The Rubber Plantations of Kerala

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Summary - *Once a lucrative business, most farmers in India's highest rubber producing state are finding alternative uses for their land, yet some hold on in hope. Tracing the trajectory of rubber through farmers' perspectives.*

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A Sense of Rubber

Growing up, I spent summers in my family's ancestral home in the countryside. It was a quaint little village surrounded by acres of rubber trees that provided respite from the scorching summer heat. Every morning, I would wake up to the sound of the rubber machine, a familiar hum that had become a part of the soundtrack of my summer vacations. The rubber machine located at the corner of our property was a hub of activity throughout the day. Workers from other properties in the area would pop in with their rectangular trays containing rubber sheets to be processed. My family's property was one of the few places in the area open to anyone who wanted to use it, leading to multiple uses of the same.

Along with other children in the area, I often stopped our play by going to the rubber shed and watching the workers put each sheet through the machine. The mechanics of rubber sheet processing were a sight to see. The rubber sheets spread out in the rectangular tray were fed through the machine. The wheel of the machine would turn, and with each rotation, the rubber sheet would be stretched and thinned out, until it was ready to be collected in neat stacks.

The sound of the machine was a constant presence in the background, a rhythmic hum that was almost soothing in its familiarity. The smell of the rubber sheets processing was distinct, a pungent odour that I had come to associate with the summers spent at my ancestral home. The rubber trees provided constant shade, and I would sit underneath the trees with my friends, listening to the sound of the rubber machine in the distance. As the day drew to a close, the sound of the rubber machine would fade, and the silence would be punctuated only by the occasional call of birds returning to their nests. It was a peaceful time, and I often sat on the porch, sipping on a cool glass of lemonade and watching the sunset behind the rubber trees. Today, when I sit on the same porch, looking out at the land that has been in my family for decades, I cannot help but feel a sense of loss. My childhood summers started with me stepping out of the house to join my friends already running through the trees, careful not to disturb the workers tapping the sap from the trees. Now, there are almost no rubber trees left. The surroundings are still green with other plants and trees, but the rubber trees and the rubber machine, constantly present during those summer months, have disappeared. It is a sad reminder of how things have changed and how we must adapt to a constantly changing world.

Figure 1. Rubber Trees that are being tapped.
Image: JANAL Archives 2023

The Rubber Tree

The rubber plant is not an indigenous species of Kerala or India. Historical records indicate that the superior variety (Hevea Brasiliensis) replaced the Indian Rubber tree (Ficus Elastica) due to British intervention during the early twentieth century. The commercial use of rubber only started in 1902, by which time Hevea

Brasiliensis replaced the Indian variety due to its latex sap which was better in quality.[1] Hevea Brasiliensis, commonly called the Para rubber tree due to its association with the Brazilian port of Para, is a perennial tree characterised by its rapid growth and robust nature, reaching approximately 25 to 30 metres. The tree has a straight trunk and thick, relatively soft bark with a light brownish-grey hue. During its initial stages of growth, the young plant displays a distinct pattern of alternating periods of rapid elongation and consolidated development. The leaves are trifoliate, each accompanied by elongated stalks.

In India, the tree follows a deciduous habit and experiences a dormant period from December to February. However, it quickly regains foliage and undergoes abundant flowering after that. Although the individual flowers are small, they cluster together in large quantities. The fruits of the Hevea Brasiliensis rubber tree consist of three lobes, each containing three seeds that resemble castor seeds in appearance but are considerably larger. These seeds possess oil-bearing properties. While the rubber tree has the potential to live for a century or more, its economic lifespan in plantations is typically limited to approximately 32 years. This duration comprises a seven-year immature phase followed by a 25-year productive phase. "Nothing will happen if you leave the trees be," said Haridas, a plantation owner in Koothattukulam, "I guess it will live for decades. That is, unless the trees are affected by disease. I have heard of cases where the sap starts coming out of branches automatically. So one ends up losing the tree. It is better not to leave it untapped for a long time."[2] As a young child, I once threw a stone at one of the rubber trees near my ancestral home. I was surprised by the sap coming out of the trunk, for the stone had cut through the outer skin of the trunk. Seeing this, my aunt commented, "You better hope that your grandfather does not notice that. He will be upset seeing you waste the sap."

Tapping Rubber Trees

The trunk must possess a diameter of at least twenty inches to initiate the extraction process. Typically, this dimension is attained by the rubber tree when it reaches the age of seven years. According to Joy, a planter from the Kottayam district, considerable attention must be given to nurturing the saplings to ensure their growth to the desired size, enabling tapping by the seven-year mark. "Just getting to age seven is not important," he said. "Being the right size and being healthy enough to be tapped by the time the tree is seven is important. If the tree trunk is not twenty inches by the time it is seven, we will have to wait till it reaches that size, which means we have to spend more before we start earning from the rubber." [3] The initial incision is made four feet from the ground level. Subsequently, the exuding latex flows into a collection cup affixed to the tree using a silver-coloured holder. These cups vary in capacity, accommodating 600 to 900 ml of latex sap.

Further incisions are made above the previous cuts, with their placement

[1] Sinumon, T.G and Mahalakshmi, K. “Study of the Problems Faced by Rubber Growers in Kerala.” *International Journal of Management* 11, no. 12 (December 2020): 4032–38.

[2] Interview with Haridas B., rubber plantation owner, 9 May 2023.

[3] Interview with Joy T., rubber plantation owner, 10 May 2023.

adjusted based on the tree's characteristics and the quantity of latex sap it generates. The sap is collected each morning to prevent drying. Suni, a rubber tapper from Palakuzha, states that the tapping gets done during the early morning hours due to the heightened flow of sap during this period. "I do not know if your studies will have a scientific explanation for this. However, that is what I have always seen, and that is what I do. I tap the trees early in the morning, starting before the sun is out." [4]

A plastic sheet is employed as a protective cover to safeguard the section of the tree subjected to cutting and the sap-collecting cup from rainwater. This sheet is securely attached to the tree using adhesive. Notably, any incision made on the tree's surface prompts sap production; even removing the leaf results in sap release at the point of detachment. "Of course, sap comes out when you pluck a leaf," says Haridas. "That is why children are always told not to pluck leaves of saplings that are still growing"[5]. Planters exercise caution to avoid any cuts or marks that penetrate the tree's outer layer, as such damage would lead to wastage of the sap.

Preparing Rubber Sheets

The latex sap obtained from the rubber trees is collected and poured into a rectangular tray. An equal quantity of water and formic acid is added to the latex sap, and the mixture is allowed to dry for three to four hours. Following the drying process, the resultant mixture undergoes a series of procedures in rubber machines to eliminate moisture. This rubber processing involves utilising two machines, which, although outwardly resembling each other, possess distinctly different features on their rollers.

Figure 2. Rollers used to squeeze the rubber sheets. Image: JANAL Archives 2023

At first, the rubber sheet passes through a rolling press, and the number of repeat passes through the machine depends on the moisture content within the sheet. Subsequently, it is fed through the second machine, facilitating the removal of additional water content and achieving the desired textured appearance. The rollers of the second machine are characterised by spiral grooves, which give the final rubber sheet its unique texture. Haridas said, "The sap is collected in a small drum and mixed with ammonia. Once ammonia gets mixed, the sap remains liquid and does not get hard. This mixture of latex sap and ammonia is ready for sale to rubber shops." He said that this way is much more economical under the present circumstances as he does not have to go through the trouble of making rubber sheets every few days."[6]

Once prepared, rubber sheets require further drying, and two distinct methods exist to accomplish this task. The first approach, commonly employed by individuals with smaller plantations, entails exposing the sheets to direct sunlight.

[4] Interview with Suni, rubber tapper, 12 May 2023.

[5] Interview with Haridas B., rubber plantation owner, 9 May 2023.

[6] Haridas B. ibid

These sheets are positioned carefully outdoors, either hung on cloth lines or placed on the ground, with utmost caution to prevent moisture absorption. Vigilance is maintained to safeguard against rainfall, as even the slightest dampness can impede the drying process. One task given to us children during my holidays in my native place was to watch out for summer showers. "Let me know if you see clouds in the sky", my grandfather used to tell me as I ran out to play each day. We, kids, would also help my grandfather or uncle collect the rubber sheets and neatly stack them in a dry place at the slightest indication of imminent rainfall. Generally, this drying method requires approximately two to three days for the sheets to reach the desired dryness level.

Conversely, the second method involves subjecting the sheets to smoke. In this scenario, a small enclosed structure, such as a shed, houses the sheets for a few hours. Subsequently, the shed's doors and windows are sealed tightly, and a fire is ignited, generating smoke that permeates the enclosed space. "Not everyone can do this," said Joy during my interview with him. "To set up a shed like this, one needs adequate space. It also does not make sense to build this if you are a small planter selling only a small number of rubber sheets. Why waste that space for a shed, then? It is much easier to dry it in the sun." [7] Through this procedure, the rubber sheets effectively relinquish all traces of moisture content within the smoke-laden environment. Although this smoking method expedites the drying process, its utilisation is limited due to the potential unavailability of suitable structures. Consequently, the weight of the rubber sheets, fully depleted of moisture via either of these techniques, can range from 400 grams to one kilogram.

Natural and Synthetic Rubber

Natural rubber is commonly derived from Hevea Brasiliensis or the Pará rubber tree, which originally hails from Brazil but is currently cultivated in countries such as Thailand, Indonesia, Malaysia, India, and Vietnam in South and Southeast Asia. While other botanical species like the Panama rubber tree, rubber fig, and the common dandelion can serve as alternative sources of natural rubber, Hevea Brasiliensis remains the preferred choice for commercial applications as it yields latex, which is subsequently utilised in rubber production. Natural rubber, classified as an elastomer, exhibits elastic properties and can revert to its original form after being stretched. It is renowned for its remarkable high tensile strength, setting it apart from most other polymers.

Moreover, natural rubber exhibits greater structural regularity, enhanced green strength, and a faster vulcanisation rate. This rapid vulcanisation rate has positioned natural rubber as a vital raw material in numerous industries, encompassing the production of tires, gloves, rubber carpets, seals, electrical components, hoses and tubes, vibration isolators, drive couplings, shock mounts, and more. The widespread utilisation of natural rubber occurs predominantly in manufacturing tires across diverse sectors, encompassing the automotive and aerospace industries.

Additional distinguishing properties of natural rubber encompass ease of processing, excellent dynamic performance characterised by low hysteresis loss, favourable low-temperature attributes, affinity for bonding with metal

[7] Interview with Joy T., rubber plantation owner, 10 May 2023.

components, high resistance to tearing and abrasion, superior dynamic performance, minimal heat build-up during heating, and low damping characteristics. The monomer responsible for natural rubber is the cis-1,4-isoprene unit. Both latex and dry rubber forms find direct application across various industrial sectors. Notwithstanding the development of alternative synthetic rubbers boasting exceptional qualities, natural rubber continues to capture a substantial market share of 30-40% in the global rubber industry.

Synthetic rubbers encompass the category of artificially produced rubbers. "That is different from our rubber", Roy, a rubber shop owner in Koothattukulam, said. "That is made in big factories. It is not the rubber we get from rubber trees."[8] Synthetic rubbers primarily rely on raw materials obtained as by-products of crude oil extraction. The synthesis of synthetic rubbers employs either solution or emulsion polymerisation techniques.

Despite its exceptional properties, natural rubber exhibits notable vulnerabilities to atmospheric oxygen, ozone, oils, and diverse hydrocarbon solvents. In contrast to natural rubber, synthetic rubber's properties are tailored to meet specific requirements by applying diverse polymer chemistry techniques. For instance, it is possible to develop synthetic rubbers with exceptional resistance to weather conditions, chemicals, temperature variations, and solvents. Over 20 distinct classes of synthetic rubbers exist, each characterised by diverse chemical and physical properties that fulfil specific product demands. For example, EPDM is renowned for its exceptional weather resistance, while NBR exhibits the highest level of oil resistance.

The distinction between natural and synthetic rubber lies in their production methods, resulting in differing properties. However, the superiority between the two depends on their use, as each exhibits more suitability for specific applications. Synthetic rubber is generally better than natural rubber when it comes to temperature, ageing, and abrasion resistance, and tends to be more cost-effective in production. Natural rubber is renowned for its strength, flexibility, and heat resistance, making it an ideal material for latex-based products. The choice between the two often hinges on the intended application. For instance, while additives can enhance the saltwater resistance of natural rubber, neoprene demonstrates superior resistance and is often favoured for marine applications.

While natural and synthetic rubber can serve as substitutes, their inherent differences limit their ability to substitute one another. Consequently, the markets for each type of rubber are not closely interrelated, resulting in observable price differences. The pricing disparity between natural and synthetic rubber arises from demand-side factors, such as utilisation and production, and supply-side factors, including raw material prices and agricultural limitations. Nonetheless, supply-side factors primarily influence rubber prices, contributing to significant volatility, particularly in the case of natural rubber.

[8] Interview with Roy, Rubber Trader, Koothattukulam. 12 May 2023.

Year	Area (in Hectares)	Production (in MT)
1955-56	78457	21680
1960-61	122628	23175
1965-66	154878	46953
1975-76	205383	128769
1985-86	312000	184563
1995-96	443300	476495
1999-00	469924	572820
2005-06	494400	739225
2006-07	502240	780405
2007-08	512045	753135
2008-09	517475	783485
2009-10	525408	745510
2010-11	534230	770580
2011-12	539565	798940
2012-13	539565	800050
2013-14	548225	648220
2014-15	549955	507700

Table 1 - Area of Land used for Rubber Plantations in Kerala. Source: Kerala Government Agricultural Report, 2016

Kerala is responsible for approximately 75% of the planted area and 89% of national rubber production, making it the largest rubber-producing state in India. Along with Tamilnadu, it is considered a traditional rubber-growing region. Since introducing natural rubber cultivation in India, Kerala has held a near-monopoly position in its cultivation and production. However, the falling and unstable price of natural rubber has been a significant issue for Indian rubber growers, notably after the introduction of new economic policies. Although Kerala remains the country's foremost rubber producer, its contribution to overall production has declined. The initial stages of rubber cultivation in Kerala witnessed relatively low production levels. However, a continuous upward trend surpassed the area's trend line during the 1990s. Despite the sharp fall in rubber prices over four consecutive years from 2012-13 to 2019-20, the total area under rubber cultivation in the traditional region increased by 23.6% compared to the previous seven-year period. The maximum area expansion was seen in Kerala's southernmost and northern districts, while the central districts showed a decline or only a marginal increase. It is still unclear why rubber cultivation expanded despite the low prices, but the rubber plantation sector remains robust compared to other crops in the state.

"The price of rubber has always fluctuated. In the seventies, I made more profit from ginger than rubber! However, I do not think it has ever fallen as low as it has now. The price looks okay when you look at it without context. What one needs to understand is how much the cost of maintenance and labour charges have gone up during the past decade. Once all these expenses are covered, we barely get any profit. Which makes it almost pointless to continue with rubber plantations," said Joy.[9]

Cultivated Area	2005-06	2012-13	2019-20
Rubber area as a per cent of the total geographical area	12.8	14.0	15.03
Rubber area as a per cent of the total cropped area	19.3	20.8	22.6

Table 2 - Changes in the per cent share of rubber cultivated area in Kerala[10]

[9] Interview with Joy T, rubber plantation owner, 10 May 2023.

[10] Balan, Pradeep & Jacob, James. (2021). Kerala Growers and their Interest in Rubber Cultivation. EPW Online. ISSN (Online) - 2349-8846.

On the production front, Kerala's share grew from 93 per cent to 94 per cent between 1965 and 1996 but has since declined to 84 per cent. The rate of decline in the percentage share of rubber production from Kerala is 10 per cent. This decline is attributed to the rise in rubber cultivation in other states across the country and current planters in Kerala choosing not to tap their trees, hoping the price will rise in the coming years.

Current Trends in Cultivation and Price

The natural rubber industry in the country has been facing a severe crisis since 2012 due to a significant drop in rubber prices, rising production costs, and declining yields from ageing rubber plantations. This crisis has affected both large estates and smallholders, with the latter being particularly vulnerable as they are often heavily reliant on rubber cultivation for their livelihoods. It is observed that small and medium rubber growers in traditional regions like Kerala are losing interest in rubber cultivation and are planning to, or already are shifting to, the cultivation of other crops. Some are even finding other uses for the land which they own. The Kerala Land Reforms (Amendment) Bill, 2013 prohibits large estates from converting their land into a plantation that grows another crop. It also prohibits such land from being put to any other use. Kerala has experienced a similar trend in the past, where farmers switched to cultivating other crops when the prices of those crops were high.

Similarly, growers who have a significant portion of their family income from non-rubber sources are abstaining from tapping their rubber holdings as the price is low. During this research, this researcher met several growers who had stopped tapping, hoping the price would rise in the coming months or years. "Our rubber is still growing. Hopefully, by the time it is old enough, the price will go back up," said Girija, another grower. Other cultivators are now choosing not to make rubber sheets due to the low cost of rubber and the high labour charges. [11]

The international market has caused wide fluctuations in natural rubber prices over the past two decades. After experiencing an upward trend from 2000-01 to 2011, with minor fluctuations, rubber prices sharply declined in 2011. As a result, the present market price is less than 50% of what it was a few years ago. This phenomenon has caused severe hardship for the approximately 13 lakh small rubber cultivators facing a crisis due to the price drop. Rubber cultivators in Kerala were experiencing a severe price fall and a substantial production cost increase. Tapping costs, chemical expenses, labour costs, and land development are leading to poor living conditions for most cultivators. The current earnings not increasing to meet their expenses is causing some to abandon rubber cultivation. Joy, a prominent plantation owner in Veliyannoor, told the researcher that he was considering stopping rubber cultivation once the trees he has now stopped producing latex. "I might not plant rubber again. It is just not profitable," he said.[12]

Small and medium rubber growers in traditional regions like Kerala are losing interest in rubber cultivation, and there is potential for the conversion of rubber holdings into other crops or land use on a

[11] Interview with Girija N, rubber plantation owner, 12 May 2023.
[12] Interview with Joy T, rubber plantation owner, 10 May 2023.

large scale. The crisis persisted for the past few years, leading to appeals and strikes for government intervention to save the farmers. Stakeholders in the industry have been demanding an urgent review of the rubber import policy to reduce imports and improve domestic prices. Immediate intervention can prevent further decline in rubber prices and safeguard the livelihoods of millions of cultivators.

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