Problems and Prospects of Rubber Farmers in Kerala: A Primary Survey-Based Study

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ABSTRACT

Natural rubber cultivation is one of the most important plantation-based agricultural activities in Kerala, contributing significantly to rural livelihoods, employment generation, and the state's agricultural economy. However, rubber farmers increasingly face challenges arising from price volatility, labour shortages, rising production costs, climate change, and institutional constraints. Against this backdrop, the present study examines the problems and prospects of rubber farmers in Kerala using primary survey data. The study is based on a structured questionnaire administered to 81 rubber cultivators during April–May 2026. Descriptive statistical tools such as frequency distribution, percentage analysis, and mean score ranking were employed to analyse the data.

The findings reveal that rubber cultivation in Kerala is predominantly undertaken by educated smallholder farmers cultivating on self-owned land. Price fluctuation emerged as the most severe challenge faced by farmers, followed by labour shortages, high production costs, climate change-related issues, inadequate government support, and crop diseases. Although a majority of respondents continue to perceive rubber cultivation as profitable and intend to maintain their plantations, considerable uncertainty exists regarding its long-term sustainability. The study further finds that large-scale crop substitution has not yet occurred; however, declining interest among younger generations raises concerns regarding the future continuity of rubber cultivation. While awareness of government support schemes is relatively high, procedural complexities, lack of guidance, and delays in subsidy disbursement limit their effectiveness.

The study concludes that strengthening price stabilisation mechanisms, improving labour availability, promoting labour-saving technologies, enhancing extension services, and simplifying subsidy procedures are essential for improving the resilience and sustainability of the rubber sector in Kerala.

Keywords: Rubber cultivation, Kerala, Rubber farmers, Price fluctuation, Labour shortage, Government support, Crop diversification, Agricultural sustainability.

JEL Classification: Q12, Q13, Q18, R11

INTRODUCTION

The agricultural sector employs around 27% of the people of Kerala (Government of Kerala, *Economic Review*, 2022). Kerala has varying altitudes, soil types and varying climate according to the region; it is suitable for growing many agriculturally significant crops. One of the major crops produced by Kerala is rubber. Kerala is the leading producer of natural rubber in India. Kerala contributes over 90% of the total rubber production in the country. More than 20% of the gross cropped area in Kerala is under rubber cultivation, producing over 5 lakh tonnes of natural rubber annually. It is the most significant cash crop in Kerala (Kerala State Planning Board, *Economic Review*, 2023). Rubber is also a historically significant crop, as rubber plantations were initially introduced during the colonial period by the British to break the Brazilian monopoly over rubber. The first commercial *Hevea brasiliensis* plantations in India were established at Thattekadu, Kerala, in 1902. Post-independence, most plantations were divided into small holdings, but the

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owners of these plots chose to continue cultivating rubber as it has a higher value compared to paddy or coconut. By the 1980s, rubber cultivation became more popular as it provided a steady income throughout the year (Sinumon & Mahalakshmi, 2020). Natural rubber is obtained by tapping the *Hevea brasiliensis* tree by making an incision on the tree and allowing the milky latex to flow into a collection cup. This process usually begins after the tree has reached maturity, which is around 5–7 years after it has been planted. After this initial wait, the latex is harvested daily for 25–30 years. Rubber plantations help in carbon sequestration and micro-climate regulation. They also act as a soil anchor and help prevent soil erosion. Timber from these plantations also serves as an eco-friendly option for the furniture industry (Anuja et al., 2012). There are approximately 2,150 registered RPS units in Kerala (Down to Earth, 2025). Rubber processing units allow farmers to move up the value chain by processing field latex — which has a short shelf life — into sheets which can be stored for longer and sold when market prices are higher. The minimum support price (MSP) provided by the government for rubber is ₹180 per kg (Rural Voice, 2024). Crop diversification has also been adopted by many farmers to increase soil fertility and income (George & Sharma, 2020).

However, in recent years, with higher costs of production and market volatility, the industry is adapting. Even though the market value of rubber has increased, due to rising labour costs farmers' income seems to be stagnant. Since rubber is grown in countries like Thailand, Vietnam, and Ivory Coast, buyers prefer imports, which increases domestic competition (Rubber Board of India, 2025). Through this paper we will look into how much of the final market price actually reaches the farmer, how effective the government schemes supporting these farmers are, and whether rubber will continue to be a dominant crop or whether a shift to other crops will occur due to economic uncertainties.

LITERATURE REVIEW

Various studies explore the economic implications of natural rubber cultivation in Kerala, examining how price signals reach smallholder farmers, how effective government interventions have been, and whether rubber will remain the dominant crop in the state.

J Manag Res Anal (2024) discovered that when rubber prices were high in previous years, a surplus can be found in current years, causing a price drop that continues to form a cobweb pattern. This cyclical dynamic means that price signals reaching farmers are inherently lagged and distorted, making rational production decisions difficult and further eroding effective price realisation at the farm level. Nithin et al. described that transportation constitutes the largest marketing cost across all channels, ranging from ₹15 to ₹23 per quintal. Farmers selling through Rubber Producers' Societies tend to have higher marketing efficiency but face challenges with economies of scale compared to private dealers, limiting the practical benefits of cooperative marketing for many smallholders. Sinumon and Mahalakshmi (2020) observed that the rubber sector in Kerala is dominated by smallholders, making it vulnerable to price fluctuations, weak marketing systems, and exploitation by intermediaries. Their findings also indicate that productivity and quality issues further reduce farmers' competitiveness, meaning that even when market prices rise, the share reaching individual farmers is often diminished by structural inefficiencies throughout the supply chain. Anuja et al. (2019) assessed the economics of natural rubber production in Kerala and found that members of Rubber Producers' Societies incurred a 14 per cent lower cost of cultivation compared to non-members, and their gross return was approximately 10 per cent higher due to better price realisation through group processing and marketing facilities. The return per rupee of cost was 2.68 for RPS members versus 2.08 for non-members, confirming the economic advantage of cooperative participation for smallholders. The Comptroller and Auditor General of India noted that 63 per cent of growers did not apply for available subsidies due to lack of awareness. Furthermore, while India's subsidies range from ₹20,000 to ₹40,000 per hectare, they are significantly lower than those in competing nations like Thailand and Malaysia, which offer up to six times more support, placing Indian smallholders at a structural competitive disadvantage in global markets.

Odamkulath and Manoj (2018) found that falling rubber prices have had a severe impact on the livelihood of small farmers, leading to reduced production and economic instability. The study emphasised the urgent need for government policy intervention to stabilise the sector, particularly through mechanisms that provide a floor price and reduce farmers' exposure to global market volatility. Mathew (2022) examined the underlying causes of declining rubber cultivation in Kerala, highlighting that small farmers face the twin problems of low yield

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

from ageing plantations and very low market prices for their produce. He noted that because farmers lack proper marketing channels and access to scientific practices, Rubber Producers' Societies were established to reduce bureaucratic obstacles and improve collective bargaining power, though their effectiveness remains constrained by limited funding and weak extension linkages. A study documented in Down to Earth (2025) found that approximately 20 per cent of Rubber Producers' Societies are now defunct and another 35 per cent dysfunctional, with the Rubber Board withdrawing approval to 336 societies in 2020–21 alone. The average annual revenue of an RPS stands at around ₹2.5 lakh, of which over 85 per cent derives from rubber and input sales, while nearly 27 per cent of RPSs rely on grants, loans, or subsidies for more than half their income, raising serious questions about their long-term institutional viability. George et al. found that due to falling prices, farmers have either reduced or stopped tapping entirely. In some regions a documented shift can be seen toward exotic fruits or real estate, as rubber is being seen as financially viable only when the final timber value of the trees is factored into calculations. This finding suggests that for many smallholders, rubber is transitioning from an active crop to a deferred asset rather than a reliable source of regular income. Ali and Manoj (2020), in a case study of Kothamangalam Taluk, found that the drastic crash in natural rubber prices since 2012, combined with rising production costs and declining yields from progressively ageing holdings, pushed the sector into a major crisis. Farmers were reluctant to maintain plantations, reduced tapping days, and in some cases abandoned cultivation entirely, resulting in increased indebtedness and overdue bank loans. Both large estates and smallholders were adversely affected, though the impact on those who depended primarily on rubber for their livelihoods was most severe. Mahesh et al. (2020), in a temporal analysis of crop diversification in Kerala covering 1987–88 to 2016–17, found that the area under food crops has been steadily declining while the area under commercial crops — particularly rubber, arecanut, and banana — has been increasing. Significantly, the study found that when wage rates rise, farmers tend to shift toward less labour-intensive perennial crops, suggesting that labour market conditions are a key determinant of cropping pattern evolution in the state. Joseph and Jacob (2021), writing in Economic and Political Weekly, presented a counter-intuitive finding using satellite-derived land-use data: despite the drastic fall in rubber prices since 2012, Kerala growers maintained their interest in the crop, with total area under rubber cultivation registering steady growth independent of market fluctuations. However, those growers with a substantial share of income from non-rubber sources abstained from tapping when prices were low, with their share of area estimated at 25 to 30 per cent, indicating a dual-track response within the smallholder community rather than a uniform shift away from rubber. Rajasekharan and Veeraputhran (2002), in a study of rubber smallholdings across three regions of Kerala, established that the availability of family labour and the type of intercrops were the most significant determinants of intercropping adoption, with banana, cassava, and pineapple showing the highest probability of uptake. This is consistent with later global evidence reviewed by Blare et al. (2022), who found that rubber agroforestry has the potential to reduce the vulnerability of smallholders to volatile rubber markets, particularly where income from secondary species constitutes a substantial share of total household income, suggesting that diversification within rubber holdings — rather than complete crop abandonment — may represent the most realistic path forward for Kerala's smallholder community.

Literature gap- Existing studies have predominantly focused on either price behaviour, marketing efficiency, government support, or crop diversification individually. Limited empirical evidence exists regarding how these factors simultaneously influence smallholder rubber farmers' livelihood decisions in Kerala. Moreover, recent post-pandemic market conditions and rising labour costs have not been adequately examined through primary survey-based studies. The present study attempts to address this gap.

Objectives- The basic intention of this paper is to

1. examine the socio-economic profile of rubber farmers
2. study labour, cost, and productivity issues
3. analyse how economic uncertainties are causing a shift from rubber cultivation to other crops
4. evaluate government support and policy effectiveness

METHODOLOGY

The present study adopts a descriptive and analytical research design to examine the problems and prospects of rubber farmers in Kerala. The study is primarily based on primary data collected through a structured

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

questionnaire administered among rubber cultivators in Kerala during April–May 2026. A convenience sampling technique was employed to select the respondents, and a total of 81 valid responses were collected from rubber cultivators in Kerala for the analysis. Since the study is exploratory in nature and aimed at understanding farmers' perceptions regarding the problems and prospects of rubber cultivation, a sample size exceeding 30 respondents was considered adequate for descriptive and inferential statistical analysis. Similar studies on plantation agriculture and farmer perception have frequently employed sample sizes ranging between 50 and 100 respondents. Furthermore, according to Central Limit Theorem principles, samples above 30 observations generally provide reasonably stable estimates for statistical analysis. Therefore, the sample size of 81 respondents was considered sufficient to identify major trends and relationships within the surveyed population.

The questionnaire was designed to gather information on the socio-economic characteristics of farmers, labour availability, production costs, productivity issues, future prospects of rubber cultivation, crop diversification tendencies, and awareness and effectiveness of government support schemes. In addition to primary data, secondary information was obtained from government reports, publications of the Rubber Board of India, the Economic Review of Kerala State Planning Board, research articles, and other relevant sources. The collected data were coded, tabulated, and analysed using descriptive statistical tools such as percentage analysis, frequency distribution, and graphical representation. The findings are presented objective-wise to provide insights into the socio-economic profile of rubber farmers, the major challenges affecting cultivation, the impact of economic uncertainties on future farming decisions, and the effectiveness of existing government support mechanisms. Although the use of convenience sampling may limit the generalisation of the findings, the study provides valuable empirical evidence regarding the current status, challenges, and future prospects of rubber cultivation in Kerala.

RESULT AND ANALYSIS

Objective 1 - examine the socio-economic profile of rubber farmers

Firstly, their education level, information about their land and income will be examined

Education level-

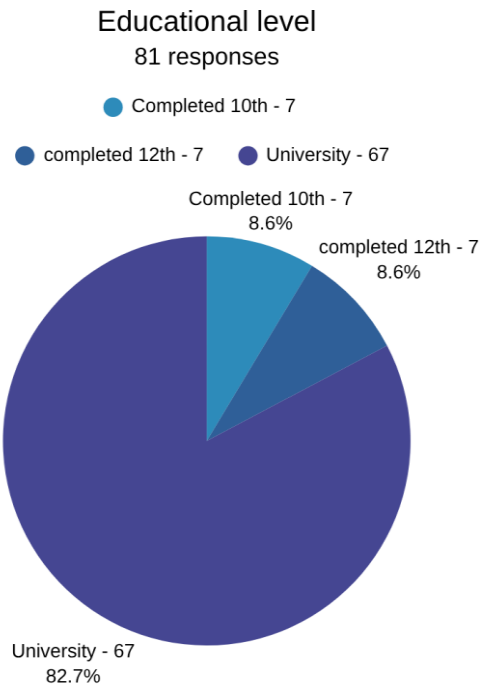

Figure 1 -Pattern of education levels of the respondents (Source- Primary Survey by the authors)

Most respondents have completed their universities, followed by people who have completed their 10th grade. Therefore, the majority of the respondents are highly educated with degrees.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

Land-

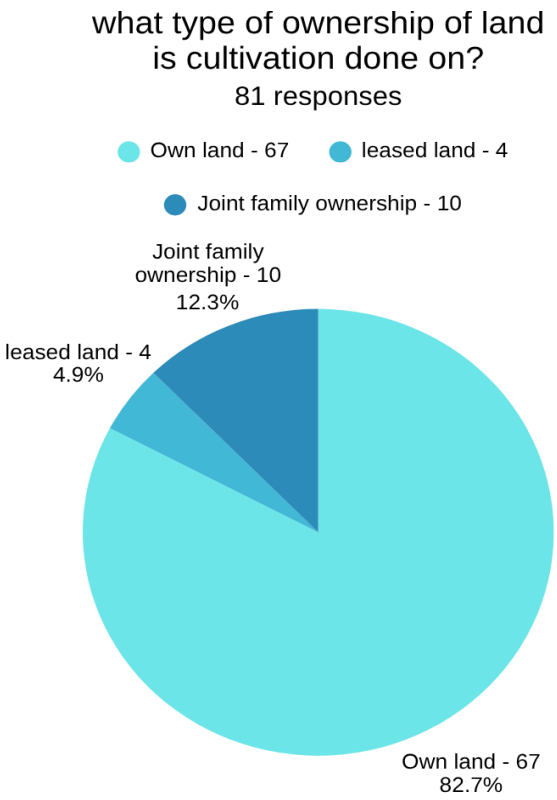

Figure 2 - Type of ownership of land cultivated on(Source- Primary Survey by the authors)

The majority of the respondents cultivate rubber on land owned by them, making up 82.7% of the total sample. Then, 12.3% of respondents work on lands owned as a joint family. The remaining 4.9% work on leased land.

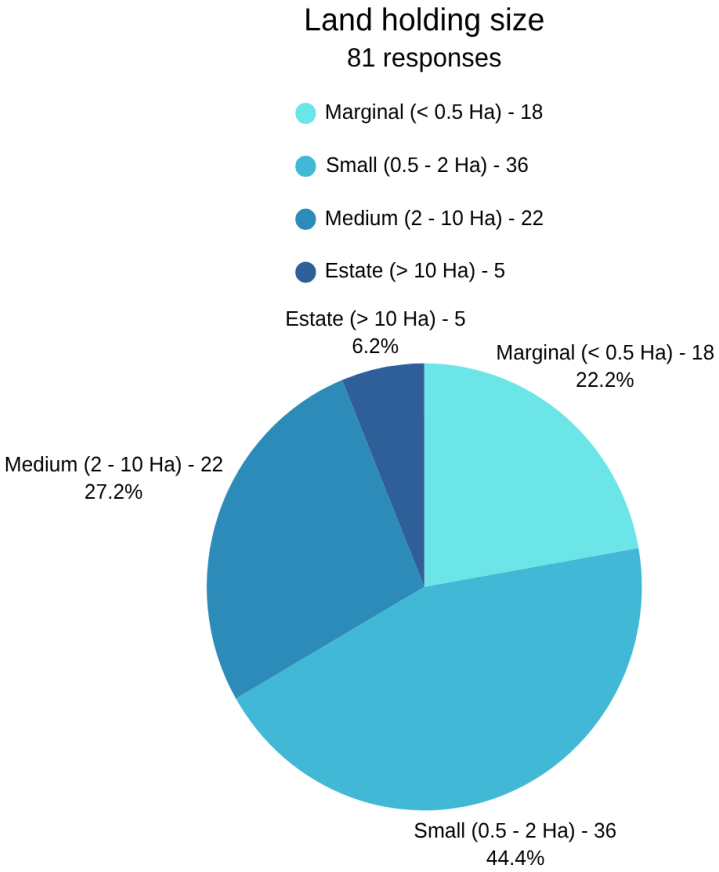

Figure 3 - Size of the land of the respondents (Source - primary survey by the authors)

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

Most respondents have a small plot (0.5 -2 Ha) on which they cultivate, followed by medium size plots (2-10 Ha) and Marginal size plots (< 0.5 Ha).

Experience-

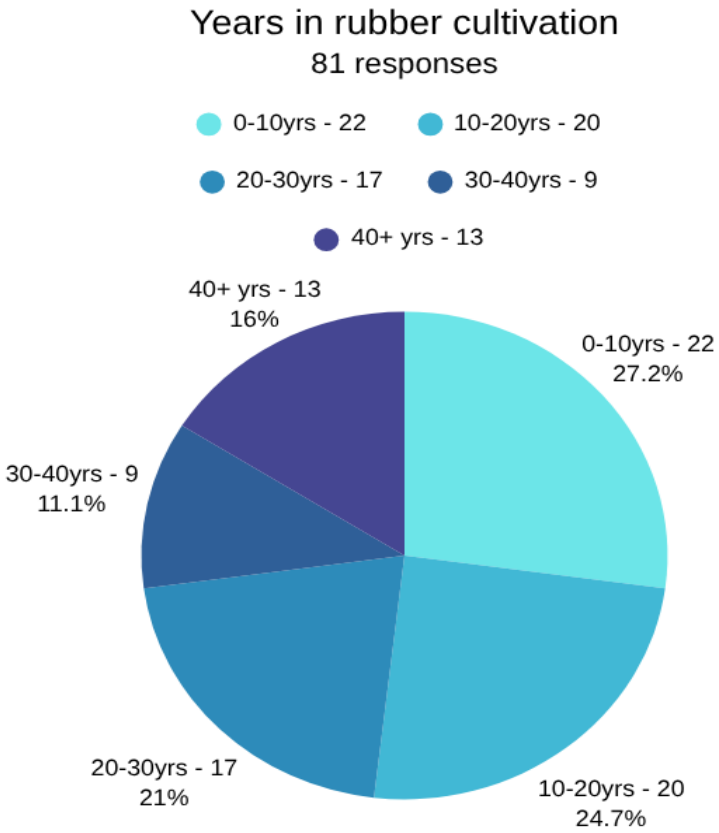

Figure 4- Years of experience in rubber cultivation of the respondents (Source - primary survey by the authors)

The majority 27.2% of the respondents had 0-10 years of experience, closely followed by 24.7% having 10-20 years and 21% having 20-30 years of expertise.

58% of responders consider rubber cultivation as their main job while the remaining 42% consider it as part time.

So, the first chapter deals with the socio-economic profile of the respondents. It indicates that rubber cultivation in Kerala is predominantly undertaken by educated farmers, with the majority possessing university-level education. This suggests that rubber farming is not merely a traditional occupation but is increasingly managed by individuals capable of understanding market trends, government schemes, and modern cultivation practices. The land ownership pattern reveals that most respondents cultivate rubber on their own land, demonstrating a strong sense of ownership and long-term commitment to the crop. The predominance of self-owned holdings reduces tenancy-related uncertainties and encourages investment in plantation maintenance. The distribution of land size indicates that smallholders constitute the largest segment of rubber growers. This finding aligns with earlier studies which identify Kerala's rubber sector as being dominated by small and marginal farmers. Consequently, fluctuations in income and production have a direct impact on household welfare.

The experience profile shows a balanced representation of both new and experienced farmers. The presence of younger entrants indicates continued interest in rubber cultivation, while the substantial share of experienced cultivators reflects the crop's historical importance in Kerala's agricultural economy. Further, 58 percent of respondents depend on rubber cultivation as their primary occupation, highlighting its continued significance as a livelihood source. Overall, the findings suggest that rubber cultivation remains an economically important activity among smallholder farmers despite emerging challenges.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

Objective 2 - This chapter deals with the issues associated with labour, cost, and productivity issues

Labour-

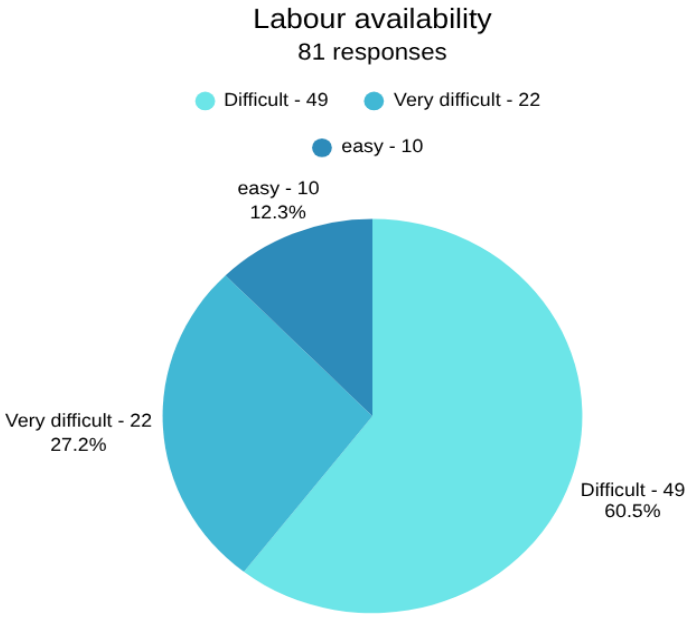

Figure 5- Labour availability (Source - primary survey by the authors)

An overarching amount of cultivators report labour availability as difficult to very difficult whilst only 12.3% of cultivators find it easily available.

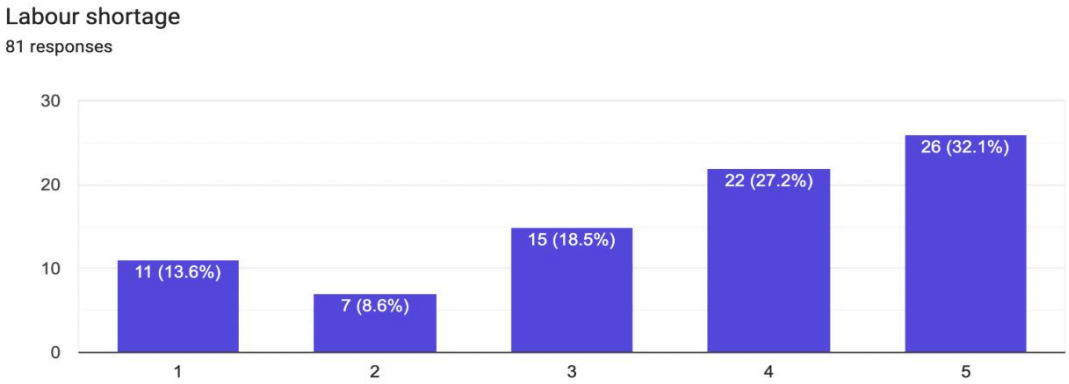

Figure 6- Labour shortage (Source - primary survey by the authors)

Most responders chose a high 4 and 5 out of 5 for how much labour shortages are affecting their production.

Costs-

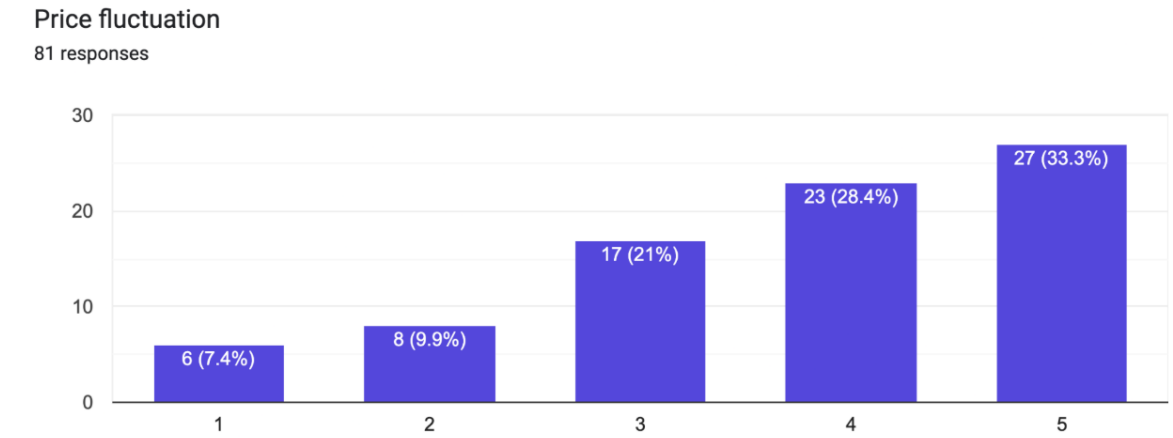

Figure 7- Labour shortage (Source - primary survey by the authors)

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

Price fluctuation of rubber in the global markets are a huge factor in the profits earned by the farmer. In economic conditions like sudden recessions and wars, uncertainty grows. The responders have reflected this through their answer as over one third of the response have noted this as a 5/5 problem.

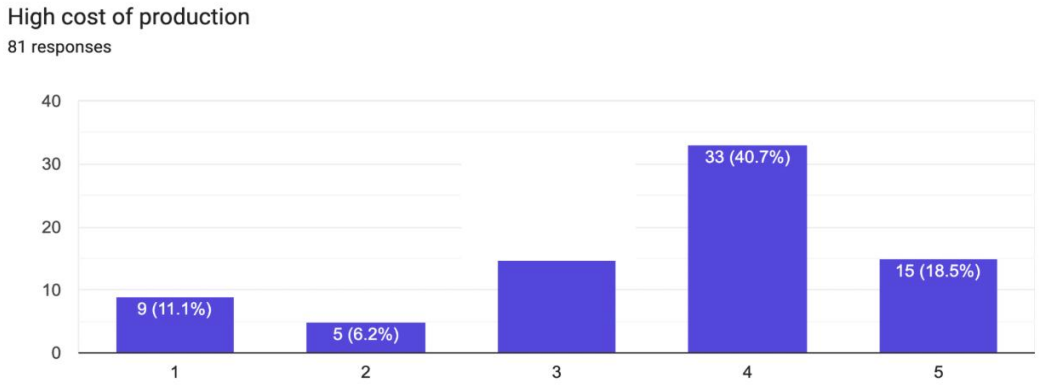

Figure 8- High cost of production (Source - primary survey by the authors)

over 40% of the respondents have described high costs of rubber production as a difficult problem. These high costs determine how profitable cultivation is and it is the reason why many farmers are deciding to abandon cultivating.

Environmental factors-

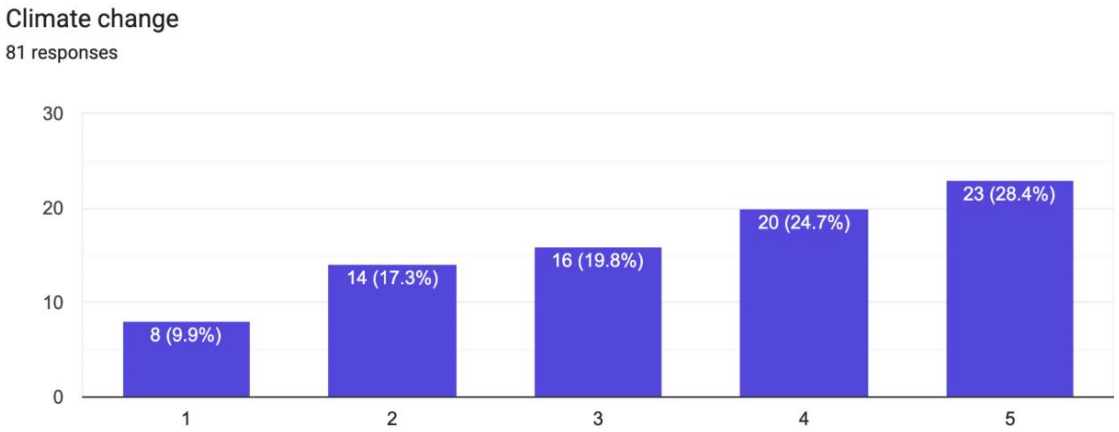

Figure 9- Climate change (Source - primary survey by the authors)

The effects of climate change are becoming more vivid day by day and it negatively affects these farmers in many ways. That is shown in their responses as 28.4% has labelled it with 5 on the scale and 24.7% as with 4 thus classifying it as a major problem.

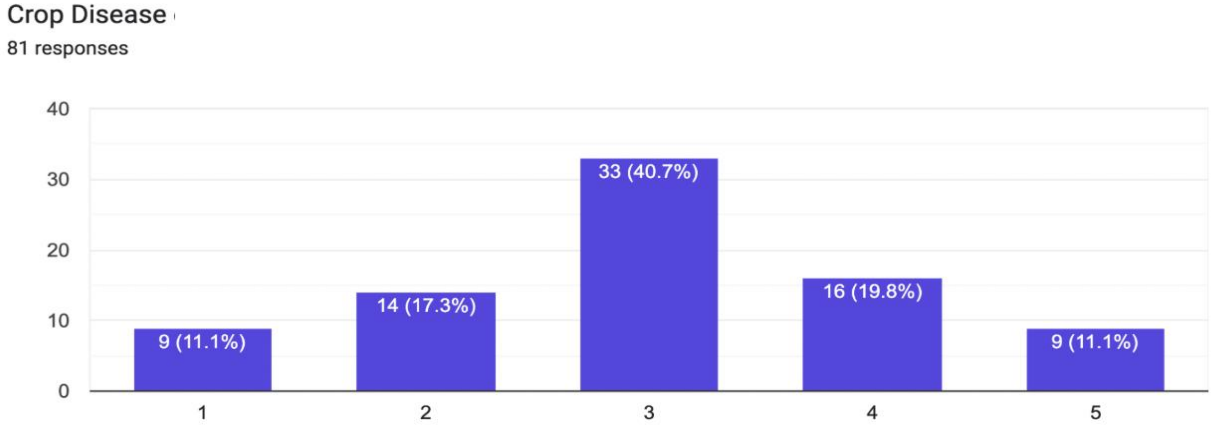

Figure 10- Crop disease (Source - primary survey by the authors)

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

Crop disease shows to be a manageable problem as it is mostly rated with a 3. The developments in technology and understanding various needs of the crop has helped in prevention and cure.

The findings from this second chapter, clearly indicate that labour-related problems constitute one of the most serious constraints faced by rubber cultivators. A large majority of respondents reported labour availability as difficult or very difficult, reflecting the growing shortage of skilled tappers in Kerala. Labour shortage has a direct effect on productivity because tapping operations require specialised skills and regular maintenance. Delays or interruptions in tapping reduce latex yield and consequently affect farmers' income. The high ratings assigned to labour shortages indicate that farmers perceive this issue as a major obstacle to efficient production.

Price fluctuation emerged as another critical concern. Since rubber prices are heavily influenced by global market conditions, farmers remain exposed to economic uncertainties beyond their control. The high severity ratings assigned to price fluctuations suggest that income instability remains one of the principal risks associated with rubber cultivation. The high cost of production also significantly affects profitability. Increasing wages, rising input costs, transportation expenses, and maintenance costs have reduced profit margins for many cultivators. This explains why some farmers are reconsidering the economic viability of rubber cultivation despite recent improvements in market prices. Environmental challenges further compound these difficulties. Climate change was identified as a major issue because irregular rainfall patterns reduce tapping days and adversely affect latex production. In contrast, crop diseases were viewed as a relatively manageable problem, possibly due to improvements in cultivation practices, extension services, and disease management technologies.

Overall, the findings demonstrate that labour scarcity, price volatility, production costs, and climatic uncertainties collectively pose significant threats to the sustainability and profitability of rubber cultivation.

Objective 3 - This chapter analyse how economic uncertainties are causing a shift from rubber cultivation to other crops

Future prospects-

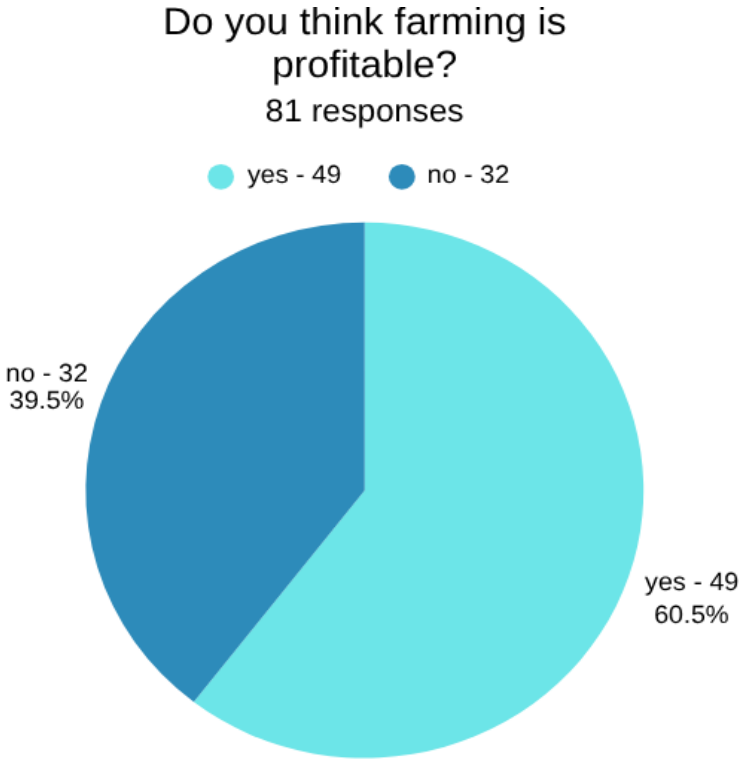

Figure 11- Profitability of rubber farming (Source - primary survey by the authors) over 55% of respondents agree that rubber farming is a profitable trade.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

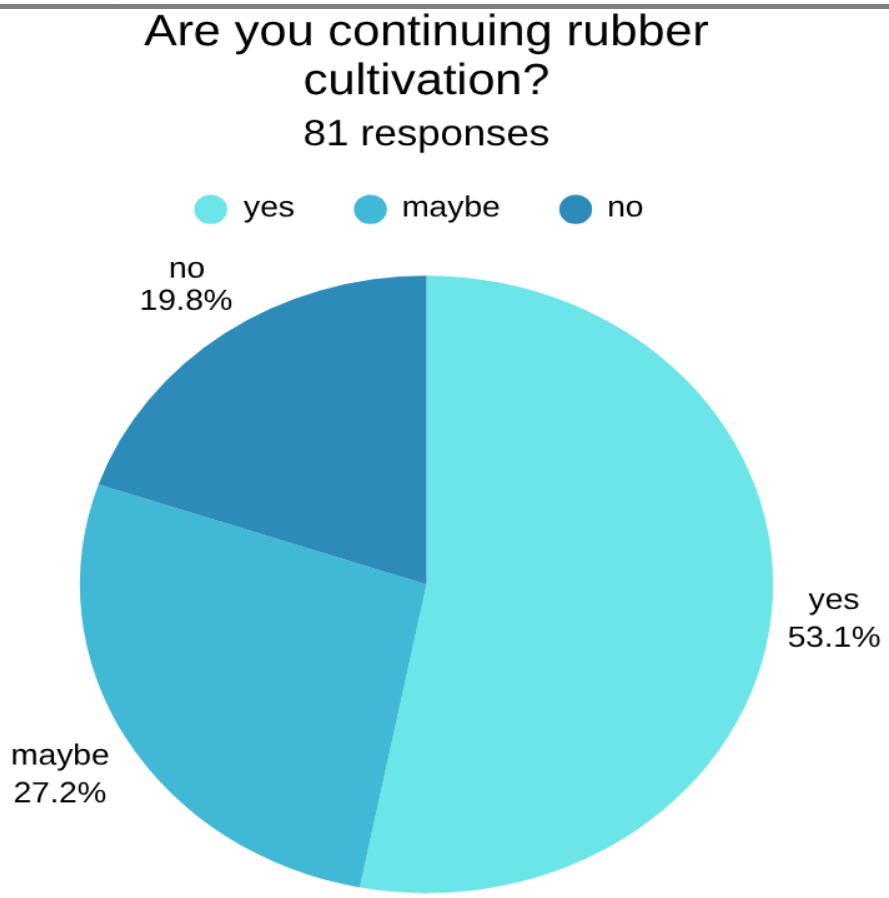

Figure 12- Continuation of rubber farming (Source - primary survey by the authors)

While most respondents have pointed out that they want to continue farming rubber a significant chunk of respondents are uncertain about the future of their rubber cultivation.

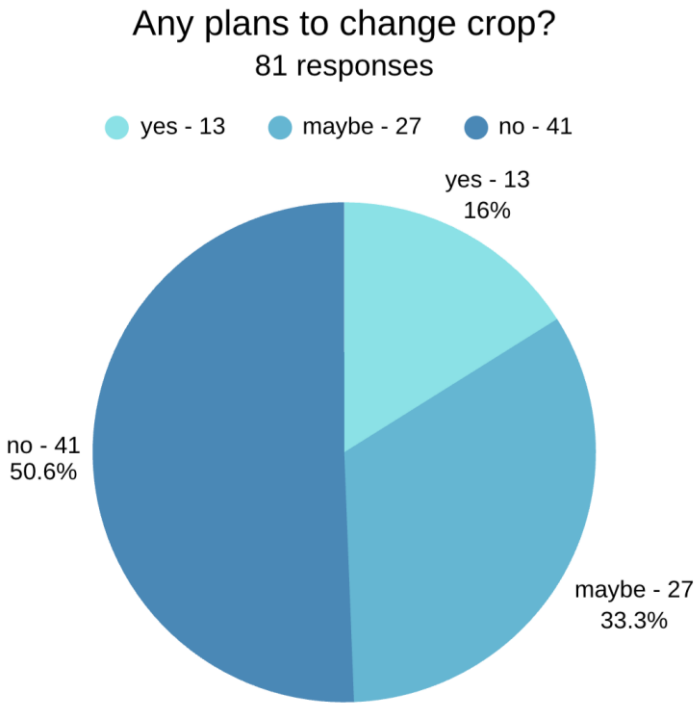

Figure 13- Crop change (Source - primary survey by the authors)

The majority of the respondents aren't planning on changing crops but almost 1/3rd of them are uncertain.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

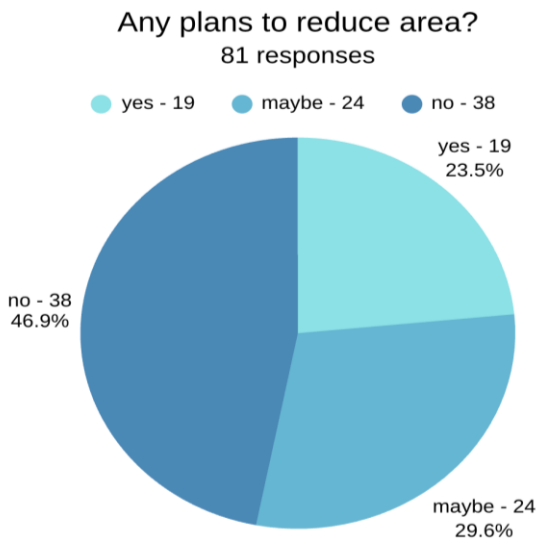

Figure 14- Area reduction (Source - primary survey by the authors)

Most farmers are not planning on reducing the area under cultivation.

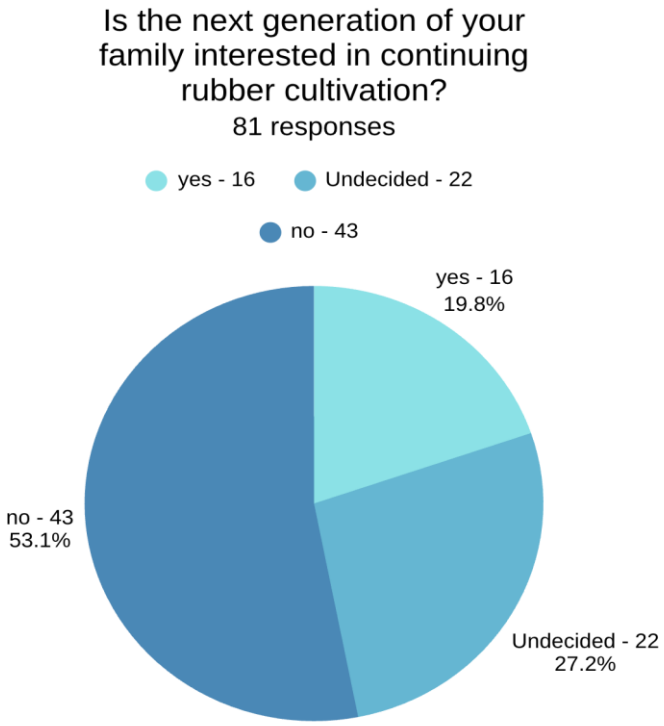

Figure 15- Interest of next generation (Source - primary survey by the authors)

The desirability of the next generation to continue rubber farming has dropped. Almost 50% have voted that the next generation is going to switch careers while 23.5% are yet to decide.

The results of this chapter reveal an interesting contradiction between current profitability perceptions and future uncertainty. Although more than half of the respondents consider rubber cultivation profitable, a considerable proportion remain uncertain about its long-term viability.

Most respondents expressed their intention to continue cultivating rubber, suggesting that the crop continues to provide economic value. Similarly, the majority are not planning to shift to alternative crops or reduce the area under cultivation. These findings indicate that despite existing challenges, rubber remains the preferred crop among most farmers. However, a significant proportion of respondents expressed uncertainty regarding future cultivation decisions. This uncertainty can be attributed to persistent concerns about labour shortages, price

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

fluctuations, climate risks, and increasing production costs. The results suggest that while farmers are not currently abandoning rubber cultivation, they are cautious about its future prospects. A particularly important finding is the declining interest of the next generation in rubber farming. Nearly half of the respondents believe that younger family members are likely to pursue alternative careers. This reflects changing occupational aspirations, urbanisation, and the perception that agriculture offers lower returns compared to non-farm employment opportunities.

Therefore, the study concludes that economic uncertainties have not yet triggered large-scale crop substitution; however, they have created considerable doubt regarding the long-term sustainability of rubber cultivation, particularly among younger generations.

Objective 4 - Lastly, this chapter will evaluate the government support and policy effectiveness.

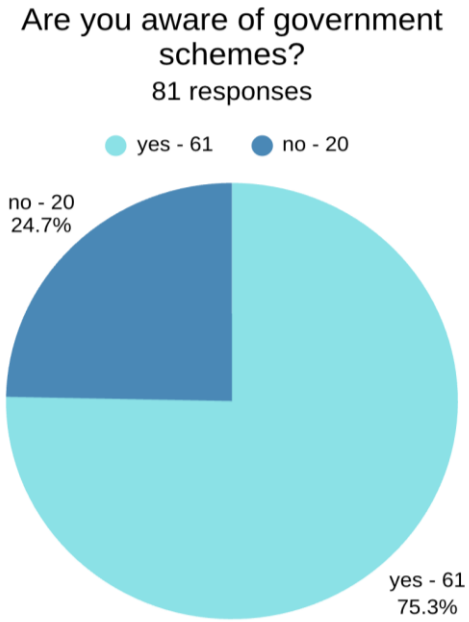

Figure 16- Awareness of government schemes (Source - primary survey by the authors)

While a huge percent of respondents seem to be aware of the government schemes, over 23% are unaware of possible benefits and subsidies provided by the government.

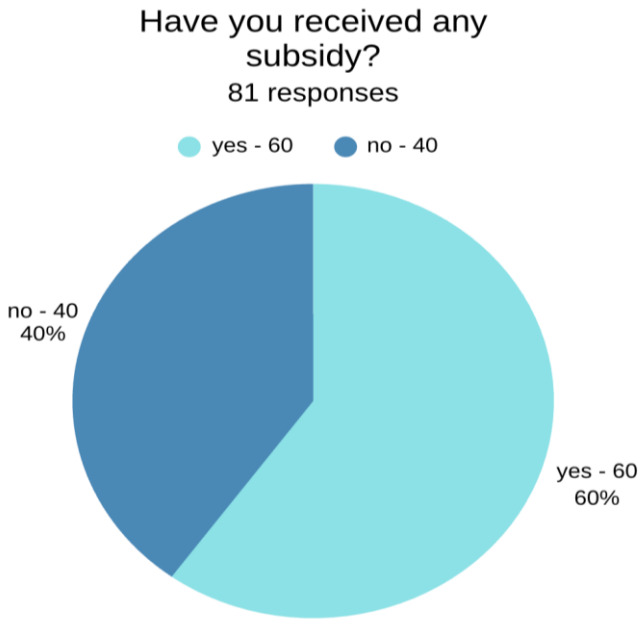

Figure 17- Subsidy (Source - primary survey by the authors)

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

The respondents who have claimed subsidies provided by the government and who have not are split in two as almost 50% have and 50% have not. Subsidies help the farmers earn more profits and oftentimes it is what helps make rubber farming economical.

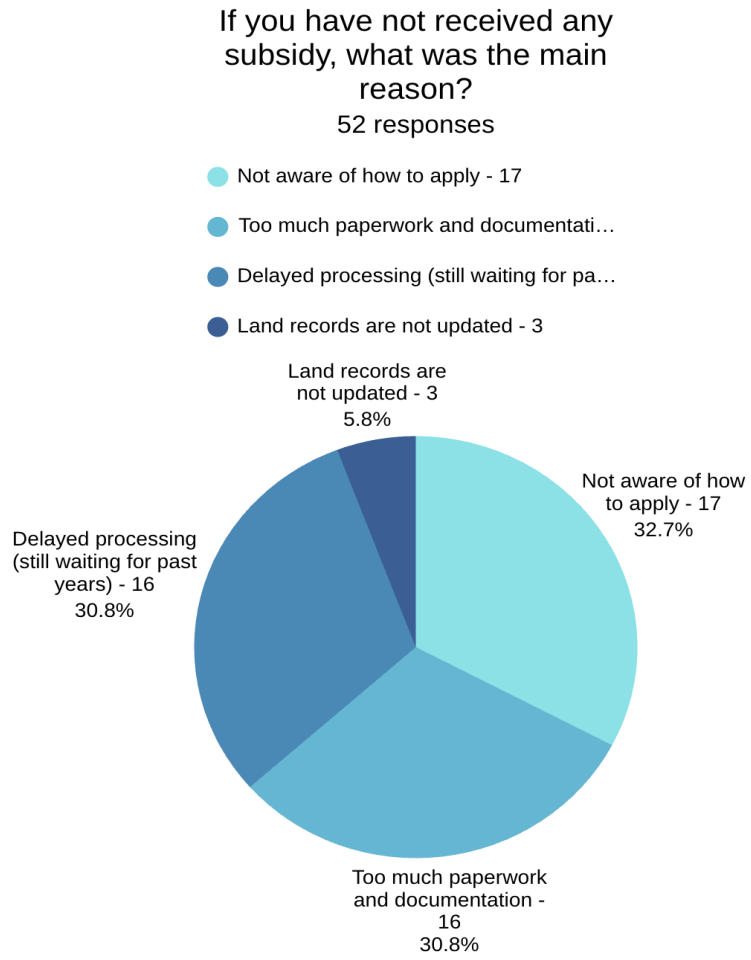

Figure 18- Reason for not receiving subsidy (Source - primary survey by the authors)

The most prevalent reason for why farmers have not received subsidies are because of lack of awareness on how to apply or the sheer amount of paper work to be done. Delayed processing of subsidies is also a major reason.

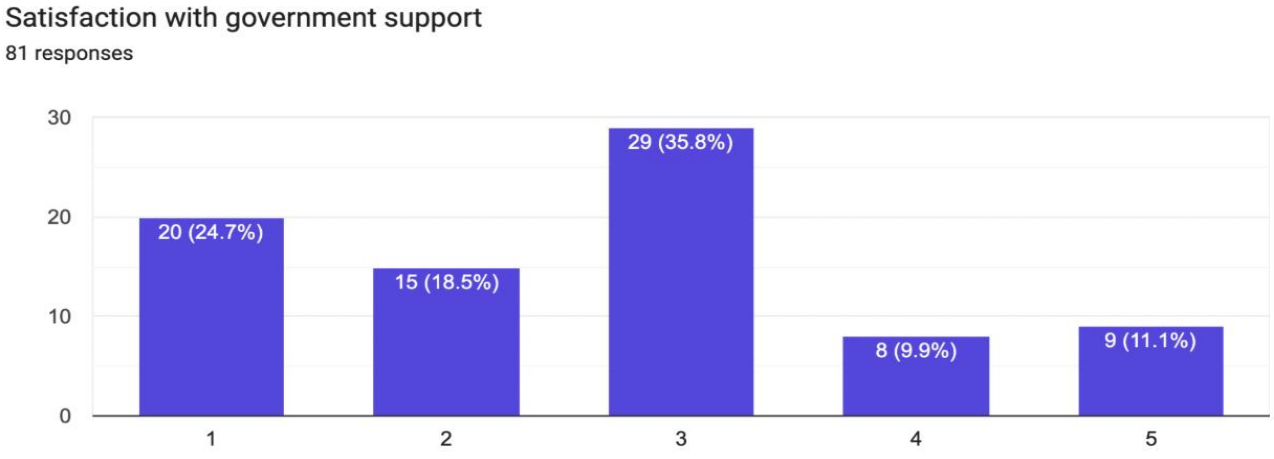

Figure 19- Government support satisfaction(Source - primary survey by the authors)

The respondents are not overly satisfied with government support. More than ⅓ have rated their satisfaction a ⅗ while almost 24% have rated their satisfaction as a ⅕.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

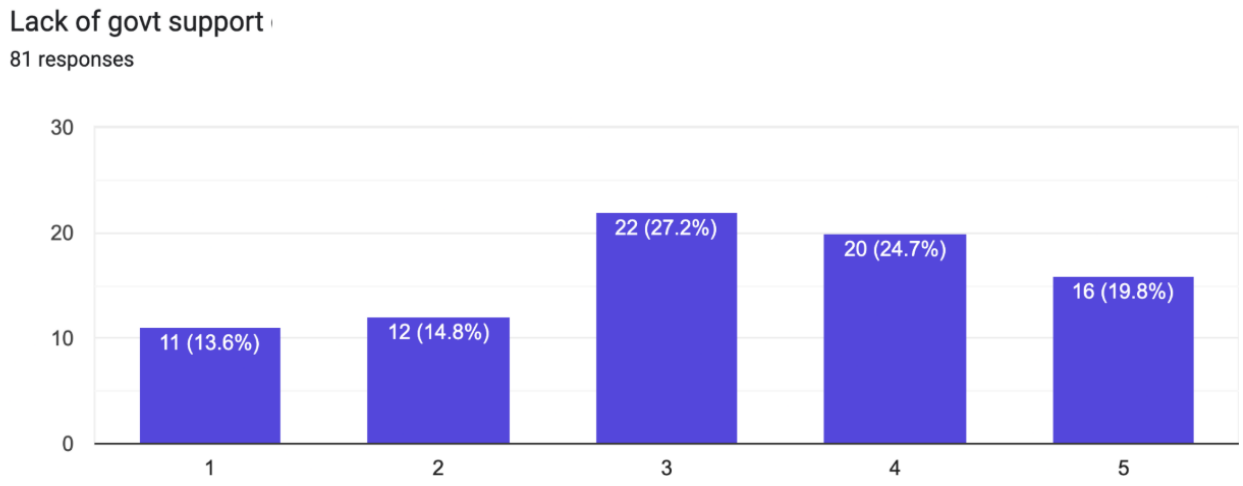

Figure 20- Lack of government support (Source - primary survey by the authors)

The intensity of the problem of lack of government support has seemingly varied from farmer to farmer. The responses are mostly scattered with most of the respondents voting ⅗ satisfaction with ⅘ right behind them.

The findings indicate that awareness of government schemes among rubber farmers is relatively high. However, a substantial proportion of respondents remain unaware of available benefits and support programmes, suggesting gaps in information dissemination.

The distribution of subsidy beneficiaries reveals that nearly half of the respondents have not received government assistance. This indicates that awareness alone does not guarantee access to benefits. Procedural complexities, inadequate guidance, documentation requirements, and delayed processing appear to hinder effective implementation. The responses regarding reasons for not receiving subsidies highlight administrative barriers as a major concern. Lack of awareness about application procedures, excessive paperwork, and delays in approval processes discourage farmers from accessing available support mechanisms. The satisfaction levels regarding government support are generally moderate. Most respondents rated their satisfaction at an average level, while a sizable proportion expressed dissatisfaction. This suggests that existing policies are providing some support but are not fully addressing the practical needs of cultivators.

Similarly, perceptions regarding inadequate government support varied across respondents, reflecting differences in individual experiences with government programmes. Overall, the findings suggest that while government interventions have contributed to supporting the sector, their effectiveness is constrained by implementation challenges, limited outreach, and bureaucratic hurdles. The results imply that strengthening extension services, simplifying subsidy procedures, improving awareness campaigns, and ensuring timely delivery of benefits could significantly enhance the effectiveness of government support for rubber farmers.

DISCUSSION

To identify the relative importance of the challenges faced by rubber farmers, respondents were asked to evaluate the severity of selected problems using a five-point Likert scale, where 1 indicates "Very Low Severity" and 5 indicates "Very High Severity". Mean scores were computed for each problem and ranked accordingly. A higher mean score indicates a greater perceived severity of the problem.

Table X: Problem Severity Ranking of Challenges Faced by Rubber Farmers

Problems	**Mean Score**	**Rank**
Labour Shortage	3.55	2
Price Fluctuation	3.70	1

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

High Cost of Production	3.49	3
Climate Change and Irregular Rainfall	3.44	4
Inadequate Government Support	3.22	5
Crop Diseases and Pest Attacks	3.02	6

Source: Computed from Primary Survey Data.

The ranking analysis reveals that price fluctuation constitutes the most severe challenge faced by rubber farmers, with the highest mean score of 3.70. The dependence of domestic rubber prices on international market conditions creates substantial income uncertainty for farmers. Respondents indicated that unpredictable price movements reduce their ability to plan investments and manage production expenses effectively. This finding is consistent with Odamkulath and Manoj (2018), who observed that declining and unstable rubber prices significantly affected the livelihood security of rubber cultivators in Kerala. Similar findings were reported by Sinumon and Mahalakshmi (2020), who identified price volatility as one of the primary economic constraints affecting the profitability and sustainability of rubber cultivation.

Labour shortage emerged as the second most severe challenge, with a mean score of 3.55. This finding reflects the growing scarcity of skilled tappers and the increasing difficulty in securing labour for tapping operations. Since rubber cultivation is highly labour-intensive, labour shortages directly affect tapping frequency, latex yield, and farm profitability. The result supports the findings of Muralidharan (2015), who identified labour scarcity and increasing wage costs as major constraints faced by small rubber cultivators. Likewise, Sinumon and Mahalakshmi (2020) reported that the shortage of skilled labour has become a critical issue for plantation farmers in Kerala, adversely affecting productivity and increasing cultivation costs.

High production costs ranked third, recording a mean score of 3.49. Rising expenditure on labour, fertilizers, transportation, and plantation maintenance has substantially reduced profit margins. The simultaneous occurrence of increasing costs and uncertain market prices creates a significant financial burden for smallholder cultivators, who constitute the majority of rubber farmers in Kerala. This finding corroborates the observations of Muralidharan (2015), who reported that increasing input and maintenance costs have reduced the economic viability of rubber cultivation among smallholders. Similar concerns regarding cost escalation and declining profitability were highlighted by Odamkulath and Manoj (2018).

Climate change and irregular rainfall were ranked fourth, with a mean score of 3.44. Farmers reported that changing weather patterns have reduced the number of tapping days and adversely affected productivity. Since rubber tapping is highly sensitive to rainfall conditions, climatic variability has become an increasingly important concern for the long-term sustainability of cultivation. This finding is supported by Sahadevan and Vaithiyanathan (2025), who found that rainfall variability and climatic fluctuations significantly influence rubber productivity in Kerala. Their study concluded that changing climatic conditions pose a growing threat to the sustainability of rubber cultivation.

Inadequate government support received a moderate severity rating, with a mean score of 3.22. Although many respondents were aware of government schemes, several expressed dissatisfaction regarding subsidy accessibility, procedural complexities, and delays in benefit disbursement. This suggests that policy interventions exist but their implementation effectiveness remains limited. Similar observations were made by Sinumon and Mahalakshmi (2021), who found that financial and institutional support mechanisms often fail to adequately address the operational challenges faced by rubber growers, particularly smallholders.

Crop diseases and pest attacks were perceived as the least severe challenge, with a mean score of 3.02. The relatively lower ranking may indicate improvements in disease management practices, extension services, and farmers' awareness regarding plantation maintenance. Although diseases remain a concern, previous studies suggest that farmers increasingly possess better access to technical knowledge and management practices compared to economic and market-related challenges, which are perceived as more immediate threats to farm sustainability (Muralidharan, 2015; Sinumon & Mahalakshmi, 2020).

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

Overall, the ranking analysis demonstrates that economic challenges, particularly price instability, labour scarcity, and rising production costs, exert a greater influence on farmers than biological factors such as diseases and pest attacks. The findings indicate that policy interventions aimed at stabilising prices, improving labour availability, reducing production costs, and strengthening institutional support mechanisms are likely to generate the greatest benefits for rubber farmers in Kerala.

Overall, the ranking analysis demonstrates that economic and labour-related constraints exert a greater influence on farmers than biological factors such as diseases. The findings suggest that policy interventions aimed at improving labour availability, stabilising rubber prices, reducing production costs, and strengthening institutional support mechanisms would have the greatest potential to enhance the sustainability and profitability of rubber cultivation in Kerala.

Future Prospects and Crop Diversification Discussion

The findings regarding future cultivation decisions present a nuanced picture of the sustainability of rubber farming in Kerala. Although respondents identified several challenges affecting profitability and productivity, the majority expressed their intention to continue rubber cultivation in the future. This suggests that rubber remains an economically important crop despite increasing production constraints and market uncertainties. The continued dependence on rubber cultivation may be attributed to farmers' accumulated experience, existing plantation investments, and the absence of equally attractive alternative crops capable of generating comparable long-term returns.

At the same time, a considerable proportion of respondents expressed uncertainty regarding the future viability of rubber cultivation. This uncertainty appears to stem primarily from fluctuating market prices, rising labour costs, and climate-related risks rather than from dissatisfaction with the crop itself. Such findings indicate that while rubber cultivation continues to be perceived as a viable livelihood option, farmers are increasingly concerned about its long-term sustainability under changing economic and environmental conditions.

The study further reveals that the tendency towards crop diversification remains relatively limited among the surveyed farmers. Most respondents reported no immediate intention to replace rubber with alternative crops or reduce the area under cultivation. This finding suggests that economic uncertainties have not yet translated into widespread crop substitution. However, the presence of a sizeable group of undecided respondents indicates a growing vulnerability within the sector. If current challenges persist, future diversification decisions may become more common among smallholder farmers seeking more stable income opportunities.

Another important finding relates to intergenerational continuity in rubber cultivation. A substantial proportion of respondents reported that younger family members show limited interest in pursuing rubber farming as a primary occupation. This reflects broader structural changes in rural Kerala, where younger generations increasingly prefer employment in non-agricultural sectors offering greater income stability and social mobility. The declining interest of youth in plantation agriculture raises concerns regarding the future availability of skilled labour and the long-term continuity of rubber cultivation.

Overall, the findings suggest that while rubber cultivation continues to possess considerable economic potential, its future sustainability will depend on the sector's ability to address labour shortages, market instability, and climate-related challenges. Strengthening profitability and reducing uncertainty will be essential for retaining existing cultivators and encouraging future generations to remain engaged in the sector.

Government Support and Institutional Constraints

The findings relating to government support indicate that institutional interventions have played an important role in supporting rubber farmers; however, significant implementation challenges continue to limit their effectiveness. Although a majority of respondents reported awareness of government schemes and assistance programmes, actual utilisation of these benefits was considerably lower. This gap between awareness and access suggests the presence of administrative, informational, and procedural barriers that prevent many eligible farmers from receiving support.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

The survey findings reveal that a significant proportion of respondents had not received subsidies or financial assistance despite being aware of available schemes. Farmers frequently cited inadequate information regarding application procedures, excessive documentation requirements, delays in approval processes, and lack of guidance from implementing agencies as major obstacles. These findings indicate that the effectiveness of support programmes is influenced not only by policy design but also by the efficiency of their implementation.

Satisfaction levels regarding government support were generally moderate, suggesting that existing interventions provide some degree of assistance but fall short of fully addressing farmers' needs. Respondents particularly emphasised the need for more timely subsidy disbursement, improved extension services, and stronger market intervention mechanisms to protect them from price volatility. The findings imply that while government initiatives have contributed positively to the sector, greater emphasis is required on accessibility, transparency, and responsiveness.

The results also highlight the importance of institutional support in addressing the broader structural challenges confronting rubber cultivation. Given that labour shortages and price fluctuations emerged as the most severe problems, farmers increasingly expect policy measures that go beyond conventional subsidy programmes. Price stabilisation mechanisms, support for labour-saving technologies, enhanced market linkages, and targeted assistance for smallholders could significantly improve the resilience of the sector.

In summary, the study suggests that government support remains a critical component of the sustainability of rubber cultivation in Kerala. However, strengthening implementation efficiency, expanding outreach, and aligning policy measures with farmers' evolving needs will be essential for improving the effectiveness of institutional interventions and ensuring the long-term viability of the rubber sector.

CONCLUSION

Natural rubber cultivation continues to play a crucial role in Kerala's agricultural economy by providing employment, income, and livelihood opportunities to a large number of rural households. This study examined the socio-economic profile, major challenges, future prospects, and effectiveness of government support mechanisms among rubber farmers in Kerala using primary survey data collected from 81 respondents.

The findings reveal that rubber cultivation in Kerala is predominantly undertaken by educated smallholder farmers cultivating on self-owned land. Despite the continued importance of rubber as a source of livelihood, farmers face several challenges that threaten the sustainability and profitability of cultivation. Among the identified constraints, price fluctuation emerged as the most severe challenge, followed by labour shortages, high production costs, climate change-related issues, inadequate government support, and crop diseases. The dominance of economic and labour-related problems indicates that market uncertainty and rising cultivation expenses have become more critical concerns than biological factors affecting production.

The study further finds that although a majority of respondents continue to perceive rubber cultivation as a profitable activity and intend to maintain their plantations, considerable uncertainty exists regarding its long-term viability. Persistent concerns relating to labour availability, production costs, climate risks, and market volatility have created apprehension among cultivators regarding the future of the sector. While large-scale crop substitution has not yet occurred, the declining interest of younger generations in rubber farming raises concerns about the future continuity of plantation agriculture in Kerala.

The analysis of government support mechanisms reveals that awareness of existing schemes is relatively high; however, the actual utilisation of subsidies and assistance programmes remains constrained by procedural complexities, inadequate guidance, documentation requirements, and delays in benefit disbursement. These implementation challenges reduce the effectiveness of policy interventions and limit their ability to address farmers' practical needs.

Based on these findings, the study suggests that strengthening price stabilisation measures, improving access to skilled labour, promoting labour-saving technologies, enhancing extension services, simplifying subsidy

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue VI June 2026

procedures, and ensuring timely delivery of benefits could significantly improve the resilience and profitability of rubber cultivation. Greater institutional support is essential to protect smallholder farmers from market volatility and climate-related risks. In addition, initiatives aimed at attracting younger generations to plantation agriculture through skill development, technological modernisation, and entrepreneurship opportunities may help ensure the long-term sustainability of the sector.

The study is subject to certain limitations. The use of convenience sampling and a relatively small sample size restricts the generalisability of the findings. Furthermore, the analysis is primarily descriptive and based on farmers' perceptions. Future research may employ larger and more representative samples, incorporate advanced statistical techniques, and undertake comparative studies across different rubber-growing regions of India to generate deeper insights into the evolving dynamics of the rubber sector.

Overall, the study concludes that while rubber cultivation remains economically significant in Kerala, its future sustainability will depend on effective policy intervention, improved institutional support, market stability, technological adaptation, and the successful resolution of labour and climate-related challenges.

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