road, adhesives, foam,
rubber bands, pencil erasers, hoses, belts, matting, flooring and some parts for the automotive industry. Gloves and toy balloons are the largest consumers of rubber.

1.12 Marketing of Natural Rubber in India

Marketing is a very complex process involving a range of techniques and procedures. An appropriate marketing strategy is the key for successful marketing. To involve into marketing strategy, one should essentially possess up-to-date knowledge of this market. This will facilitate the building up of correct picture of the market and would also provide guidelines for making a realistic sales forecast for the future. For this purpose knowledge of the following aspects are the basic requirements;

1. Size of the market
2. Demand
3. Market structure
4. Buying habits
5. Market share
6. Overseas market

The activities of rubber marketing system are connected with the movement of rubber from the primary producers to the ultimate consumers. There are distinct differences in the primary marketing system in between small holding and the estate sectors. The raw rubber has to be processed in different form of final products required by the final consumers.

1.12.1 Marketing by Small holding sector

The small holders are not favorably placed like large estates in marketing. The small holders sell sheet rubber and latex through village level dealers or merchants. They buy small holders' sheet rubber in ungraded loads with a price differential determined by market demand. These village
level dealers include co-operative societies and rubber producers' societies. Small growers have flexibility to turn from latex to sheet making when the price of latex becomes unattractive.

1.12.2 Marketing by Estates

The estates market their produce more efficiently than the small holders. They have a better marketing system which assures better price realization. Big plantation companies have facility for processing different types and grading them to make direct sales to consumers and they avoid unnecessary intermediaries which would make a dent in the net price realised. Such companies generally follow a system of direct sales, tender or auction.

1.13 Institutional arrangements for development of rubber industry

Rubber Board at the national level and Rubber Producers’ Cooperatives at the district level, sub-district level and at the village level are functioning to help the rubber producers in production and marketing of rubber.

1.13.1 Rubber Board

Rubber Board is a statutory body constituted by the Government of India under the Rubber Act 1947, for the development of the rubber industry in the country.

The importance of rubber production in India for strategic and security reasons has been realized by the government during the Second World War. The rubber growers in India were encouraged to produce the maximum rubber required for the use during the war. After the war, there was growing demand from the growers for setting up a permanent organization to look after the interests of the industry. Thereupon the government set up an ad-hoc committee in 1945 to study the situation and to make appropriate recommendation. On the recommendation of this ad-
hoc committee, the government passed the Rubber (Production and Marketing) Act, 1947 on 18\textsuperscript{th} April 1947 and the “Indian Rubber Board” was constituted forthwith. The Rubber Production and Marketing (Amendment) Act 1954, amended the name of the Board as “The Rubber Board”.

1.13.1.1 Main functions of Rubber Board

The Board undertakes the following activities and functions;

- Providing subsidy for new planting and replanting
- Providing advisory and extension services to the growers, rubber producers societies etc.
- Supplying technical advice to rubber growers
- Training students in improved method of planting, cultivation, manuring and spraying
- Improving the marketing of rubber
- Collection of statistics from owners of estates, dealers and manufacturers and dissemination of knowledge
- Undertaking, assisting or encouraging scientific, technological and economic research
- Securing better working conditions and the provisions and improvement of amenities and incentives for workers
- Carrying out any other duties which may be vested in the Board under rules mad under this Act
- Submit to the Central Government and other authorities, as may be prescribed half-yearly reports on its activities and the working of Rubber Act
- Advising the Central Government on all matters relating to the development of the rubber industry, including the import and export of rubber.
1.13.1.2 Rubber Production activities

The Department is responsible for planning, formulation and implementation of schemes for improvement and expansion of rubber cultivation and production. Extension/advisory service, supplies of inputs, demonstration and training for small growers etc. are also undertaken by the Rubber Production Department. There is a well-structured field establishment set up under the Rubber Production Department which renders free advisory and extension services to rubber growers on all aspects of rubber cultivation, production, processing and marketing and simultaneously attends to implementation of various development schemes as well.

The development strategy for natural rubber production has to keep in view the following essential requirements: i) Optimization of production from existing plantations through replanting with improved cultivars and better agro management, ii) Expansion of cultivation in traditional plantation areas, identification of suitable non-traditional areas that is fit for economic production and extension of cultivation to such areas, iii) Reduction of cost of production to withstand challenges from competing crops, synthetic substitutes and cheap imports, iv) Upgradation of quality of produce to meet the increasingly exacting demands of consuming industries, v) Formation and effective working of small holders self-help groups to ensure informed community participation to create infrastructure to facilitate organized production, processing and marketing chains to gain maximum returns.
The most important development schemes and activities undertaken through the production department are:

- Rubber Plantation Development Scheme
- Production and distribution of improved planting materials
- Advisory and extension services to growers
- Demonstration of scientific planting and production
- Supplies of equipment and materials requiring popularization
- Identification of non-traditional areas suitable for rubber and planning and undertaking activities for its promotion in such areas.
- Schemes for productivity enhancement in small holdings
- Schemes for improvement of quality of small holder rubber
- Schemes for extra income generation from rubber plantations – Apiculture
- Block planting, group planting etc. for promotion of rubber among scheduled caste/scheduled tribe members
- Promotion of activities of voluntary associations and self-help groups among small growers
- Training of tappers

1.13.1.3 Role of Rubber Board in Non-Traditional areas
The traditional rubber growing tract has almost reached the level of saturation for rubber cultivation and the scope for further expansion of the crop is very much limited. Expansion of cultivation, which is of prime importance for setting up rubber production on a suitable basis, has to take place mainly in non-traditional areas. Studies on agro-climatic conditions in different parts of the country have been carried out for the last few decades with a view to identifying areas suitable for economic cultivation of rubber. Trial plantings have been carried out in areas,
which prim facie appeared promising. Based on successful results obtained, rubber cultivation is being promoted on commercial scales in regions identified as suitable for the purpose. Non-traditional areas for rubber cultivation are hinterlands of coastal Karnataka, Goa, Konkan region of Maharashtra, hinterlands of coastal Andhra Pradesh and Orissa, certain areas in the northern parts of West Bengal, Tripura, Assam, lower reaches of hills of Meghalaya, Mizoram, Manipur, Nagaland and Arunachal Pradesh and Andaman and Nicobar Islands. Different types of constraints or stress factors, mainly from the climatic angle are experienced in different areas. These range from highly seasonal rainfall, excessive rain precipitation, prolonged drought conditions, high temperature during summer, low temperature during winter, low relative humidity and occasional hailstorms. In certain areas like Karnataka, Goa, Maharashtra and Orissa limited irrigation will have to be provided for young plants during dry season.

1.13.2 Rubber Producers’ Cooperatives
Rubber production in Kerala State as well as elsewhere the country is contributed largely by the small producers. Kerala accounts for more than 78 percent of the area under rubber by small holdings and which account for more than 90 percent the production. These small producers suffer from problems like low productivity, poor quality of rubber processing and weak marketing as well. The producers are exploited by the too many intermediaries. To overcome the problem of small farmers, the formation of cooperatives called ‘Rubber Producers’ Cooperatives’ was suggested. Accordingly the cooperatives are established either at the district level or at the sub-district level to provide services to the small rubber growers. These societies are providing services like supply of inputs, technical services to reduce the cost of production, group processing and
community smoke house facility to produce good quality rubber sheet. The members of the cooperatives realize better price for their products compared to non-members.

1.14 Significance of the Study
A reasonable and economic return to the farmers is the most important for the development of the agricultural sector. The Rubber plantation in the country plays a vital role in this sector. The size of natural rubber industry focuses not only in the economic growth of the country but also provide employment to a large number of people. In India, the central and State governments are encouraging the small farmers and other stake holders to promote natural rubber industry in the country. The institutional support is provided by the government through the establishment of the Rubber Board which provides technical assistance to a large number of small holders. The rubber industry was started as a plantation crop in the country, but it has become basically a small holder’s crop and it continues to be a small producers industry as large estates are fragmented. The demand for natural rubber in the world is increasing and India is importing rubber from other rubber producing countries as the domestic production does not meet the entire consumption. Hence there is dire need to enhance domestic production to share on foreign exchange spent on rubber imports.

In view of these, the present study is important to understand the significance of rubber plantation industry in the country and its structural changes such as area under crop, production and productivity, marketing of natural rubber and value added form of rubber, rubber imports and exports. The present study was undertaken in Kerala State as it has about 88 percent of the cropped area and accounts for about 92 percent of the country’s rubber output.
1.15 **Objectives of the Study**

1. To analyze the impact of recent developments on area, production and productivity of natural rubber in Kerala.
2. To examine the marketing of natural rubber and the value added forms of natural rubber in the study area.
3. To examine the degree and direction of export of natural rubber from India in general and from Kerala in particular.
4. To identify the constraints in production and marketing of natural rubber and to suggest appropriate policy measures.

1.16 **Hypotheses**

**H1:** There is an increase in area, production and productivity of natural rubber in Kerala over the years.

**H2:** The volume of natural rubber exports has increased significantly and imports decreased substantially in recent years.

1.17 **Methodology**

This study was mainly based secondary data, however, primary data was also obtained from the stakeholders of the natural rubber industry to understand their problems in production, processing and marketing in the study area.

1.17.1 **Primary data**

The Primary Data were collected through personal interviews by administering the structured questionnaires from the natural rubber producers, traders, processors and exporters in the study area. Among the fourteen districts in Kerala, three districts namely Kottayam, Ernakulam and Kasargod districts were selected for the study. In total 225 farmers are selected from these three districts choosing 80 farmers from Kottayam, 77 farmers from Ernakulam and 68 farmers from Kasargod.
district from various categories i.e. small, medium and big category of rubber producers. In addition to these, 30 traders were interviewed by administering the questionnaire in these three districts. 10 processors and 16 exporters were interviewed by administering the questionnaire from Kottayam and Ernakulam districts, since these are operating only from these two districts only.

1.17.2 Secondary data
The Secondary Data were collected from Rubber Board, rubber Producer’s cooperative society, rubber journal, published reports, related journals, Food and Agricultural Organization (FAO) reports and from the internet.

1.17.3 Data Base
In order to fulfill the objectives and examine the hypotheses, data on production and marketing aspects were necessary. Data for analyzing the trend in area under rubber plantations, yield and production, etc., a time series data were collected and analysed. The data from 2000-01 onwards were gathered for time series analysis. The degree and direction of the trade, trade volume, price variation etc are also analyzed by using the time series data from 2000-01 onwards. Efforts were being made to collect data till 2016. The actual reference period of the study was for the year 2014-15, unless it is otherwise mentioned. The data from producers, exporters and processors were collected for the production year 2014-15.

1.17.4 Statistical tools and techniques used
The statistical tools and techniques are used to draw a definite and precise conclusion on the subject chosen for the study. Statistical techniques like, tables, graphs and charts, which are generated from the analysis of both
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primary and secondary data collected from the study area, were used to
draw an appropriate inferences.

Statistical Tools and Techniques used in the analysis are Compound
Annual Growth Rate for analyzing the trend in area, production,
Statistical Package for Social Sciences (SPSS) to analyze the primary
data, Markov Chain Analysis to analyze the structural changes in exports
of natural rubber, Instability analysis, Regression analysis and Growth
equation models to analyze the production and marketing of natural
rubber in Kerala.

1.18 Limitations of the Study

The study is confined to Kerala State only. In the State three districts
were selected for the study namely Kottayam, Ernakulam and Kasargod
and the commodity selected for the study is Natural Rubber. The outcome
of this study is a result of data obtained from both Primary and Secondary
Source. The results were drawn on the basis of the data collected from
primary source such as rubber producers, processors, exporters etc., and
secondary source like Rubber Board, Rubber Cooperatives, FAO
Statistics, books, journals, govt. reports etc.

The data on area under natural rubber, production and productivity were
gathered from Rubber Board, Kottayam, Directorate of Economics and
Statistics, Govt. of Kerala and FAO statistics published from time to time.
The country-wise comparison on area under natural rubber, production
and productivity was based on rubber tapped area of FAO statistics
published in different production and marketing years. The details on the
area under natural rubber, production and productivity in Kerala were
sourced from Rubber Board statistics unless it is stated.

Based on the availability of the data on area, production and productivity
of natural rubber, imports and exports from different sources have been
used to analyze the trend and to draw necessary inferences. Some data have been used up to 2013-14, some for 2014-15 and some other data for 2015-16. Therefore, uniformity in data is not maintained due to the data constraints. Though the data were used from 2000 on words, some data were used from 2003-04, 2004-05 due to the data constraints.

1.19 Organization of the Study
The present research study is presented in seven chapters:

Chapter I presents the introduction to the research topic chosen for the study. The chapter deals with the history of natural rubber, natural rubber production in the world and in India, importance of the rubber, rubber production in Kerala State, Collection of natural rubber, various forms of natural rubber, Uses of rubber, Marketing of natural rubber in India, Export of natural rubber from India, Importance of the study, Objectives, hypothesis, Methodology, Limitations of the present study

Chapter II presents a review of literature highlights the study conducted by researchers on various issues on production and marketing of natural rubber in the past.

Chapter III deals with the methodology used in the study to analyze and interpret the data obtained from the secondary and primary source to draw a meaningful conclusion.

Chapter IV focuses on the production of natural rubber in the study area i.e. on soil, climatic conditions, preparation of land and rubber nurseries and maintenance of plants. In addition to this, the chapter also gives a brief profile of rubber production in the world and in India and a detailed discussion on production of rubber in the study area i.e. in Kerala State.

Chapter V discusses the marketing of natural rubber in India, import and export, direction of trade and the role of rubber producing countries in global markets.
Chapter VI analyses the opinions of the farmers, traders, processors and exporters and importers of natural rubber industry in the study area.

Chapter VII presents the Summary, Major findings of the study, and their implications for policy and conclusion.