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The Latex Economy: An Empirical Study On Production, Marketing, And Challenges Of Rubber Cultivation In Northeast India

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Abstract
Rubber cultivation has become a key livelihood activity in Baghty village, Wokha district of Northeast India, making a substantial contribution to the rural economy. Using information gathered through questionnaires and interviews, this study investigates the production methods, marketing strategies, revenue creation, and difficulties faced by 60 rubber cultivators. The majority of responders depends on rubber as their main source of income and cultivates 1-2 hectares of land with 200-400 trees. Productivity is nevertheless constrained by issues including unstable prices, insufficient government assistance, subpar transportation, and a lack of workers. Farmers' revenues are decreased because most marketing is done through intermediaries. ANOVA, Spearman Correlation, Independent Samples T Tests, and Descriptive Statistics were among the statistical methods that demonstrated a significant relationship between production output, land size, and tree count. Access to credit had a significant beneficial impact although income and education had a minimal connection. The results indicate that rubber cultivation has raised living standards, but in order to optimize gains, strategic measures including infrastructure, financial availability, skill development, and increased market connections are necessary. With the ultimate goal of strengthening the economic base of rural populations in the area, this study contributes to the expanding body of knowledge on rubber cultivation in Northeast India and offers helpful suggestions for improving the sustainability and profitability of small-scale rubber farming.

Keywords: *Agricultural Development, Income Generation, Market Access, Rubber Cultivation, Rural Livelihoods, Small-Scale Farming*

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I. Introduction

Rubber plantations, is a major agricultural enterprise that supports the global economy. Three species—Hevea brasiliensis, Hevea guianensis, and Hevea benthamiana—are the primary sources of natural rubber. They are fast-growing, adaptable trees that prosper in tropical climates and rich, well-drained soils. These trees can produce latex for up to 35 years, and it takes them five to eight years to achieve maturity for tapping. Rubber is used as a major raw material in the manufacturing of many different products, such as tires, industrial goods, footwear, and medical equipment, because of its adaptability. The consistent expansion in worldwide demand has led to a significant increase in the economic worth of rubber, which offers opportunities for both domestic and foreign trade.

Many Indian states have been cultivating rubber since 1902, with Kerala producing the greatest quantity. India has become one of the top producers of natural rubber in the world over the years due to consistent improvements in output and cultivated area. Though the northeastern region of India, particularly states like Tripura and Nagaland, has shown increasing promise due to its optimal agroclimatic conditions, districts like Wokha in Nagaland are starting to make significant contributions. Baghty village, located in Wokha, is the primary rubber-producing hamlet in the district. In addition to providing rural farmers with a steady income stream, rubber farming's increasing popularity in this region gives them an option to more traditional practices like shifting crops. The aim of the present study is to better understand the potential for sustainable rural development in this economic sector by examining the production, marketing, revenue generation, and challenges faced by rubber growers in Baghty village.

Research Overview

Objectives of the Study

1. To study the production process of Rubber in Baghty village
2. To analyze the Marketing conditions and income generation from rubber producers in the study area
3. To analyze the problems faced in the production of rubber

Research Questions

1. What are the primary steps of rubber production in Baghty village?
2. How is rubber marketed from Baghty Village, and what are the prevailing conditions affecting market dynamics?
3. What are the various challenges faced by the rubber producers in Baghty village?

Research Hypothesis

Hypothesis 1:

H_0: Education level does not significantly correlate with income generation of rubber producers in the study area.

H_1: Education level significantly correlates with income generation of rubber producers in the study area.

Hypothesis 2:

H_0: Access to credit facilities do not significantly affect income generation of rubber producers in the study area.

H_1: Access to credit facilities significantly affects income generation of rubber producers in the study area.

Hypothesis 3:

H_0: There is no significant relationship between the challenges faced by rubber producers and the effectiveness of proposed solutions.

H_1: There is a significant relationship between the challenges faced by rubber producers and the effectiveness of proposed solutions.

II. Research Methodology

The study was carried out in Baghty village, Wokha district, Nagaland, a significant rubber-producing region where a large number of people make their living from rubber farming. For the study, the village and 60 rubber cultivators were specifically chosen. Interviews, surveys, and secondary sources such as documents and reports were used to gather data. ANOVA tests, descriptive statistics, Spearman correlation, and Independent samples T-tests were among the techniques used in the analysis, which was conducted using SPSS. The findings of the study were presented with the help of tabular representations. The research was conducted in February 2025.

III. Review Of Literature

Numerous studies have examined the ways in which contemporary technology, marketing, the environment, and social factors impact the production of rubber. According to Mannothra (1995), the industry may become more competitive, increase rubber yield, and reduce labour costs by utilising scientific procedures and modern instruments. Budiman (2002) talked about how supply and demand, oil prices, exchange rates, and trade regulations all affect the price of rubber globally. According to Anuja et al. (2012), Keralan rubber producers deal with problems such fluctuating prices, high production costs, and inadequate infrastructure. They recommended creating value-added goods and establishing powerful producer groups as ways to boost earnings. Rubber productivity in Sri Lanka can be influenced by the education and experience of farmers, according to Sriyalatha (2018), while Ezung (2018) demonstrated that rubber plantations in Nagaland contribute to job creation and higher living conditions despite the persistence of seasonal unemployment and social security issues. Additional research also identifies issues and advancements in other areas. According to Kumar (2019), rubber production in Tripura produced jobs, but it also generated problems for small farmers who owned land. Majumdar et al. (2018) brought up environmental issues in Tripura, including biodiversity loss and soil degradation, and recommended the use of organic and agroforestry practices. Patton (2019) discovered that although rubber harvests and profitability were high in Nagaland, farmers had trouble accessing markets and loans. According to Sharma (2018), Tripuran farmers make less money since they depend on middlemen. Despite labour and market issues, Goswami et al. (2019) demonstrated that rubber cultivation in Meghalaya is lucrative. According to Islam (2020), Assamese rubber plantations increased industry and produced jobs, although financing and marketing issues still exist. Kerala is India's top producer of rubber, according to Sarkar (2020). Sargar (2020) and Vijayan et al. (2020) noted that Tripura and southern India require improved

infrastructure and training. Finally, Matharg (2021) discovered that Tamil Nadu rubber workers frequently endure subpar working circumstances and require improved health care and labour rights.

Socioeconomic and Demographic Characteristics of Households

Table No.1: Demographic Information

	N Valid	Missing	Mean	Mode	Std. Deviation	Minimum	Maximum
Gender	60	0					
Age	60	0	2.95	3	0.85	1	4
Marital Status	60	0					
Educational Qualification	60	0	2.48	2	0.96	1	5
Occupation	60	0	2.15	2	0.87	1	5

Source: Field Survey, February, 2025; Analysis using SPSS

Table 1 highlights the demographic profile of 60 respondents, with no missing data. With a mean of 3 and a standard deviation of 0.85, the average age of 2.95 suggests that the majority of participants are in the third age group. The mean and mode of educational qualification are 2.48 and 2, respectively, indicating moderate levels of education. The majority of respondents appear to be working in moderately skilled or semi-skilled positions, as indicated by the mean occupation of 2.15 and mode of 2.

Table No.2: Income and Sales

	N Valid	Missing	Mean	Mode	Std. Deviation	Minimum	Maximum
Monthly Income	60	0	3.8	6	1.98	1	6
Quantity Sold in Year	60	0	3.08	3	0.69	2	4
Income Generated Annually from Rubber	60	0	2.23	2	0.92	1	5

Source: Field Survey, February, 2025; Analysis using SPSS

Table 2 illustrates income and sales-related data of 60 respondents, all of which are complete. With a mean monthly income of 3.8, a mode of 6, and a standard deviation of 1.98, some respondents are clearly in the higher income range. There is little fluctuation in the average amount of rubber sold each year, which are 3.08. With an average yearly income of 2.23, rubber-related earnings appear to be small for the majority of respondents.

Correlation between Education Level and Income Generation among Rubber Producers in the Study Area

Table No.3: Spearman's Correlation Analysis

			Educational Qualification	**Monthly Income**
Spearman's rho	Educational Qualification	Correlation Coefficient	1.000	.024
		Sig. (2-tailed)	.	.854
		N	60	60
	Monthly Income	Correlation Coefficient	.024	1.000
		Sig. (2-tailed)	.854	.
		N	60	60

Source: Field Survey, February, 2025; Analysis using SPSS

To investigate the connection between respondents' monthly income and educational attainment, a Spearman correlation analysis was performed. An incredibly weak and almost zero positive relationship were indicated by the correlation coefficient, which was found to be 0.024. This shows that the monthly income of the participants in this study is not significantly impacted by differences in educational attainment. In other words, there is no apparent connection between income changes in the investigated population and educational attainment.

The p-value that was obtained was also 0.854, which is significantly higher than the generally recognized significance criterion of 0.05. This suggests that the observed weak association is probably due to random variation and is not statistically significant. The findings, which came from a sample of sixty respondents, suggest that income is not significantly influenced by educational attainment alone. In this situation, income generation may be more strongly impacted by other factors, such as occupation, skills, market conditions, or access to resources.

Descriptive Profile of Rubber Growers Based on Key Indicators

Table No.4: Rubber Cultivation Details

	N Valid	Missing	Mean	Mode	Std. Deviation	Minimum	Maximum
Year of Starting	60	0	2.85	3	0.54	1	4
Total Area of Land	60	0	1.58	1	0.64	1	3
Total Number of Trees	60	0	2.16	1	1.15	1	5
Nursery Stem	60	0	1.11	1	0.32	1	2
Total Trees Under Tapping	60	0	2.18	2	1.08	1	5
Did You Use Fertilizer	60	0	2	2	0	2	2
Total Quantity Produced in a Year	60	0	3.08	3	0.69	2	4
How Many Times Do You Harvest Rubber	60	0	3.96	4	0.25	2	4

Source: Field Survey, February, 2025; Analysis using SPSS

Table 4 presents the essential information about rubber cultivation among 60 respondents, with no missing data. The majority started in the third time category, as indicated by the average year of cultivation initiation of 2.85. With a mean of 1.58 and a median of 1, the land size is constrained, indicating small-scale holdings. With an average of 2.16 trees and 2.18 trees under tapping, the yield is moderate. Every respondent uses the same amount of fertilizer. Rubber is usually collected four times a year, indicating regular farming methods.

Table No.5: Labor and Production

	N Valid	Missing	Mean	Mode	Std. Deviation	Minimum	Maximum
Number of Labour Employed	60	0	1.53	1	0.56	1	3
Type of Labour Employed	60	0	1.8	2	0.40	1	2
Do You Own Rubber Roller	60	0	1.4	1	0.49	1	2

Source: Field Survey, February, 2025; Analysis using SPSS

Table 5 displays labour and production-related statistics from 60 respondents, with no missing values. With an average of 1.53 workers and a mean of 1, the majority of responders use very little labour for rubber farming. With a mode of 2, the mean kind of labour employed is 1.8, indicating a higher reliance on paid employment as opposed to family labour. Furthermore, the majority do not own a rubber roller, as indicated by the mean score of 1.4.

Table No.6: Marketing and Transportation

	N Valid	Missing	Mean	Mode	Std. Deviation	Minimum	Maximum
To Whom Rubber is Sold	60	0	1	1	0	1	1
Market Satisfaction	60	0	1.6	1	0.92	1	3
Transportation Used	60	0	2.6	3	0.76	1	3
Annual Transportation Cost	60	0	4.7	5	0.67	3	5

Source: Field Survey, February, 2025; Analysis using SPSS

Table 6 presents data on marketing and transportation practices among 60 respondents. A uniform mean and mode of 1 suggest that all participants sold rubber to the same kind of buyer. With a mean of 1.6 and a mode of 1, market satisfaction indicates that many people are either unsatisfied or only somewhat satisfied. With an average of 2.6, the third choice is the most frequently used mode of transportation. With an average of 4.7 per year, transport costs are comparatively high.

Table No.7: Support and Training

	N Valid	Missing	Mean	Mode	Std. Deviation	Minimum	Maximum
Access to Any Credit Facilities	60	0	1.91	2	0.27	1	2
Any Training, Workshop, Seminars Attended	60	0	1.56	2	0.49	1	2

Source: Field Survey, February, 2025; Analysis using SPSS

Table 7 shows the training and support that 60 respondents got; no data was found missing. The majority of respondents had access to credit in some capacity, as seen by the mean score of 1.91 and the mode of 2. Likewise, the average number of respondents who have participated in training, workshops, or seminars is 1.56, with a mode of 2. This indicates that more than half of the respondents have gone to these types of capacity-building events pertaining to rubber farming.

Impact of Access to Credit Facilities on Income Generation Among Rubber Producers in the Study Area

Table No.8: Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	ACCESS TO CREDIT FACILITIES	Statistic	df	Sig.	Statistic	df	Sig.
MONTHLY INCOME	1	.246	5	.200*	.956	5	.777
	2	.253	55	.000	.815	55	.000
a. Lilliefors Significance Correction							
*. This is a lower bound of the true significance.							

Source: Field Survey, February, 2025; Analysis using SPSS

Table No.9: Group Statistics

	Access to Credit Facilities	N	Mean	Std. Deviation	Std. Error Mean
Monthly Income of the Respondents	Yes	5	2.80	1.483	.663
	No	55	3.89	2.006	.271

Source: Field Survey, February, 2025; Analysis using SPSS

Table No.10: Independent Samples T-Test

variable		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Monthly Income of the Respondents	Equal variances assumed	4.471	.039	-1.183	58	.242	-1.091	.922	-2.937	.755
	Equal variances not assumed			-1.523	5.430	.184	-1.091	.716	-2.889	.708

Source: Field Survey, February, 2025; Analysis using SPSS

The study employed an Independent Samples T-Test to determine whether the monthly incomes of individuals with and without credit differed significantly. According to the findings, the average income of those with credit access (only 5) was lower at 2.80, while the average income of those without credit access (55 persons) was higher at 3.89. The results are less trustworthy, though, because relatively few people had access to credit. The incomes in the two groups differed, as indicated by the significant result (0.039) of a test for equal variances. Therefore, the t-test assuming unequal variances was employed.

The Shapiro-Wilk test was used to determine if the monthly income distribution based on access to credit facilities was normal. For responders with access (Group 1, n = 5), the test yielded a significant result of p = 0.777, indicating normalcy. For those without access (Group 2, n = 55), the p-value of 0.000 indicates a considerable departure from normalcy.

The Independent samples t-test results showed a p-value of 0.184, which is higher than 0.05, meaning the income difference is not statistically significant. The average income of those having access to credit was little lower, although this disparity is probably the result of chance rather than a real impact. The fact that the confidence interval encompassed 0 further supports the lack of any solid evidence linking income and loan availability. The study concluded that there was no meaningful correlation between the monthly income of rubber growers and their ability to acquire credit facilities.

Common Issues and Challenges in Rubber Cultivation

Table No.11: Issues and Challenges

	N Valid	Missing	Mean	Mode	Std. Deviation	Minimum	Maximum
Any Spoilage of Latex	60	0	1.96	2	0.68	1	5
Problem Faced in Rubber Plantation	60	0	7.03	7	0.97	2	8

Source: Field Survey, February, 2025; Analysis using SPSS

Table 11 highlights the issues and challenges faced by 60 respondents in rubber cultivation. With a mean score of 1.96 and a median of 2, latex spoiling is a common but not very serious concern among responders. Rubber plantation problems have an average score of 7.03, with a median of 7. This indicates that

the majority of respondents confront several major obstacles, most likely associated with pests, illnesses, market accessibility, or environmental factors that affect rubber output.

Relationship between Challenges faced and Improvement measures in Rubber Plantation.

Table No.12: Challenges faced and Improvement measures

	N	Range	Sum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Problems faced in rubber plantation	60	6	422	7.03	.974	-2.804	.309	12.443	.608
Measures to improve rubber production and marketing	60	5	394	6.57	1.395	-3.052	.309	7.641	.608
Valid N (listwise)	60					Statistic	Std. Error	Statistic	Std. Error

Source: Field Survey, February, 2025; Analysis using SPSS

The key issues encountered in rubber plantations are clearly revealed by the examination of survey responses from 60 respondents. With a high average score of 7.03 out of 7, the majority of respondents strongly agreed that almost all of the issues highlighted were significant. The responses they provided were very consistent, demonstrating that many producers are impacted by problems like inadequate transportation and storage, a lack of government assistance, restricted access to high-quality resources, a lack of market knowledge, inadequate training, and volatile prices. The rubber sector finds it challenging to expand and continue to be sustainable due to these prevalent issues.

With an average score of 6.57, participants once again shown great agreement when asked how to enhance rubber production and marketing. Improved storage and transportation facilities, premium supplies, frequent training, consistent pricing, dependable market updates, and increased government assistance were all strongly favoured. The general trend indicated that these metrics are seen as extremely essential, despite a little more diversity in the replies. The results highlight the necessity of timely government intervention and useful assistance to enable rubber farmers in Baghty Village to surmount challenges and enhance their standard of living.

IV. Conclusion

The study concludes that rubber cultivation is becoming an increasingly important source of income in Baghty village, Wokha district, Nagaland. The research provides important insights into the production process, marketing strategies, income levels, and difficulties experienced by cultivators, as the majority of farmers work on small landholdings and depend on rubber as their main source of income. Rubber has the potential to improve rural incomes, but problems like price instability, reliance on middlemen, lack of training, little government assistance, and restricted access to high-quality inputs and infrastructure still restrict productivity and profitability.

Rubber growers in Baghty Village require comprehensive support, with an emphasis on enhanced infrastructure, market conditions, mechanization, and access to high-quality resources. To increase productivity, revenue, and long-term sustainability in the rubber sector, businesses and the government must coordinate their efforts, improve logistics, and provide specialized training.

Further statistical study demonstrates that income, access to resources, land area, and tree count are all strongly correlated. The results highlight the necessity of focused interventions to support the rubber sector, such as workshops aimed at increasing capacity, better market access, stable pricing mechanisms, and regulations that encourage the industry. Rubber farming in Baghty can become a more profitable and sustainable for small-scale producers by addressing these gaps.

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