RESEARCH ARTICLE Indian Journal of Agricultural Research, Volume 57 Issue 6: 845-851 (December 2023)

Economics of Rubber Plantation in Mokokchung District

Watisenla Longkumer[1], Amod Sharma[1]

10.18805/IJARe.A-6137

ABSTRACT

Background: The present study was conducted with an aim to study the socio-economic and livelihood of the rubber growers in Mokokchung district, further main objective is to provide extra income as well as generating more employment through rubber plantation.

Methods: For the present research study a total of 160 respondents were selected from 8 villages, out of which, 94 respondents (58.75 per cent) were small, 50 respondents (31.25 per cent) were marginal and 16 respondents (8.00 per cent) were medium farms, respectively.

Result: Gross income for marginal, small and medium farmers was ` 2,48,400, ` 6,21,000 and ` 9,93,600 and net income was ` 95,300, ` 4,10,797.88 and ` 7,46,600. About 52.50 per cent respondents were employed in government sector with an average annual income of ` 1,01,70,021, followed by 38.75 per cent respondents with an average annual income of ` 31,00,016, 5 per cent respondents were daily wage earners with an average annual income of ` 2,10,002 and 3.75 per cent respondents were working in private sectors with an annual income of ` 5,40,000. Maximum required trained labourers and hired labourers, 89.00 per cent had permanent workers and 29.00 per cent had contract labourers. Total two marketing channels were involved *viz*; channel I: Producer-Processor, channel II: Producer-Agent-Processor. In channel I, the marketing cost incurred by the producer was ` 38/kg and the marketing cost incurred by the agent was ` 27/kg. In channel II the marketinpg cost incurred by the producer was ` 3/kg and the marketing cost incurred by the agent was ` 36/kg. The major cconstraints were lack of local trained labourers, lack of government funding, lack of market, price instability, lack of training programmes and road condition.

Key words: Constraints, Grower, Livelihood, Marketing channel, Rubber, Socio-economic.

INTRODUCTION

Hevea brasiliensis also commonly known as rubber plant or tree belongs to family *Euphor biaceae* originally native to Amazon basin. It has soft wood and thick barks and the latex that oozes from the tree contains about 30.00 per cent rubber, which is solidified and refined into final products. It is most economically important because of the latex extracted which is the primary source of rubber naturally (Reporter, 2020). The total rubber demand was estimated to improve by 9.40 per cent in 2021, reaching 29.57 million tons, surpassing the pre-pandemic level. The catch was backed by repressed demand from both tire and non-tire sectors, especially in the first half of 2021 (Jin *et al.,* 2022). A strong recovery projected for non-tire sector (10.50 per cent) was driven by continued surge in need for rubber products in the worldwide healthcare industry. Natural rubber production was forecasted to further growth by 3.50 per cent, reaching 14.27 million tons in 2022. Natural rubber production growth was estimated to average 3.70 per cent in 2023 (Rubber World, 2023).

Based on agro-climatic conditions there are two major rubber growing regions in India. The traditional area accounts for 93.00 per cent of the production of rubber in the country. Keralais the largest producer of rubber in India and it constitutes 90.00 per cent of the production. In Kerala, Kottayam district is the leading producer of rubber accounting for 21.00 per cent of the area under rubber in Kerala (Mongabay, 2018). In India, the rubber plantation industry is controlled by small land holdings (<2 hectares) which sums to 89.00 per cent of area under rubber and it accounts for 92.00 per cent of the production (Ministry of Commerce and Industry, 2019). Assam and other northeastern states are major natural rubber producers, estimates ` 1,100 crore in northeast region (Morung Express, 2022). Rubber plantation is enthusiastically promoted in North-east India. In the northeastern states 1.89 lakh ha of total area is under natural rubber of which Tripura accounts for over 60,000 ha, Assam has nearly 58,000 ha, while Meghalaya has approximately 16,300 ha of area under rubber (Adikari and Sharma, 2018). Nagaland has 15,000 ha of area under rubber and remaining states has roughly 5,000 ha each. Total production of rubber latex in northeastern states was found to be around 1.12 lakh tonnes (Tiseo, 2022).

[1]Department of Agricultural Economics, Nagaland University, School of Agricultural Sciences, Chumoukedima- 797 106, Nagaland, India.

Corresponding Author: Amod Sharma, Department of Agricultural Economics, Nagaland University, School of Agricultural Sciences, Chumoukedima- 797 106, Nagaland, India.
Email: hodsasrd2011@gmail.com

How to cite this article: Longkumer, W. and Sharma, A. (2023). Economics of Rubber Plantation in Mokokchung District. Indian Journal of Agricultural Research. 57(6): 845-851. doi: 10.18805/IJARe.A-6137.

Submitted: 12-07-2023 **Accepted:** 28-09-2023 **Online:** 04-10-2023

Rubber plantation is being adept in various parts of Nagaland to generate more income, as rubber is grown well in between 450 to 500 m above mean sea level and warm climate with a temperature ranging between 21 to 35°C and a well distributed rainfall of 20 to 45 cm (Patton and Ezung, 2019). As of 2021, overall area under rubber plantation in Nagaland stands at 19132.50 ha 4989 ha has been brought under tapping which produces about 15,700 MT of latex per year and the remaining 14,100 ha of rubber plantation has attained maturity (Kumar, 2022). In Mangkolemba division under Mokokchung district, the rubber plantation had boomed in the last decade with a local rubber plantation farmers' union according to the 2021 census of Nagaland, dependent on agriculture however during harvest season there is a shortage of workers. Labourers from outside the states are called in to extract and process the raw materials. The price of rubber differs from one farmer to another ranging from ` 110 to ` 140/kg. There is no fixed price for the raw materials. A study was felt necessary for the above cited dilemma, the result of which will help gap the price spread and help elevate the social and economic livelihood of the rubber growers. Hence, present research study was undertaken with the succeeding objective.

(1). To study the socio-economic characteristics of the rubber growers.
(2). To study the marketing channel of rubber under the selected area.
(3). To study constraints of rubber growers under the selected area.

METARIALS AND METHODS

In Nagaland, approximately 11,000 ha area is under rubber plantation with close to 45 lakh standing tress at various stages of growth. The Mokokchung district in Nagaland was purposely designated for this study as rubber production was gaining momentum at this area in the recent years having geographical area of 1,615 kms with 8 blocks *viz*; Alongkima, Chuchuyimlang, Changtongya, Kubolong, Merangmen, Longchem, Ongpangkong and Mangkolemba blocks, so all blocks were purposively selected, then out of total villages 8 villages *viz*; Changki, Merayim, Longnak, Atuphumi, Satsukba, Shihaphumi, Japu and Longtho villages, then total 160 rubber growers were selected by simple stratified random sampling procedure. The data were gathered from the respondents through personal interviews, observation, structured schedule and contend-analysis, developed. The secondary data and related information were gathered through concern departments, text books, handbooks, *etc*; to arrive at relevant inferences. To accomplish the objectives of the study, the data collected were processed, tabulated, classified and systematically analyzed using appropriate statistical tools, however the cost and returns estimation procedure is adopted from Adhikari and Sharma (2018); Singh and Sharma (2020a) and for the marketing channel of rubber shepherd's formula was used to identify marketing efficiency. Primary data pertain during the agricultural year from 2021 to 2023 (two years).

$$\text{Marketing efficiency index} = \frac{\text{Value of goods}}{\text{Total cost of marketing}}$$

The different types of constraints such as technical constraints, infrastructural *viz*; production and marketing was explored through Garrett's ranking technique was converted into scores with the help of formula given below:

$$\text{Per cent position} = \frac{100\ (R_{ij} - 0.5)}{N_j}$$

Whereas:
R_{ij}= Rank given for i^{th} item by j^{th} person.
N_j= Number of item ranked by j^{th} person.

RESULTS AND DISCUSSION

Table 1 reveals the population according to the age, marital status and family size. 88 respondents were from the age group 40 to 59 years (55.00 per cent), followed by 54 respondents from the age group 20 to 39 years (33.75 per cent) and lastly 18 respondents above 60 years (11.25 per cent), respectively. 150 respondents (93.75 per cent) were married, 6 respondents (3.75 per cent) were unmarried and 4 respondents (2.50 per cent) were widowed. Small family size was maximum (94 family) among the respondents (58.75 per cent), followed by medium family size (56 family) (35.00 per cent) and large family size (10 family) (6.25 per cent), respectively (Chishi and Sharma, 2019).

Table 2 reveals that 76 respondents (47.50 per cent) were graduates, followed by 48 respondents (30.00 per cent) with higher secondary qualifications, 22 respondents (13.75 per cent) had completed high school, followed by 10 respondents (6.25 per cent) with primary education and 4 respondents (2.50 per cent) who were illiterate, further 84 respondents (52.50 per cent) were had primary occupation as government jobs, followed by 62 respondents (38.75 per cent) in business sectors, 8 respondents (5.00 per cent)

Table 1: Distribution of population according to age, marital status and family size.

Particulars	Numbers of respondents	Per cent
	Age (years)	
20 to 39	54	33.75
40 to 59	88	55.00
Above 60	18	11.25
	Marital status	
Married	150	93.75
Unmarried	6	3.75
Widowed	4	2.50
	Family size	
Small	94	58.75
Medium	56	35.00
Large	10	6.25

worked as daily wage earners, followed by 6 persons (3.75 per cent) working in private sectors. As a secondary occupation 150 respondents (93.75 per cent) took part in agriculture activities and 10 respondents (6.25 per cent) were involved in animal husbandry (Singh and Sharma, 2021b).

Table 3 reveals that 108 respondents (67.50 per cent) had small land holdings, followed by 28 respondents (17.50 per cent) with marginal land holdings and 24 respondents (15.00 per cent) with medium land holding. For land under rubber, 94 respondents (58.75 per cent) had small farms, followed by 50 respondents (31.25 per cent) with marginal farms and 16 respondents (10.00 per cent) with medium farms, respectively (Singh and Sharma, 2021a).

Table 4 reveals that 104 respondents (65.00 per cent) owned concrete house, followed by 42 respondents (26.25 per cent) with semi-concrete house and 14 respondents (8.75 per cent) with non-concrete house. 100.00 per cent *i.e*; 160 respondents were having owned mobile phones and owned televisions, 132 respondents (83.00 per cent) had newspaper subscription; 150 respondents (94.00 per cent) owned 4-wheelers and 58 respondents (36.00 per cent) owned 2-wheelers, respectively.

Table 5 reveals that 144 respondents (45.00 per cent) had yearly income between ` 5 to 10 lakhs/annum, 136 respondents (43.00 per cent) had yearly income of more than 10 lakh/annum and 40 respondents (13.00 per cent) had yearly income below 5 lakhs/annum; whereas, 176 respondents (55.00 per cent) had yearly income of less than 5 lakhs from rubber and 144 respondents (45.00 per cent) had yearly income between 5 to 10 lakhs annually. The respondents employed in the government sector had the highest annual income with an average of ` 1,01,70,021, followed by those who owned their own businesses with an average yearly income of ` 31,00,016, respondents working in the private sectors had yearly income of ` 5,40,000, followed by those who were daily wage earners with an average of ` 2,10,002 per annum.

Table 6 reveals the average cost of cultivation of rubber production came to ` 2,12,934.04/ha, for marginal farmers was ` 1,63,100; while for small group was ` 2,19,702.12 and medium group of farmers was ` 2,56,000, which implied an increase in farm size leads to increase in the cost of production (Chouhan *et al.,* 2019).

Table 7 reveals the per ha indicated Cost A_1 to be ` 1,05,600 for marginal, ` 1,61,702.12 for small and ` 1,97,500 for medium farmers, the cost A_1 was found to be the highest in medium farmers, followed by small farmers and the lowest in marginal farmers. The cost A_2 included Cost A_1 and rent paid for leased land. Cost A_2 remained equivalent to Cost A_1 as there was no leased land, the cost A_2 and cost B_1 for marginal, small and medium farmers was found to be ` 1,08,100, ` 1,64,702.12 and ` 2,01,000, respectively. The cost $B_2$ for marginal, small and medium farmers was ` 1,10,600, ` 1,67,702.12 and ` 2,04,500, respectively. The cost C_1 was worked out per ha by including the imputed value of family labour to cost B_1, so cost C_1 for marginal, small and medium group of farmers was ` 1,52,600, ` 2,09,702.12 and ` 2,46,500, respectively. The average cost $C_2$ for all the groups of farmers was ` 2,23,227.37 per ha. Cost C_2 for marginal, small and medium group of farmers was ` 1,67,860, ` 2,30,672.12 and ` 2,71,150, respectively (Yadav *et al.,* 2022).

Table 8 reveals that 76 respondents (48.00 per cent) sold their produce at a price level between ` 110 to ` 120, 42 respondents (26.00 per cent) sold their produce at a price level between ` 130 to ` 140, 26 respondents (16.00 per cent) sold their produce at a price level between ` 120 to ` 130 and 16 respondents (10.00 per cent) sold their produce at a price level above ` 140, so the average price was found to be ` 124.20, respectively.

Table 2: Distribution of population based on education qualification and occupations.

Particulars	Numbers of respondents	Per cent
Educational qualifications		
Illiterate	4	2.50
Primary	10	6.25
High school	22	13.75
Higher secondary	48	30.00
Graduate	76	47.50
Primary occupation		
Business	62	38.75
Government job	84	52.50
Private job	6	3.75
Daily wage earner	8	5.00
Secondary occupation		
Agriculture activities	150	93.75
Animal husbandry	10	6.25

Table 3: Distribution of respondents based on land holdings.

Particular	Size (in ha)	No's of respondents	Per cent
Land holding			
	Marginal (<1)	28	17.50
	Small (1-4)	108	67.50
	Medium (4.01-10)	24	15.00
Land under rubber			
	Marginal (<1)	50	31.25
	Small (1-4)	94	58.75
	Medium (4.01-10)	16	10.00

Table 9 reveals the average yield of rubber production per ha was 2 tonnes for marginal respondents, 5 tonnes for small farmers and 8 tonnes for the medium farmers. The average price of the rubber was ` 124.20/kg and the gross income was ` 2,48,400 for marginal, ` 6,21,000 for small and ` 9,93,600 medium farmers, respectively. The average net return from rubber production was ` 4,17,565.96. The net return per ha was the highest in medium group and the lowest in marginal group. The net return was ` 95,300.00 for marginal group of farmers, ` 4,10,797.88 for small farmers and ` 7,46,600 for medium farmers. The benefit-cost ratio was found to be highest in medium farmers with 4.666, followed by small farmers with 2.916 and lowest on marginal farmers with 1.166. The average was estimated to be 2.916 (Singh *et al.,* 2021).

Table 10 reveals that 160 respondents (100.00 per cent) required trained labours for extraction of rubber latex and processing it, 160 respondents (100.00 per cent) required hired labours during cleaning/clearing season, 142 respondents (89.00 per cent) had permanent workers living at the farm and 46 respondents (29.00 per cent) had contract labours with whom they share 50: 50 of the profit, respectively (Yani and Sharma, 2022).

Table 11 reveals that 66 respondents (41.00 per cent) had 5 to 10 years of experience, 50 respondents (31.00 per cent) had more than 10 years of experience and 44 respondents (28.00 per cent) had less than 5 years of experience in

Table 4: Distribution of respondents based on house type and material possessed.

Particulars	Number of respondents	Per cent
	House type	
Concrete	104	65.00
Non-concrete	14	8.75
Semi-concrete	42	26.25
	Material possessed	
Mobile	160	100.00
Television	160	100.00
Newspaper	132	83.00
4-wheelers	150	94.00
2-wheelers	58	36.00

Table 5: Distribution of respondents based on their annual income.

Particulars	Amount (in `)	Numbers	Per cent
Annual income	<5 lakhs	40	13.00
	5.01-10 lakhs	144	45.00
	>10 lakhs	136	43.00
Annual income from rubber	< 5 lakhs	176	55.00
	5.01-10 lakhs	144	45.00
Business	31,00,016	124	38.00
Government job	1,01,70,021	168	52.50
Private job	5,40,000	12	3.75
Daily wage earners	2,10,002	16	5.00

Table 6: Cost of production (per ha) of rubber various size groups.

Particulars	Marginal	Small	Medium	Average
1. a. Family labour	42000.00	42000.00	42000.00	42000.00
b. Hired labour	30000.00	60000.00	70000.00	53333.00
2. Marketing cost	33600.00	59702.12	85500.00	59600.00
Total variable cost	105600.00	161702.12	197500.00	154933.00
1. Rental value of owned land	2500.00	3000.00	3500.00	3000.00
2. Depreciation on implements	5000.00	5000.00	5000.00	5000.00
3. Machine cost	50000.00	50000.00	50000.00	50000.00
Total fixed cost	57500.00	58000.00	58500.00	58500.00
Total cost (A+B)	163100.00	219702.12	256000.00	212934.04

Table 7: Cost and return analysis of rubber production (`/ha).

Particulars	Marginal	Small	Medium	Average
Cost A_1	105600.00	161702.12	197500.00	154934.04
Cost A_2	105600.00	161702.12	197500.00	154934.04
Cost B_1	108100.00	164702.12	201000.00	157934.04
Cost B_2	110600.00	167702.12	204500.00	160934.04
Cost C_1	152600.00	209702.12	246500.00	202934.04
Cost C_2	167860.00	230672.12	271150.00	223227.37

rubber plantation. Even 84 respondents (53.00 per cent) had no training exposures, 56 respondents (35.00 per cent) had 1 time training exposure and 20 respondents (13.00 per cent) had 2 to 3 times of training exposures (Drishti, 2022).

Table 12 reveals the marketing channels are the path through which the agricultural commodities move from the producer to the final consumers. The survey revealed two different channels involved in marketing of the rubber *viz*; Channel I: Producer-Processor (Rubber Board) and Channel II: Producer-Agent-Processor (Rubber Board). The marketing channel followed by the rubber growers that 100.00 per cent (85+75= 160 respondents) of the respondents followed the channel II for selling their produce as they found it more convenient and more profitable than channel I. The costs involved in moving the rubber from the producers to the traders, is discussed in this section (Yani and Sharma, 2022).

Table 13 reveals the marketing cost incurred by the producer amounted to ` 38/kg, total transportation cost was 66.00 per cent preceded by loading/unloading for 26.00 per cent, packaging accounted for 5.00 per cent and storing accounted for 3.00 per cent, respectively. The marketing cost incurred by the Processor was ` 3/kg. In total cost of marketing, weighing, storing, loading and unloading accounted for 33.00 per cent each, total cost of marketing and packaging was 67.00 per cent preceded by storing cost (33.00 per cent) (Yadav *et al.,* 2022).

Table 14 reveals the marketing cost incurred by the agent was ` 36.00/kg, total cost of transportation cost was 69.00 per cent preceded by loading/unloading charge (28.00 per cent) and weighing charge accounted for the rest 3.00 per cent, respectively (Singh and Sharma, 2020b).

Table 15 reveals that the channel II with marketing efficiency index of 3.18 was found to be more efficient than channel I with marketing index of 3.02, respectively (Singh and Sharma, 2020a).

Table 16 reveals the various constraints faced by the rubber growers under the selected area. Through Garrett's ranking technique it had been found that the first and most serious constraints was due to lack of local trained labours (Rank I) with a mean score of 67.16 as the farmers had to search and employ trained labours from out of state. The second most predominant problem was the lack of

Table 8: Cost of raw rubber under the selected area.

Price (in `)	Number of respondents	Per cent
110 to 120	76	48.00
120 to 130	26	16.00
130 to 140	42	26.00
>140	16	10.00
Overall average price	124.20	-

Table 9: Income of different farm groups.

Particulars	Marginal	Small	Medium	Average
Average yield (t/ha)	2.00	5.00	8.00	5.00
Average price (`)	124.20	124.20	124.20	124.20
Gross income (`/ha)	248400.00	621000.00	993600.00	621000.00
Net return (`/ha)	95300.00	410797.88	746600.00	417565.96
BCR	1.166	2.916	4.666	2.916

Table 10: Distribution of different types of labourers required on the rubber farm.

Particulars	Number of respondents	Per cent
Trained	160	100.00
Hired	160	100.00
Contract	46	29.00
Permanent	142	89.00

Table 11: Distribution of respondents based on experience and training exposure.

Particulars		No. of respondents	Per cent
Experience in rubber	< 5 years	44	28.00
	5.01-10 years	66	41.00
	>10 years	50	31.00
Training exposure	Never	84	53.00
	1 time	56	35.00
	2-3 times	20	13.00

government funding (Rank II) with a mean score of 67.00, all the cost for production was incurred by the farmers alone. Other problems such as lack of market, price instability, lack of training programmes and road condition were rank III, IV, V and VI, respectively (Singh *et al.,* 2021).

Table 12: Channel wise distribution adopted by rubber growers.

Particular	Number of respondents	Per cent
Channel I	85	100.00
Channel II	75	100.00

Table 13: Overall average marketing cost incurred on channel I.

Particulars	Producer		Processor	
	Cost (in `)	Per cent	Cost (in `)	Per cent
Weighing	0	0.00	1	33.00
Packaging	2	5.00	0	0.00
Storage	1	3.00	1	33.00
Loading/unloading	10	26.00	1	33.00
Transportation	25	66.00	0	0.00
Miscellaneous	0	0.00	0	0.00
Total	38	100.00	3	100.00

Table 14: Overall average marketing cost incurred on channel II.

Particulars	Producer		Agent	
	Cost (in `)	Per cent	Cost (in `)	Per cent
Weighing	0	0.00	1	3.00
Packaging	2	67.00	0	0.00
Storage	1	33.00	0	0.00
Loading/unloading	0	0.00	10	28.00
Transportation	0	0.00	25	69.00
Miscellaneous	0	0.00	0	0.00
Total	3	100.00	36	100.00

Table 15: Marketing efficiency of marketing channel I and II.

Particulars	Channel I	Channel II
Consumer price (`/kg)	124.20	124.20
Total marketing cost (`/kg)	41.00	39.00
Marketing efficiency (`/kg)	3.02	3.18

Table 16: Constraints of rubber growers under the selected area (n=160).

Factors	Garrett's mean score	Rank
Local trained labour	67.16	I
Government funding	67.00	II
Market	53.66	III
Price instability	37.16	IV
Training programmes	33.33	V
Road condition	21.66	VI

CONCLUSIONS AND SUGGESTIONS

The main conclusion may be drawn majority of the respondents were graduates and employed in the government sector, rubber farming was found to be a secondary occupation, the raw rubber was sold through channel II, the price of the rubber fluctuated depending upon its quality and relations between the farmer and agent, the marketing efficiency of marketing channel II (producer-agent-processor) was found to be more efficient than channel I (producer-processor), lack of local trained labour was found to be the most prominent constraints followed by lack of government funding.

POLICY IMPLICATIONS

- Government agency should take note of the flourishing business and organize timely training to help the locals learn the art of extracting and processing.
- The local rubber association should reorganize and check the pricing of the rubber so that the farmers receive fair price for their goods.
- The government of Nagaland and the farmers should sign an MoU and export the raw material through government agency in order to help the farmers as well as improve the state economy.
- The future generation should also be sensitized and encouraged to be more proactive in the rubber business.
- In the current study location, direct person to person dissemination of information was seen to be more beneficial therefore personal interaction by the extension workers would be more beneficial.

Conflict of interest

All authors declare that they have no conflict of interest.

REFERENCES

Adikari, S.B. and Sharma, A. (2018). Marketing Pattern of Rubber Plantation in Tripura, India. International Journal of Current Microbiology and Applied Sciences. 7(6): 847-853.

Chishi, S., Kanitoli and Sharma, A. (2019). Resource use efficiency on different farm size groups of integrated watershed development programmes beneficiaries in Nagaland. International Journal of Current Microbiology and Applied Sciences. 8(6): 2135-2144.

Chouhan, P. Kuki, V. and Bhowmik, I. (2019). A study on the emerging labour relations in the rubber plantations of Tripura. Indian Journal of Economics and Development. 7(4): 56-59.

Drishti, I.A.S. (2022). Rubber Industry. Drishti IAS. Retrieved November 14, 2022 from https://www.drishtiias.com/daily-updates/daily-news-analysis/rubber-industry.

Jin, S. Min, S. Huang, J. and Waibel, H. (2022). Rising labour costs and the future of rubber intercropping in China. International Journal of Agricultural Sustainability. 20(2): 124-139. doi: 10.1080/14735903.2021.1918482.

Kumar, K.A. (2022). Cost and return analysis of natural rubber plantations in Pathanamthitta District in Kerala. Mudra: Journal of Finance and Accounting. 9(2): 98-110.

Ministry of Commerce and Industry. (2019). Production of natural rubber. Press Information Bureau. Retrieved November 14, 2022 from http://pib.gov.in//PressReleasePage.

Mongabay (2018). Study: Unchecked rubber spread in northeast India threat to native forest. Retrieved November 15, 2022 from http://india.mongabay.com/2018/03/rubber/.

Morung Express (2022). Rubber plantation area in Nagaland. Retrieved June 29, 2022. from http://morungexpress.com/191325-ha-rubber-plantation-arrea-in-nagaland.

Patton Renthungo and Ezung Prof. (2019). Farm size and productivity of rubber plantation in Nagaland. International Journal of Recent Scientific Research. 10(08): 34179-34182. doi: 10.24327/2019.1088.3837.

Reporter, B.O. (2020). Rubber production increases in Nagaland. The Shillong Times. Retrieved August 24, 2022 from http://theshillongtimes.com/2012/11/17.

Rubber World. (2023). International rubber studies group release latest industry outlook. Rubber World - The Technical Service Magazine for the Rubber Industry. Retrieved June 09, 2023 from http://rubberworld.com/.

Singh, S.S. Chauhan, J.K. and Devarani, L. (2021). Review on rubber producers' societies in North East India. International Journal of Current Microbiology and Applied Sciences. 10(01): 2814-2819.

Singh, Th.M. and Sharma, A. (2020a). Cost and returns on various farm levels of selected major horticultural crops in the state of Nagaland and Manipur, India. Plant Archives. 20(2): 9095-9103.

Singh, Th.M. and Sharma, A. (2020b). Resource-use-efficiency analysis for the selected major horticultural crops in the state of Nagaland and Manipur, India. Plant Archives. 20(2): 9113-9119.

Singh, Th.M. and Sharma, A. (2021a). Implication of indigenous farming practices on the employment and income pattern for the selected horticultural crops of Nagaland and Manipur States of India. Plant Archives. 21(2): 859-863.

Singh, Th.M. and Sharma, A. (2021b). A comparative study of the farmers' perception on the organic cultivation in selected horticultural crops of Nagaland and Manipur states of India. International Journal of Creative Research Thoughts. 9(4): 4702-4707.

Tiseo, I. (2022). Natural rubber leading producers worldwide 2021. Statista. Retrieved November 14, 2022 from http://www.statista.com/statistics.

Yadav, M.K., Sharma, A. and Singh, Th.M. (2022). A Sustainability approach of Income, Expenditure and Employment through different activities adopted under watershed programme in Nagaland. Agricultural Mechanization in Asia. 53(2): 5591-5598.

Yani, P. and Sharma, A. (2022). Prioritization strategies for the resources of traditional paddy-cum-fish culture in lower subansiri District. Indian Journal of Agricultural Research. 56(3): 357-362.