

**AN EXPLORATION OF THE TRIBAL RUBBER
GROWERS' LIVELIHOOD ASSETS STATUS IN
ASSAM, INDIA**

A THESIS
SUBMITTED IN FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE
OF
DOCTOR OF PHILOSOPHY
IN
ECONOMICS
AT



GOKHALE INSTITUTE OF POLITICS AND ECONOMICS

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GOKHALE INSTITUTE OF POLITICS AND ECONOMICS

2024

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Number of Volumes	Thesis (One)
Name of the Student	Dibyangana Chakraborty
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Name of University Economics	Gokhale Institute of Politics and
Month and Year of Submission	July 2024

DECLARATION BY THE CANDIDATE

I, **Dibyangana Chakraborty**, hereby declare that this thesis on the topic entitled, **“AN EXPLORATION OF THE TRIBAL RUBBER GROWERS’ LIVELIHOOD ASSETS STATUS IN ASSAM, INDIA”** is submitted for the award of Degree of Doctor of Philosophy in Economics to the Gokhale Institute of Politics and Economics, Pune 411004. It is an original contribution and has been completed during my tenure as a research scholar at Gokhale Institute of Politics and Economics, Pune. This thesis has not been submitted by me elsewhere for the award of any degree or diploma-part or full. The information gathered by me elsewhere for the thesis is original, true, and factual. Such material as has been obtained from other source has been duly acknowledged in the thesis. I hereby request, to consider the thesis for the award of the degree of ‘Doctor of Philosophy.’

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Date: 05.07.2024

CERTIFICATE

(FORM 'A')

CERTIFIED that the work incorporated in this thesis entitled **"AN EXPLORATION OF THE TRIBAL RUBBER GROWERS' LIVELIHOOD ASSETS STATUS IN ASSAM, INDIA"** submitted by **Ms. Dibyangana Chakraborty** was carried out by candidate under my supervision. It is an original contribution and has not been submitted elsewhere for the award of any other degree. Such material as has been obtained from other source has been duly acknowledged in this thesis. I recommend that the thesis should be considered for the award of the degree of 'Doctor of Philosophy.'

Date:

Place:

(Research Guide)

ACKNOWLEDGMENTS

It gives me great pleasure to express my gratitude for all the support, assistance, and advice I received from different people and organizations throughout my PhD journey. First and foremost, I want to extend my sincere gratitude to my parents and my spouse who have been constant sources of motivation and encouragement over these long years leading to completion of my PhD.

I will forever be indebted to my supervisor, Prof. Anjali Radkar for her guidance, support and patience throughout this journey. Her unwavering support, direction, intellectual input, and generosity were crucial and of paramount significance for the successful completion of my thesis.

The PhD section of GIPE also deserves special mention due to its prompt support in case of any administrative query. The finance section of the institution also deserves accolades due to on time processing of my UGC fellowship.

I wish to extend my gratitude to the Rubber Board officials of Guwahati, Silchar, Agia and Kajalgaon for their prompt support in identifying the Rubber-dense areas and the potential Rubber grower-inhabited localities in the survey districts.

The study has been conducted largely based on the information shared by the Rubber growers of select districts of Assam. I would want to sincerely thank these rubber growers for voluntarily participating in my study as subjects; without their genuine and active involvement, the study would not have come to be.

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LIST OF ACRONYMS

ADB	Asian Development Bank
AHP	Analytical hierarchy process
ANM	Auxiliary Nurse and Midwife
ANOVA	Analysis of Variance
BCR	Benefit-Cost Ratio
BLFT	Bodoland Liberation Tiger Force
BPS	Block Plantation Scheme
BTC	Bodoland Territorial Council
BTR	Bodoland Territorial Region
CAFA	Compensatory Afforestation Fund Act
CARE	Cooperative for Assistance and Relief Everywhere
CD	Community Development
CHC	Community Health Centre
CHTDB	Chittagong Hill Tracts Development Board
CI	Capital or Asset Index
DFID	Department for International Development
FAO	Food and Agricultural Association of United Nations
FCI	Financial Capital or Asset Index
FEPPCAR	Forestry, Environment, Plantation Crops and Permaculture Consultancy and Research
FRA	Forest Rights Act
GNI	Gross National Income
GOI	Government of India
GPC	Group Processing Centre
GSDP	Gross State Domestic Product
HCI	Human Capital or Asset Index
HDI	Human Development Index
HH	Household
HLRR	High Livelihood Resources Region
ICT	Information and Communication Technology
IGA	Income Generating Activity

IIPS	International Institute for Population Sciences
ILO	International Labour Organisation
IRR	Internal Rate of Return
KCC	Kisan Credit Card
Kg	Kilogram
Km	Kilometre
LLRR	Low Livelihood Resources Region
MFP	Minor Forest Product
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Schemes
MLRR	Medium Livelihood Resources Region
MMCS	Mendipathar Multipurpose Cooperative Society
MOEF	Ministry of Environment and Forest
MPI	Multi-dimensional Poverty Index
MSME	Medium, Small and Micro Enterprise
NCI	Natural Capital or Asset Index
NER	North-Eastern Region
NFHS	National Family Health Survey
NGO	Non-Government Organisation
NIC	National Informatics Centre
NTFP	Non-Timber Forest Product
OECD	Organisation for Economic Co-operation and Development
OR	Odds Ratio
ORRAF	Office of the Rubber Replanting Aid Fund
OXFAM	Oxford Committee for Famine Relief
P	Provisional
PCA	Principal component analysis
PCI	Physical Capital or Asset Index
PES	Payments for Ecological Services
PESA	Panchayats Extension to Scheduled Areas Act
PLA	Plantation Labour Act
R&D	Research and Development
RGS	Rubber Growers' Society
Rs	Rupee
RSS	Ribbed Smoked Sheets

SC	Scheduled Caste
SCI	Social Capital and Asset Index
SE	Standard Error
SHG	Self-Help Group
SLI	Sustainable Livelihood Index
SLF	Sustainable Livelihood Framework
ST	Scheduled Tribe
TFDPC	Tripura Forest Development and Plantation Corporation Limited
TISP	Tappers Intensive Skill Improvement Programme
TRPC	Tripura Rehabilitation and Plantation Corporation
TSS	Tappers Skill Development School
TRIFED	Tribal Cooperative Marketing Development Federation of India
UAM	Udyog Aadhaar Memorandum
UDISE+	Unified District Information System for Education Plus
UDYAM	Udyog Aadhaar Memorandum
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
USP	Upland Settlement Project
US\$	United States Dollar
VLRR	Very Low Livelihood Resources Region

CHAPTER 1: INTRODUCTION

1.1 Introduction

Rubber plantation in India was initiated in the southern state of Kerala by the Britishers in the early 1900s (*Viswanathan, 2008a*). Over the years Kerala has turned into the most prominent Rubber producing zone in our country. As of 2019-20, India's 67% Rubber area and 75% Rubber production are contributed by Kerala alone (*Rubber Board, 2021b*). However, further expansion of the Rubber area in Kerala has been limited by land constraints. At the same time, demand for Rubber has been on a continuous rise given its importance as an industrial raw material. Search for suitable land within various parts of the country has been initiated with the objective of growing new Rubber plantations. The North-Eastern Region (NER) of India has been found to be agro-climatically suitable for developing plantations. Moreover, the hill dwelling Tribal communities of NER needed to be pulled out of shifting cultivation practices which had been responsible for environmental degradation, subsequently rehabilitating these nomadic communities into permanent settlement-based agriculture practices. At this backdrop commercial Rubber plantation was initiated in NER (*Viswanathan, 2008a*).

Assam is the second largest state in NER. Since the early 19th century, native Rubber extraction and sale to British Rubber *Meheldars* had been a source of livelihood among various hill-dwelling Tribal communities, such as, Miri, Aka, Khampti, etc. in Assam (*Majumdar, 2016*). However, native Rubber (scientific name *ficus elastica*) is different from the presently cultivated Rubber (scientific name *hevea brasiliensis*) in the state, the latter being more commercially productive. Commercial Rubber plantation was introduced in the state during the 1950s by the state's soil conservation department (*Pradeep et al., 2017*). Currently, Assam is the 2nd largest Rubber producing state from NER. The objective of plantation development in Assam has been the same as that for the entire NER, i.e., to arrange for rehabilitation of hill Tribes engaged in shifting cultivation and preventing associated environmental degradation. Seven decades have gone by since the inception of commercial

plantations in the state and Rubber continues to be an integral part of Tribal development.

In the ten-year duration from 2009-10 to 2019-20, the state has garnered more than two-fold increase in Rubber plantation area from 25,805.9 hectares to 57,745 hectares. The rise in Rubber production has been even higher, from 9832.4 tonnes in 2009-10 to 30,350 tonnes in 2019-20 (*Government of Assam, 2011; Rubber Board, 2021b*). In this regard, it is to be noted that Tripura, the largest Rubber producing state in NER, which is called as the ‘second Rubber capital of India’ has brought around 85% of its one lakh hectare of potential Rubber cultivable land under plantation (*Viswanathan and Bhowmik, 2014; Datta et al., 2019*) (refer table 1-m for state wise Rubber area) and the scope of further horizontal expansion in the state seems to be exhausted in near future. Assam, on the contrary, is expected to contribute two lakh hectares out of a total five lakh hectares of potential Rubber cultivable land in the NER (*Maibangsa and Subramanian, 2000*). Thus, Assam is the most obvious choice of state for furthering Rubber plantations in NER.

However, in order to create a sufficient grasp of the state's current situation, before diving into the Rubber plantation sector of Assam, an overview of the state's geography, economy, and human development features are explored below.

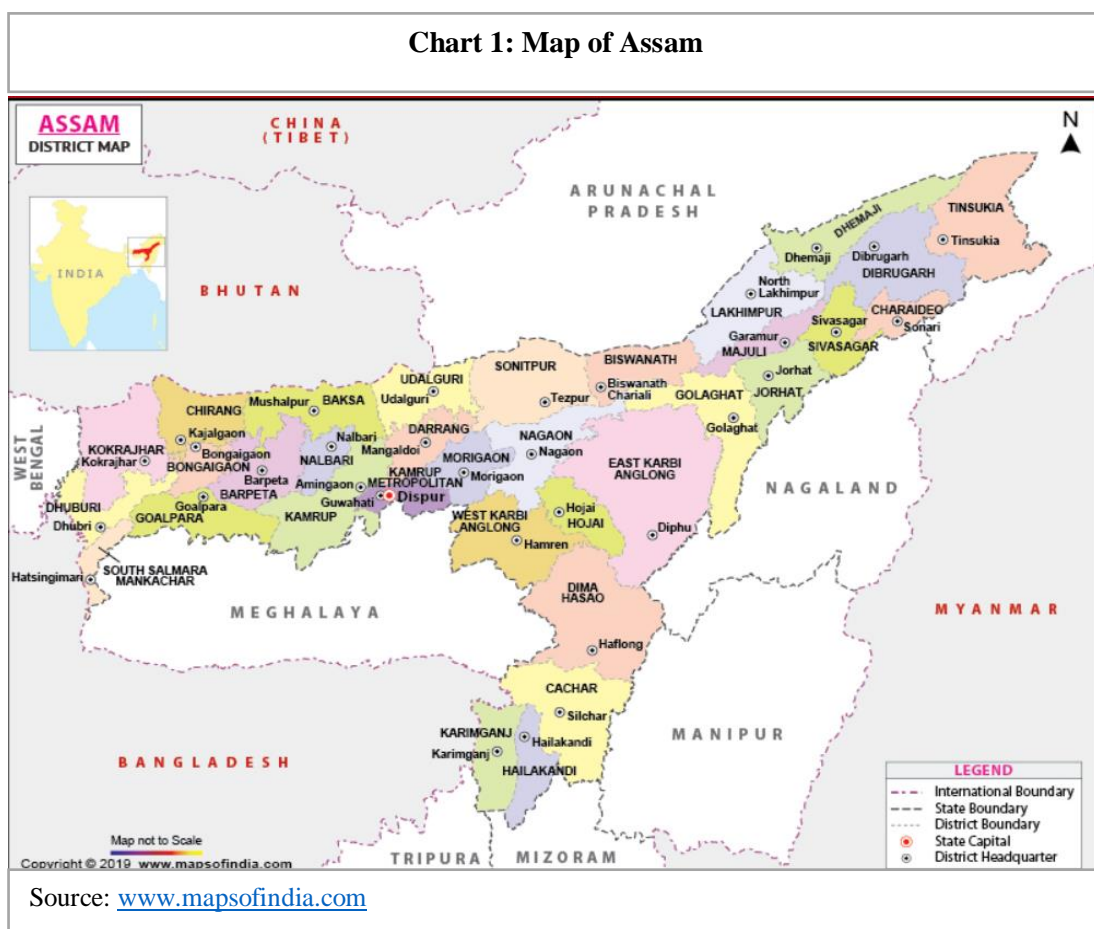
1.2 Assam: Climate, population, administration, sectoral contributions, human development, and ST profile

Assam is a prominent state of NER with geographical area of 78,438 Sq. Km. It is surrounded by Bhutan and Arunachal Pradesh to the north, West Bengal to the west, Meghalaya, Tripura, Mizoram, and Bangladesh to the south and Nagaland, Arunachal Pradesh and Manipur to the east. The topography here is uneven, having combinations of hills, plains, forests and rivers. River Brahmaputra which flows along the width of the state is considered a prime influence on climate, agriculture, forests as well as on many livelihood generating activities for the locals. The current section provides an outline of the climatic conditions, population, sectoral contributions, human development and ST profile of the state.

1.2.1 Climate and population

Climatic conditions here are more tropical in nature. Hot, humid, and stormy summers (March to June), heavy downpouring in monsoons (July to September) and mild winters (October to February) sum up the weather pattern. Entire state is divided into six agro-climatic zones, viz. lower Brahmaputra valley, upper Brahmaputra valley, central Brahmaputra valley, North bank plains, Barak Valley, and hill zone (*Government of Assam 2021*). The lower Brahmaputra valley receives highest rainfall during monsoons and flooding are a concurrent event every year.

Chart 1: Map of Assam



The state's population is 3.12 crores with 398 persons/Sq. Km density. There are 958 females per '000 males. Majority of the people in Assam live in rural areas, the share of urban population in total state population being only 14.09%. Around 7.15% and 12.44% of the total state population respectively belong to the scheduled caste (SC) and scheduled tribe (ST) communities. Nagaon is the most populous district of the state contributing around 6.06% of total state population. On the other hand, newly formed river Iceland-district Majuli is found to be the least populous one contributing

a meagre 0.53% in Assam's total population (refer table 1-a for population figures of the state).

Table 1-a: Salient population features of Assam	
Total population	3,12,05,576
Population density per Km ²	398
Decadal growth rate (%)	17.07
Female population	1,52,66,133
Sex ratio (per '000 male)	958
Rural population	2,68,07,034
Urban population	43,98,542
ST population	38,84,371
SC population	22,31,321
Most populous districts	Nagaon (18,92,550) Cachar (17,36,617) Barpeta (16,93,622)
Least populous districts	Majuli (1,67,304) Dima Hasao (2,14,102) West Karbi Anglong (2,95,358)
Source: Government of Assam, 2022	

1.2.2 Administrative setup and sectoral contributions

Assam has an elected unicameral legislative assembly and the Chief Minister is the elected head of the Government. The entire state is divided into five administrative divisions, viz, Barak Valley, Central Assam, Lower Assam, Upper Assam and North Assam, each headed by a commissioner. Each of these divisions are composed of a few districts which are headed by Deputy Commissioners. A district is divided into several subdivisions, headed by sub divisional officers. A subdivision is further divided into circles and each circle is headed by a circle officer. A circle has several villages and towns under its jurisdiction. Assam has 35 districts, 80 subdivisions, 185 revenue circles, 219 community development (CD) blocks, 214 towns and 26395 villages (*Government of Assam, 2022*). Dispur is the state capital and Guwahati is the largest city in the state as well as in NER (population is 0.9 million). Some other

important cities of the state are Silchar (population 1.72 lakh), Dibrugarh (population is 1.39 lakhs) and Nagaon (population is 1.17 lakhs) (*Census 2011*).

Assam's gross state domestic product (GSDP) at constant prices (base year 2011-12) for the year 2020-21 stands at Rs. 2,47,819 crores and has shown compound annual growth rate (CAGR) of 5.64% over the period of 2011-12 and 2020-21. In the year 2020-21, as table 1-b reveals, the highest contribution in state GDP is made by services (38.75%), followed by industry (32.89%), agriculture and allied activities (15.61%). Comparing between the period of 2011-12 and 2020-21, agriculture and allied activities' contribution have declined during this period, whereas service as well as industry have become the driving sectors contributing to GDP of Assam. In terms of growth, the industrial sector has registered highest growth rate (6.34%) during the selected period, followed by services (4.31%) while agricultural growth remained the lowest at 2.99% in the state.

Table 1-b: Sectoral composition, share in GSDP and their growth at constant prices (base year 2011-12)				
Sector	Year	Contribution (Rs crore)	Share in GSDP (%)	Compound annual growth rate (CAGR) (%)
Agriculture and allied activities	2011-12	28,819.00	20.12	2.99
	2020-21	38,675.00	15.61	
Industry	2019-20	44,083.19	30.78	6.34
	2020-21	81,518.00	32.89	
Service	2011-12	62,950.52	43.96	4.31
	2020-21	96,018.00	38.75	
GSDP	2011-12	1,43,212.44	-	5.64
	2020-21	2,47,819.00	-	
Source: Directorate of Economics and Statistics, Assam, 2016 & 2024				

1.2.3 Agriculture, forests and industry

To the rural population of Assam, agriculture is the dominant source of income and provides employment to almost 70% of the workforce (*Directorate of Economics and Statistics Assam, 2021*). Around 51% of the total state area is under agricultural use.

Paddy is the primary crop produced in the state. Other notable food crops produced here are maize (cereal), wheat (cereal), pulses, oilseeds, etc. The other important crops produced in the state are betel nuts, sugarcane, turmeric, banana, papaya, pineapple, sweet potato, potato, chillies etc. Another important crop of Assam is tea. In fact, Assam is the largest tea producing state in India in terms of production area and production quantity. It has contributed around 50% of India's overall tea production in the year 2021-22 (*Tea Board India, n.d*). Table 1-c shows area and production quantity of some of the above-mentioned crops in Assam.

Table 1-c: Total cropped area and major crops in Assam		
Total cropped area (hectare) (2019-20)	39,74,812	
Major crops (2019-20) (P)	Area (in '000 hectare)	Production (in '000 tonnes)
Rice	2400	5214
Cereals	2454	5360
Pulses	143	106
Oilseeds (excluding coconut)	332	192
Fruits	167	2540
Vegetables	289	5499
Coconut	25	194
Tea	343	514 (in '000 kg)
Source: Government of Assam, 2021		

Assam is also rich in forest resources. Various medicinal herbs, timber, fuel wood, etc. are some of the forest resources of the state. Around 18,52,695 hectares of land, i.e., 23.61% of the state's total land area is covered by forests, out of which around 73.35% comes under reserve forests (*Government of Assam, 2021*). The state is home to four national parks and 18 wildlife sanctuaries among which Kaziranga National Park, which is famous for one-horned rhinos, is declared a UNESCO heritage site.

Table 1-d: Salient industry-related figures of Assam	
Index number of industrial production (base 2011-12 = 100)	112
Number of registered factories (as per NIC 2008), 2020	7512

Number of registered MSME units (as per UAM/UDYAM)	20,058
Production of important minerals and silk yarn (2020-21)	Sulphur ('000 tonne): 6545 Lime stone ('000 tonne): 1510 Petroleum crude ('000 tonne): 3908 Coal ('000 tonne): 40 Natural gas ('000 tonne): 2831 Silk yarn (including Eri, Muga and Mulberry) ('000 Kg): 5549.60
Source: Government of Assam, 2022	

The major industries in Assam are grown around the natural and agricultural resources available here, some of the prominent industries being tea, oil and gas, silk, cement, tourism etc. As table 1-d reveals, more than 20,000 registered medium, small and marginal enterprises (MSMEs) and 7512 registered factories are operating in the state now. In terms of industrial raw materials, the state is the second largest crude oil producer in India. Digboi, Bongaigaon, Numaligarh and Guwahati houses four oil refineries. Also, Oil India Ltd, India's one of the most prominent public sector oil companies is headquartered in Duliajan, Assam. Coal, limestone, sulphur and natural gas are some of the other mineral resources produced here. Assam tea has an international reputation for its distinct flavour and tea industry is one of the oldest business avenues of Assam. Currently the state provides around 60% of the entire country's employment in the tea sector (*Directorate of Economics and Statistics Assam, 2021*). Sericulture is another important industry here which provides gainful employment to a considerable section of the rural and semi-urban population. Muga, Eri and Mulberry are the three most prominent silk types produced in the state. Assam produces around 85% of global Muga silks and it has been associated with the state's cultural heritage and identity on a global platform for a long time. The other recognised industry of Assam is tourism. The industry has been developed surrounding the wildlife, natural beauty and cultural heritage of the state. The Manas-Kaziranga-Pobitora national parks, the largest river island of the world - Majuli, the Kamakhya temple and the *Ambubachi mela*, etc. are some of the famous tourist attractions of the state.

1.2.4 Human development

According to the *Human Development Report (1990)*, “human development is a process of enlarging people's choices at all levels of development, the three essential ones (choices) are for people to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living....” (*UNDP, 1990*). Thus, human development cannot be guaranteed by growth of income alone, it needs overall progress of human lives at least in the three areas of education, health and standard of living. Deprivations in these three dimensions faced by humans can be captured by UNDP’s human development index (HDI). HDI is composed of the indicators of mean years of schooling and expected years of schooling representing education dimension, life expectancy at birth representing health dimension and gross national income (GNI) per capita representing standard of living dimension (*Roser, 2014*).

The state of Assam ranks quite low at 28th position among the 36 states and union territories of India in HDI ranking. Assam's HDI score for 2017–18 is 0.651, which is lower than the national HDI of 0.672 and reflects the state's higher overall human development deprivations. However, the state’s HDI has improved when compared with its own values for the year 1995-96. There has been improvements across the three dimensions of education, health and standard of living in the state, but the improvements are not enough big to match the respective national averages.

Table 1-e: HDI and its components in Assam

Components	1995-96	2017-18
Health index*	0.444 (0.490)	0.711 (0.754)
Education index**	0.529 (0.429)	0.591 (0.545)
Income index	0.656 (0.671)	0.657 (0.739)
HDI	0.543 (0.530)	0.651 (0.672)
Figures in the parentheses represent national values		
*Health indices for the years 1995-96 and 2005-06 include ‘infant mortality’ and ‘life expectancy at birth’. For 2017-18, ‘infant mortality’ is excluded from the index.		
**Education indices for 1995-96 and 2005-06 include ‘literacy rate’ and ‘mean years of schooling’. ‘Literacy rate’ is replaced by ‘expected years of schooling’ in 2017-18 education index.		
Source:		
i. Gendering Human Development Indices: Recasting the Gender Development Index and Gender Empowerment Measure for India, 2009		
ii. Gendering Human Development a Working Paper for Computing HDI GDI and GII for States of India, 2021		

1.2.5 Scheduled Tribes (ST) profile

Assam has the lowest ST share in total state population among the seven North-Eastern states, with only 12.4% of its population belonging to ST category (refer table 1-f). A total of 7,94,768 Tribal HHs exist in the state (*Government of Assam, 2022*). Despite having a small ST share in population, diverse ST communities are found in the state. Boro, Borokachari: Miri and Karbi Tribal communities together contribute more than 60% of Assam's Tribal population. Other prominent Tribal communities here are Rabha; Garo; Kachari, Sonwal, etc. (refer table 1-g).

Mizoram	94.4
Nagaland	86.5
Meghalaya	86.1
Arunachal Pradesh	68.8
Manipur	40.9
Tripura	31.8
Assam	12.4
Source: Annual Report 2021-22, Ministry of Tribal Affairs, Govt of India	

Name of the Tribal community	Population
Boro, Borokachari	13,61,735(35.05)
Miri	6,80,424 (17.51)
Karbi	4,30,452 (11.08)
Rabha	2,96,189 (7.62)
Kachari, Sonwal	2,53,344 (6.52)
Lalung	1,82,663 (4.70)
Garo	1,36,077 (3.50)
Dimasa, Kachari	1,02,961 (2.65)
Total state ST population	38,84,371
Figures in parentheses represent percentage share in total state ST population	
Source: Computed from A-11 Appendix: District wise scheduled tribe population (Appendix), Assam – 2011, Census 2011	

As seen from table 1-h, among the Tribe-dense districts of Assam, Dima Hasao, West Karbi Anglong and Karbi Anglong districts individually have more than 50% of their respective district population belonging to various ST communities. On the other hand, Karbi Anglong district has highest Tribal population in the state, contributing around 13.86% of STs in the state's total ST population, followed by Baksa and Dhemaji districts (8.52% and 8.38% respectively) (refer table 1-i). Moreover, the top ten districts contributing maximum number of STs in Assam's ST pool are inhabited by Karbi; Dimasa, Kachari; Boro, Borokachari; Rabha; Miri; Garo; Kachari, Sonwal and Deori communities.

District	Share of STs in district population (%)
Dima Hasao	70.92
West Karbi Anglong	65.51
Karbi Anglong	52.23
Dhemaji	47.44
Majuli	46.38
Chirang	37.05
Baksa	34.84
Udalguri	32.14
Kokrajhar	31.41
Lakhimpur	23.93

Source: Government of Assam, 2022

District	Tribal population	Major Tribes
Karbi Anglong	5,38,738 (13.86)	Karbi; Dimasa, Kachari; Garo
Baksa	3,31,007 (8.52)	Boro, Borokachari; Rabha
Dhemaji	3,25,560 (8.38)	Miri; Boro, Borokachari; Kachari, Sonwal
Kokrajhar	2,78,665 (7.17)	Boro, Borokachari; Rabha; Garo
Udalguri	2,67,372 (6.88)	Boro, Borokachari; Rabha; Garo
Lakhimpur	2,49,426 (6.42)	Miri; Kachari, Sonwal; Deori
Sonitpur	2,32,207 (5.97)	Boro, Borokachari; Miri; Rabha
Goalpara	2,31,570 (5.96)	Rabha; Garo; Boro, Borokachari

Kamrup	1,82,038 (4.68)	Rabha; Boro, Borokachari; Garo
Chirang	1,78,688 (4.60)	Boro, Borokachari; Rabha
Figures in parentheses represent share of district in total state Tribal population		
Source: Computed from A-11 Appendix: District wise scheduled tribe population (Appendix), Assam – 2011, Census 2011		

The STs of Assam showcase mixed performance when compared to the state's total population as well as country's total ST population, in terms of various education, health and economic indicators. Table 1-j puts forth performance of the ST population of Assam in comparison to state total population and/or to India's total ST population. The literacy rate among the STs in Assam stands at 72.1%, a meagre one percentage point less than the state average. In terms of GER, the Tribal communities exhibit higher enrolment in elementary levels of schooling (class I-VIII) compared to the state average, whereas, at higher levels more ST children stay out of school compared to overall state population. The reasons are many-fold, starting from lack of assimilation of Tribal culture and folklore as part of education, lack of enthusiastic participation from Tribal as well as non-Tribal communities in interior Tribal areas as teachers, seasonal migration, etc. among others (*Malayadri, 2012; Brahmanandam and Babu, 2016*).

In terms of sex ratio, the Tribals have better outcomes than the state average, the former community having 985 females per thousand males. In terms of life expectancy, the STs average around 56 to 58 years, higher than the total state life expectancy of 54 years. In terms of health infrastructure, the Tribal areas in Assam suffer from shortfalls in the number of primary health centres (PHCs), community health centres (CHCs) and sub-centres (SCs). Surprisingly, the number of health workers and nursing staff in these health centres are found to be adequate in number.

Assam's Tribal communities mostly own marginal operational holdings (less than one hectare) (60.85%), the share being higher than the national ST-owned marginal holdings (56.26%). Table 1-l also shows that the shares of small (1 to less than 2 hectares), semi-medium (2 to less than 4 hectares), medium (4 to less than 10 hectares) and large holdings (10 hectares and above) among the state's STs are lower than those among the STs at national level. This simply reflects the lacklustre land

ownership situation of these STs despite inhabiting forest and other lands for generations.

In terms of poverty status also, the Tribal people of Assam are found to have a poverty rate (i.e., poverty head count ratio) of 40.5%, 3.5 percentage points higher than the state's overall poverty rate. The per capita annual income of the STs of the state is found to be around Rs. 21,445, less than the state average (Rs.24,660).

Table 1-j: Salient characteristics of ST population of Assam	
Literacy rate (%) *	72.1 (72.2)
GER (%) (2019-20) *	Elementary: 115.4 (107.4) Secondary: 89.7 (74.0) Higher secondary: 42.0 (30.9)
Sex ratio (2011) *	985 (958)
Life expectancy at birth (2013) *	56-58 (54)
Status of health infrastructure (2020) **	SCs: 786 (558) PHCs: 185 (16) CHCs: 32 (18)
Number of female health worker/auxiliary nurses and midwifery (ANM) (2020) **	SCs: 1163 (no shortfall) PHCs: 215 (no shortfall) CHCs: 277 (nursing staff) (no shortfall)
Percentage distribution of number of operational holdings for STs (2015-16) ***	Marginal: 60.85 (56.26) Small: 21.64 (23.46) Semi-medium: 13.99 (13.98) Medium: 3.45 (5.55) Large: 0.07 (0.75)
Per capita annual income (2013) *	Rs.21,445 (Rs.24,660)
Poverty rate (2013) *	40.5 (37.0)
*Figures in parentheses represent Assam averages	
**Figures in parentheses represent shortfalls	
***Figures in parentheses represent all India ST averages	
Sources:	
i. Annual Report 2021-22, Ministry of Tribal Affairs, Govt of India	
ii. Assam Human Development Report 2014, Government of Assam	
iii. UDISE+ Report 2019-20, Ministry of Education	
iv. Statistical Handbook of Assam-2021, Government of Assam	

1.3 Salient features of Rubber plantation

Rubber is a perennial cash crop, originally found in the Amazon basin. It is widely used as an industrial raw material, especially in auto-tyre industry. Other uses of Rubber as a raw material include foam, hoses, foot wear, camel back, gloves, etc. Rubber can also be produced synthetically from petroleum by-products. However,

given the limited crude oil stock, demand for natural Rubber is expected to be long-lasting.

For development of productive Rubber plantations, temperature should be minimum 20°C or more to maximum 29°C to 34°C, with 125-150 rainy days a year. Rainfall should vary between 2000 and 3000 millimetres with around 80% atmospheric humidity (*Rubber Board*). In other words, tropical weather conditions are ideal for growing Rubber which is evident from the fact that apart from India, South and South-East Asian countries like China, Thailand, Vietnam, Indonesia, etc. with similar weather pattern are the major Rubber producing countries in the world. In India, the traditional Rubber growing zone, which features required weather conditions for plantations, consists of Kerala and Tamil Nadu. The non-traditional zone of Rubber plantation slightly varies in terms of weather patterns from the traditional zone, but is conducive enough to grow Rubber at an extensive scale. Such non-traditional Rubber zone is found in entire NER as well as in states like Karnataka, Maharashtra, Goa, etc.

Rubber trees attain maturity at the 7th year after planting and remain productive till 32nd year (*Rubber Board*). During this productive phase Rubber trees produce a sticky white fluid called latex which is the primary produce of Rubber. It is collected by making incision on the tree bark. This process of latex collection is called tapping. Usually tapping starts in early morning and continues up to 6 to 8 hours. Latex flow is highest during wet seasons, but tapping may get hampered due to excessive wet conditions. During winters, in the months of December to February, latex production is lowest and tapping is ceased. Around 85 to 140 days in a year tapping can be carried out in a plantation (*Verheye, 2010*).

Latex can be transformed into different Rubber types depending on usage, such as concentrated latex, ribbed smoked sheets (RSS) and crepe Rubber. In India, 68.43% of total produced natural Rubber during 2019-20 is of RSS type (*Rubber Board, 2021b*). For preparing RSS, latex is first coagulated using formic acid and run into rolling machine to convert it into thin sheets. These sheets are again passed through grooved rollers for texture. The Rubber sheets are then placed to dry in smoke houses or under sun for a few days. Finally, the sheets are graded according to quality from RSS 1 to RSS 5 by visual inspection and are ready for being marketed.

Rubber trees which have passed their productive phase are considered as valuable wood source, as the wood can be used for domestic and/or industrial fuel, production of charcoal, manufacture of pulp for the paper industry, furniture making, etc (Verheye, 2010). Replanting remains possible and is encouraged in the land with existing plantation.

1.4 Rubber Plantations of Assam

Kerala has been the leading Rubber producing state In India for a long time. However, its share has been declining over time in Rubber area and production with the emergence of NER as a significant Rubber producing zone. From 2013-14 to 2019-20, within seven years, the share of Kerala in total Rubber area and Rubber production of India have reduced from 70.42% to 67.01% and from 83.74% to 74.92% respectively (refer table 1-k and 1-l for state wise contributions in Rubber area and production respectively). Along with other states of NER (especially Tripura), Assam's share in Rubber area and production in India have also increased during the same duration from 6.16% to 7.02% and 1.75% to 4.26% respectively.

Table 1-k: Area under Rubber in major states and all India from 2013-14 to 2019-20							
State	Area under Rubber (hectare)						
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Kerala	5,48,225	5,49,955	5,50,840	5,51,050	5,51,115	5,51,200	5,51,030
Tripura	71,370	75,070	81,080	83,380	84,400	85,100	85,500
Assam	47,975	51,795	55,250	57,050	57,700	57,725	57,745
Karnataka	47,055	49,210	50,510	51,010	51,410	51,500	51,450
Tamil nadu	20,890	20,925	21,160	21,250	21,300	21,340	21,310
Meghalaya	13,875	14,775	15,420	16,020	16,270	16,280	16,330
Other states	29,010	33,405	36,540	38,240	38,705	38,855	38,935
India	7,78,400	7,95,135	8,10,800	8,18,000	8,20,900	8,22,000	8,22,300
Source: Rubber Board, 2021b							

Table 1-l: Production of Rubber in major states and all India from 2013-14 to 2019-20	
State	Production (tonnes)

	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Kerala	6,48,220	5,07,700	4,38,630	5,40,400	5,40,775	4,92,500	5,33,500
Tripura	39,000	47,000	44,245	50,985	50,500	52,300	61,950
Karnataka	35,230	34,560	29,400	38,800	38,300	38,900	41,550
Assam	13,600	17,310	14,560	19,970	23,300	25,200	30,350
Tamil nadu	25,000	23,785	19,495	21,140	21,110	21,500	21,600
Meghalaya	7570	8510	7360	8950	9050	9300	9350
Other states	5380	6135	8310	10,755	10,965	11,300	13,700
India	7,74,000	6,45,000	5,62,000	6,91,000	6,94,000	6,51,000	7,12,000
Source: Rubber Board, 2021b							

Assam currently holds 3rd position in the entire nation and 2nd position in NER respectively in terms of Rubber area (refer table 1-m). In terms of production, Assam is at 4th position in India and 2nd position in NER respectively (refer table 1-l). Many Rubber plantations of Assam are in immature stage as reflected by a less than 50% tapping ability of existing Rubber area in the state (table 1-m). Assam's share of tapped area in total Rubber area is also the lowest compared to the other major Rubber producing states. In terms of average yield also, Assam falls behind most of the major growing states (except Meghalaya) with 1150 kg per hectare of Rubber yield. However, as of 2019-20, only around 29% of the huge potential Rubber cultivable land area of two lakh hectares is cultivated. Hence the scope for further expansion of Rubber cultivation remains wide open for future in the state.

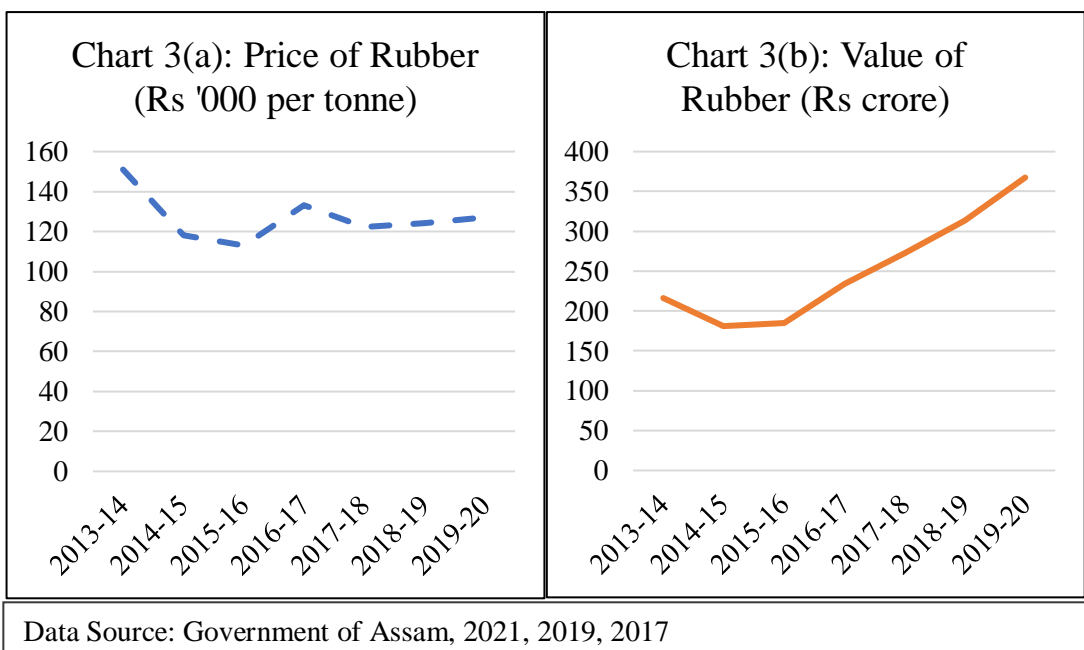
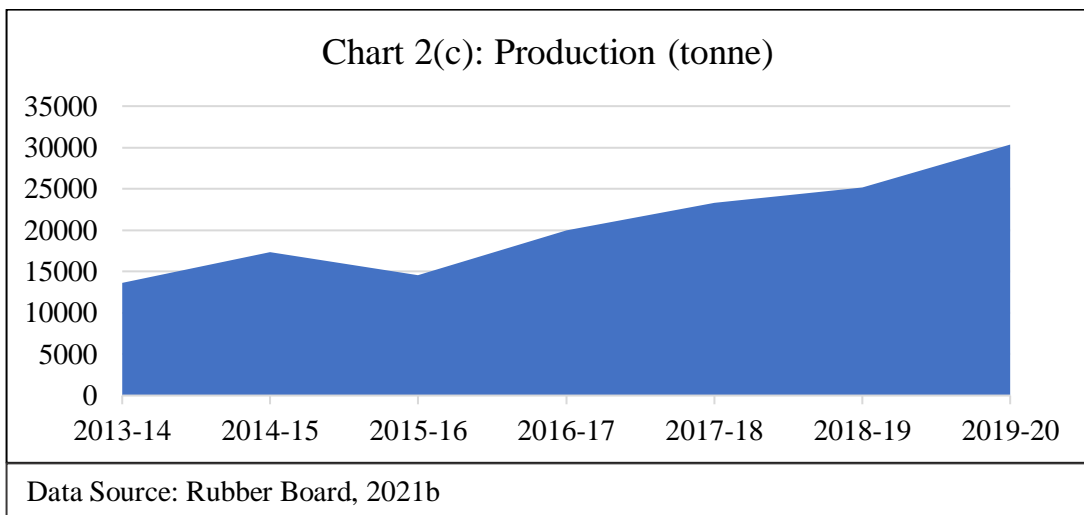
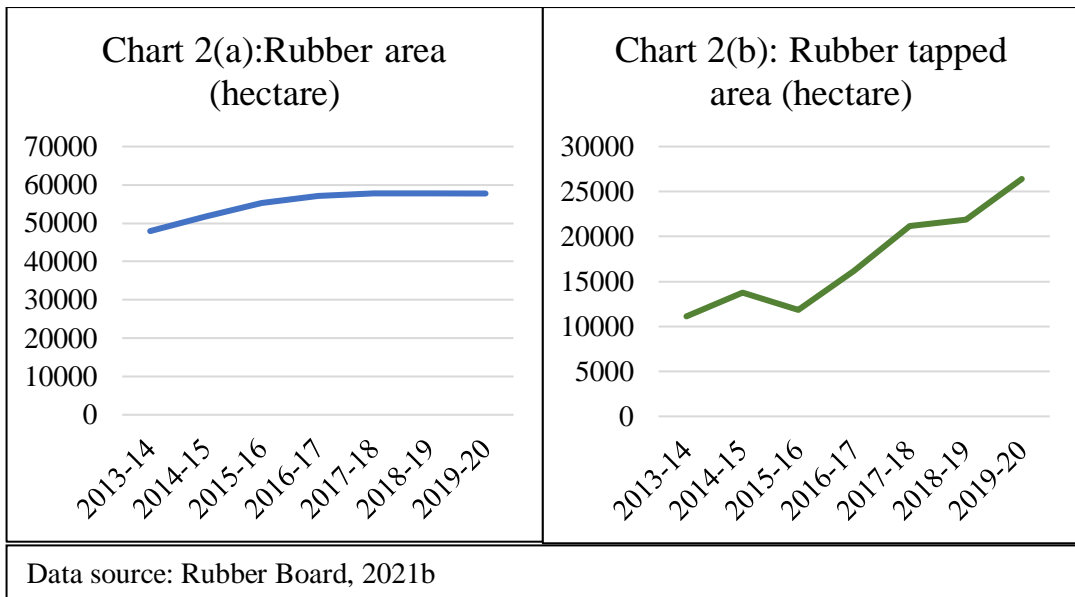
Table 1-m: Major state wise tapped area and yield and of Rubber during 2019-20		
State	Tapped area (hectare)	Average yield (Kg/hectare)
Kerala	3,42,240 (62.10)	1559
Tripura	50,300 (58.83)	1232
Karnataka	33,060 (64.25)	1257
Assam	26,400 (45.71)	1150
Tamil Nadu	14,400 (67.57)	1500
Meghalaya	8500 (90.90)	1100
Other states	13,100 (33.64)	-
India	4,88,000 (68.53)	1459

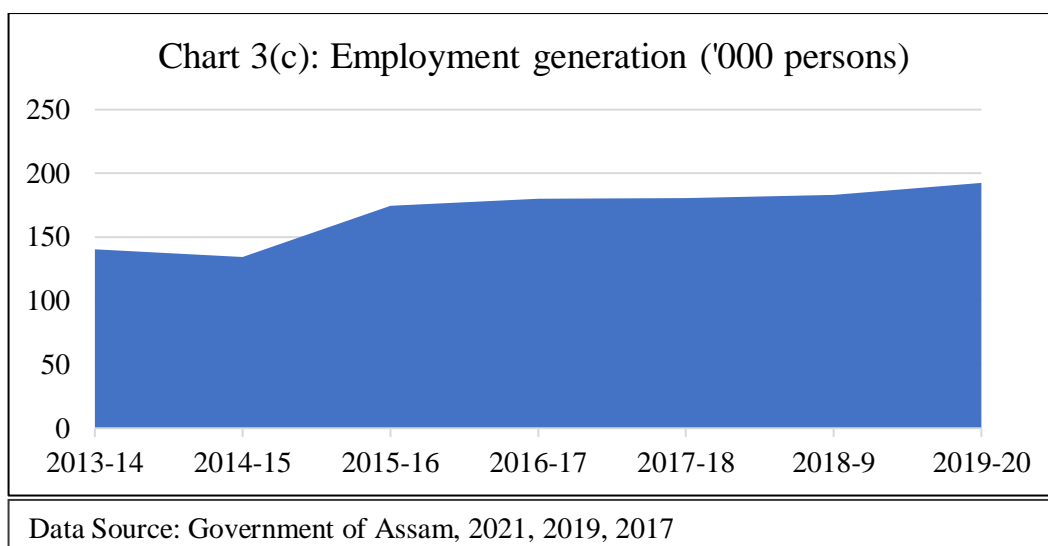
Figures in parentheses represent percentage of tapped area in total area under Rubber in a state/India
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Source: Rubber Board, 2021b

Charts 2(a) to 2(c) shows status of Rubber cultivation between 2013-14 and 2019-20 in terms of area, tapped area and production in Assam. The gap between total Rubber area and tapped area can be explained by the existence of a higher share of new planters having immature plantation of less than seven years of age with no latex production. However, it is to be seen that this difference between total Rubber and tapped area is reducing over the years, indicating more and more plantations are reaching their productive phases. Along with the rise in tapped area, production of natural Rubber has shown more than two-fold growth during 2013-14 to 2019-20 (chart 2(c)).

Though Rubber area has been growing over time, since 2016-17, the growth rate is negligible. Such low rates of Rubber expansion may be related to unwillingness of new households to take up Rubber as income generating source. This in turn can be explained by discouraging domestic as well as international Rubber price conditions. Chart 3(a) shows that the Rubber prices in India have remained volatile and are not showing upward movement. The reasons for unstable prices may be sluggish demand and surplus supply of Rubber in international markets, volatile oil prices leading to unstable demand for natural Rubber, exchange rate volatility and other geo-political factors (*Raju, 2016; Pareed and Kumaran, 2017*). The absorption of people in Rubber sector is also sluggish as only around 40,000 additional employment is generated in Rubber sector between 2013-14 and 2019-20 (chart 3(c)). However, unlike prices, the total value generated from Rubber has been rising steadily as growth of total value of Rubber during 2019-20 is found to be approximately 70% than that observed in 2013-14 (chart 3(b)).





Along with ST communities, over the years, various non-ST communities have also been growing Rubber. Currently there are 48,952 Rubber growers in Assam, among whom non-ST growers' share is around 33.55%. The STs are the primary growers of Rubber in the state (32,526, i.e., around 66.44%) (as of March, 2019) (collected from Rubber Board Regional Office, Guwahati).

In terms of district wise Rubber plantation shares, the highest contributors are Karimganj, Goalpara and Karbi Anglong districts (refer table 1-n). These three districts together contribute around 60% of Rubber area, tapped area, production and employment generation in the state. Karimganj district stands 1st in terms of Rubber area (28.45% of total state Rubber area) and employment generation (33.21% of total state Rubber employment) in Assam. Goalpara district holds 1st position in the state in terms of tapped area and production (contributing 26.21% and 23.38% of state total respectively). Karbi Anglong district holds 3rd position in terms of Rubber area and employment generation in the state (14.89% and 14.42% of state total respectively) whereas, its position is 2nd in terms of tapped area as well as production (21.03% and 19.65% respectively). The other important Rubber growing districts in Assam are Kokrajhar, Cachar, Chirang, etc.

Table 1-n: Top 5 Rubber producing districts in Assam for the year 2019-20

Area (Hectare)	Tapped area (Hectare)	Production (Tonnes)	Employment generation (numbers)
Karimganj (16429.00)	Goalpara (6919.56)	Goalpara (8615.00)	Karimganj (63932)

Goalpara (9610.50)	Karbi Anglong (5553.67)	Karbi Anglong (5964.64)	Goalpara (28832)
Karbi Anglong (8601.01)	Karimganj (3915.00)	Karimganj (4365.00)	Karbi Anglong (27770)
Kokrajhar (3390.04)	Kokrajhar (2604.55)	Kokrajhar (2206.00)	Kokrajhar (10760)
Kamrup (3184.54)	Chirang (1665.53)	Chirang (1685.00)	Cachar (9988)
Source: Government of Assam, 2021			

1.5 Role of Rubber Board in NER

Rubber Board is the apex body relating to Rubber industry development in India. The Board was constituted under the Rubber Act, 1947 by Government of India and presently operates under Ministry of Commerce and Industry. According to the Rubber Act 1947, the Board's broad areas of functions are as follows (*Rubber Board, 2021a*);

- Encouraging and assisting in conducting scientific, technological and economic research on any Rubber related events or activities
- Imparting training as well as technical advice to growers in improved methods of planting, cultivation, processing and marketing of Rubber
- Improving the quality of Rubber and implementing the standards for quality, marking, labelling and packing for the Rubber produced or processed in, imported into, or exported from India;
- Rubber related statistics collection from growers, dealers and manufacturers
- Securing better, improved and incentivised working conditions of the plantation workers
- To advise the Central Government on all matters relating to the development of Rubber industry, including the import and export of Rubber, participation in any international conference or scheme relating to rubber
- To submit to the Central Government and such other authorities as may be prescribed annual report on its activities and the working of the Act
- To prepare and furnish such other reports relating to the Rubber industry as may be required by the Central Government from time to time.

Rubber Board has contributed in Rubber plantation expansion in the NER as well as guided plantation-based settlements and socio-economic upliftment of various Tribal communities of the region. However, in the cases of the three major Rubber growing states of NER, viz., Tripura, Assam and Meghalaya, the initial hand holding for establishment of Rubber as an economically viable livelihood avenue for the natives was done by the respective state governments. Rubber Board's involvement into these state's Rubber sectors have accelerated the plantation as well as planters' development through training, supply of planting materials, management support, financial subsidy support and processing and marketing of Rubber through Rubber Growers' Societies (RGSs), etc.

During 2019-20, some of the activities undertaken by the Board in NER region are mentioned in table 1-o. The Board has undertaken 950 hectares of area under Rubber plantations in NER. Due to dearth of funds, no plantation subsidy is granted to new planters during the period. However, funds equivalent to Rs.9.87 crores are disbursed by the Board towards carry-forward and committed liabilities against the subsequent instalments of planting subsidy during the same period. Moreover, for aiding smooth and efficient processing of latex into sheets, Rubber Board has granted subsidies on installation of roller machines and smokehouse (Rs. 85 lakhs and Rs.8.4 lakhs respectively) to 427 and 42 Rubber growers respectively. In terms of Rubber-based Tribal development, the Board has not taken up any new projects, but continue to support the existing projects, viz., *Ujanghaniamara* and *Twisaplant I and II* in terms of input supply and advisory support on growing and managing plantations. To provide quality planting materials, such as, budwoods, polybagged plants and brown budded stumps to the remotely located growers under its various schemes, Rubber Board manages several nurseries under its aegis. During 2019-20, two such nurseries are established in NER, one of which is in Assam. Nineteen private nurseries are also given certification/registration by the Board and in return, has received Rs.1,86,232 as fees during the same period. To improve the productivity of the plantation as well as the planters, Rubber Board carries out numerous training programmes every year for various stakeholders of the Rubber industry. In the year 2019-20, it has arranged for a total 730 training related events engaging 8657 participants. Highest number of trainings are organised on tapping and tapping defects rectification as well as on

quality upgradation of the plantations. For further development of skilled tapping among the growers the Board also organises trainings through *Tappers Skill Development Schools (TSS)*, situated in Guwahati, Assam and Agartala, Tripura as well as through short-term training programmes named, *Tappers Intensive Skill Improvement Programme (TISP)*. During 2019-20, total 90 tappers development programmes are organised by the Board benefitting 1397 growers in total. To facilitate receipt of fair prices for the Rubber produce, Rubber Board arranges for collective marketing through Rubber growers' societies (RGSs). Most Rubber growers have traded Rubber in the sheet form in the year considered, followed by field latex. Along with RGSs, 69 group processing centres (GPCs) are operational in the NER to facilitate to produce graded Rubber sheets. Rubber produce is sold in the market through various channels, such as, through RGSs, through authorised dealers as well as through their agents and intermediaries. For the dealers to operate in Rubber market, it is mandatory to get license from the Board. In the concerned year, there are 1283 licensed Rubber dealers operating in NER, out of which 103 are in Assam. Rubber Board has issued new licenses to 10 dealers in 2019-20.

Details of planting		New planting (hectare)		800
		Replanting (hectare)		150
Details of ongoing Tribal development projects	Project name	Year of undertaking	Area (hectare)	No. of beneficiaries
	Ujanghaniamara	2014	14.34	12
	Twisaplant-I	2015 & 2016	29.65	32
	Twisaplant-II	2015 & 2016	31.46	27
Total			75.45	71
Establishment of nurseries (Nos.)				2
Planting material generation in Board's nurseries		Brown budded stumps (Nos.)		28,891
		Poly bagged Plants (Nos.)		276
		Bud wood (Meter)		6443
Assistance for processing-related infrastructure development		Roller subsidy (Rs.)		85 lakhs (427 beneficiaries)
		Smokehouse subsidy (Rs.)		8.4 lakhs (42 beneficiaries)
Group processing centres (GPC) operational (Nos.)				69
Details of collective marketing (excluding GPCs)		Type of produce	Quantity (MT)	No. of growers

	Field latex	1442	3995
	Sheet	1313	4260
	Field coagulum	25	120
On-farm training programmes	Type of training	No. of events	No. of participants
	Rain guarding	36	491
	Tapping	155	1985
	Controlled upward tapping	27	249
	Quality upgradation	108	1448
	Rectification of tapping defects	304	3381
	Plantation management	92	840
	Others	8	263
	Total	730	8657
Number of licensed Rubber dealers	1283 (103 in Assam)		
Number of licenses issued	10 (6 in Assam and 4 in Tripura)		
Source: Rubber Board, 2021a			

1.6 Need for the study

Despite the expansion of plantations in terms of area, production and employment, there is no denying that prices of Rubber at national as well as international markets are plummeting or stagnating for the last couple of years. During 2013-14 to 2019-20 period, domestic prices of Ribbed smoked sheets of grade 4 (RSS 4), which is the most popular Rubber sheet type produced in India, have varied between Rs.11,306 and Rs.16,602 per 100 Kg, whereas, its global equivalent RSS 3 price is fluctuating between Rs.9636 and Rs.15,525 during the same period (*Rubber Board, 2021b*). Assam's Rubber sector is no different in terms of Rubber prices. RSS 4 prices in the state have varied between Rs.11,300 and Rs.15,100 per 100 kg during the mentioned period (refer chart 3(a)). Unstable Rubber prices have resulted in several coping responses from the growers all over the world, such as, occupational and livelihood diversification in the form of wage labour, growing other commercially viable crops, being involved in petty businesses, etc. (*Lestari, 2020; Jin, 2021*). However, in some cases, falling Rubber prices have resulted in declining socio-economic status of the Rubber growing households as they fail to cover the cost of education and marriage of their children, their purchasing power and community welfare have been weakened,

etc. among others. Rubber growers in such cases are found to be abandoning plantation activity and moving entirely to other occupations (*Karunakaran, 2017; Nugraha et al., 2018*).

Given the vulnerable Rubber prices uninterrupted expansion of the Rubber sector requires that the existing Rubber growers refrain from abandoning plantations as well as new planters enter Rubber cultivation. This is possible when the existing Rubber growing households (HH) continue to experience consistent socio-economic development despite adverse market price conditions. As mentioned earlier, diversification of livelihood sources is an established coping practice in various Rubber growing areas across the globe. However, irrespective of the type of coping mechanism, livelihoods to be sustainable, HHs should have ownership or access to several livelihood assets. In other words, access to and/or ownership of productive livelihood assets by the existing Rubber growing HHs will ensure that they are able to survive oddities related to Rubber markets and continue growing Rubber along with taking up other farm and/or non-farm activity. Thus, the status of livelihood assets of these Rubber growers is a reliable indicator of their current socio-economic conditions. Given the successful rehabilitation of the Tribal people through Rubber plantations in NER in general and in Assam in particular, studying the livelihood assets status of the ST community Rubber growers of the state of Assam would ensure assessment of their current socio-economic conditions as well as identification of the areas of further development and policy focus.

1.7 Research Questions

The current study intends to focus on finding explicable answers to the following set of research questions;

- What are the current livelihood assets status of the Rubber growers belonging to various Tribal communities in Assam?
- Are there significant differences in livelihood assets conditions among different Tribal communities' growers?
- Are there significant differences between Tribal and non-Tribal growers in terms of livelihood assets status in Assam?

- How do these livelihood assets conditions of the Rubber growers impact their household (HH) poverty status?

1.8 Inclusion Criteria

To maintain uniformity and integrity of analysis, the current study restricts its coverage among the Rubber growers and/or plantations fulfilling the following criteria;

- In the present study, Rubber growers imply Rubber plantation owners. Those who work as tappers and/or labourers in others' Rubber plantations only and do not own Rubber plantations themselves are excluded from consideration in the study.
- Rubber plantations of age seven and/or above which are in the stage of producing latex are included for the study. Immature plantations and/or plantations having no latex production capacity are excluded.
- Only those Rubber growers are included in the current study who sell Rubber produces in the form of Rubber sheets, more specifically, Ribbed smoked sheets of grade 4 (RSS 4). During 2019-20, 68.43% of total natural Rubber production in India has been in the form of different RSS grades. On the other hand, 44.45% of total domestic Rubber consumption has been in similar form during the same period (*Rubber Board, 2021b*).
- The study only considers the case of natural Rubber plantations and does not consider synthetic Rubber production related events or activities.

1.9 Thesis layout

The thesis is divided into following five chapters;

- **Chapter 1: Introduction**

The current chapter provides a sneak peek into various aspects of the state of Assam including its Rubber plantation sector, such as, climate, population characteristics, especially STs, human development situation with respect to national figures, etc. In case of Rubber plantation related aspects, the chapter throws light on the area, production, price and employment situation of Assam as well as other major producing states during 2013-14 and 2019-20. Finally, the need to take up the current study is

explained along with research questions, answers to which are to be looked out for in course of the study.

- **Chapter 2: Review of literature**

This chapter deals with the discussions on the existing scholarly works on livelihood assets in general, their relationship with other components of sustainable livelihood framework with examples from various countries, livelihoods assets conditions of various Tribal communities spread across different parts of India, livelihood assets status of the Rubber growers of major Rubber producing countries as well as those of the major states of India and the available literary works on Assam's Rubber sector. The chapter ends with the identification of research gap for the current study.

- **Chapter 3: Livelihood assets status of Tribal Rubber growers in Assam**

This chapter explores the livelihood assets status of various intra-Tribal communities as well as Tribal vs. non-Tribal communities. It includes the methodology of conducting field surveys and index formulation for livelihood assets of Tribal and non-Tribal communities, representation of results and discussion based on the obtained results on Tribal growers' current livelihood assets conditions in the state.

- **Chapter 4: Income, poverty and livelihood assets of Rubber growers of Assam**

The overall household (HH) income, income from Rubber only as well as from other sources, measurement of poverty status of Rubber HHs using World Bank's poverty line and the role of livelihood assets on determining poverty status of these HHs are discussed in this chapter.

- **Chapter 5: Conclusion**

The chapter begins with a summary of the findings of the current study, followed by proposing few recommendations based on these findings and finally, stating the limitations of the study and putting out the future scope of further research.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Introduction

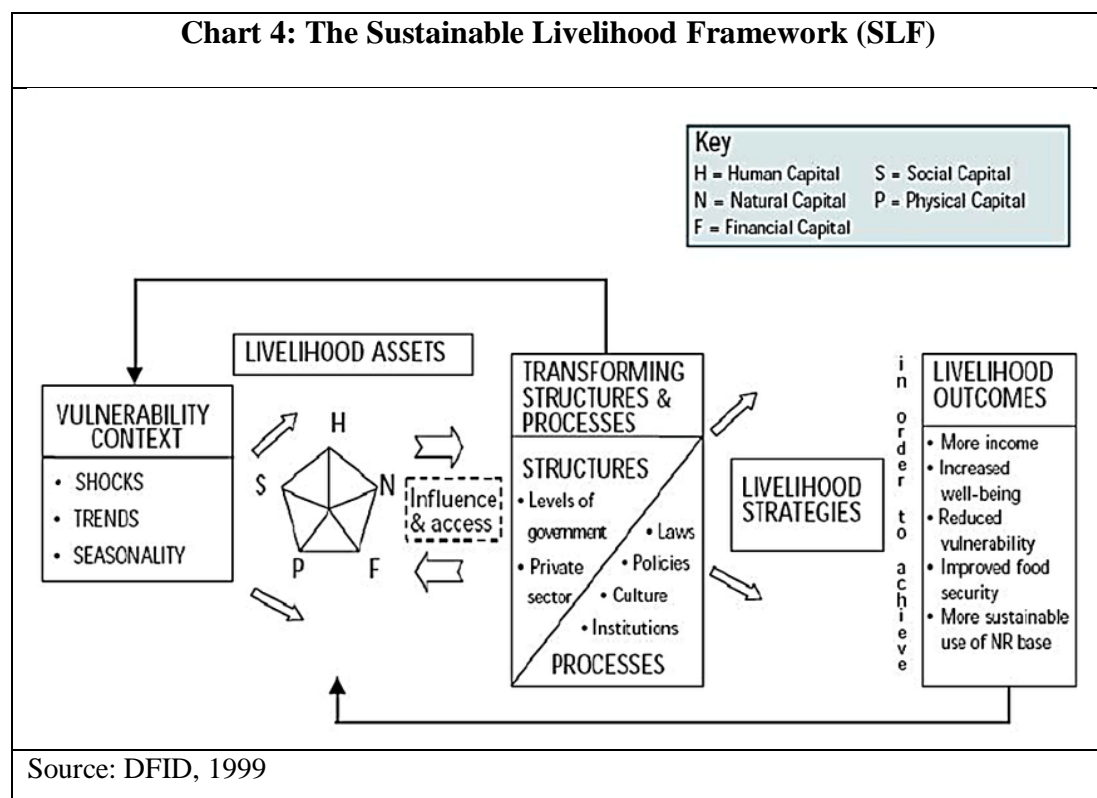
The current chapter reviews the prior scholarly works on livelihood assets broadly as well as regarding the Rubber growing HHs at the global, national, and regional scales, which aids in identifying feasible research gaps for further study. The chapter is broadly divided into five sections with multiple sub-sections. The present section introduces the chapter outline, followed by two sections exploring the concept of livelihood assets, their relationship with other livelihood framework's components and practical examples of such a relationship in various nations' rural livelihoods set up through review of several scholastic works. The fourth section explores the livelihood assets conditions of various Tribal communities across different regions of India. Finally, the chapter examines the available literary works on Rubber Growers' livelihood assets globally, in India, as well as in NER, and identifies plausible research gaps that serve as the foundation for developing the research questions.

2.2 Concept of Livelihood Assets

The decade of the 1990s has been significant in terms of shifts in the definition and measurement of wellbeing and standard of living. From being measured by incomes and calorie intake, the concept of wellbeing has subsequently been associated with various non-monetary achievements as well. One such explanation is given by *Sen (1987, 1993)* through his concepts of 'capabilities' and 'functioning'. According to *Sen's capability approach (1993)*, wellbeing is associated with the ability of an individual to carry out certain 'doings and beings,' such as, being in good health and appropriately nourished, avoiding premature mortality and morbidity, feeling socially integrated etc. among others. Among other non-monetary approaches to measure individuals' wellbeing, livelihood studies have gained prominence, especially in the developing countries. Organizations like Department for International Development (DFID), United Nations Development Programme (UNDP), World Bank, Cooperative for Assistance and Relief Everywhere (CARE), Oxford Committee for Famine Relief (Oxfam), etc. have developed various concepts and tools under the livelihood approach to study socio-economic status and wellbeing of rural population across the

globe. According to this approach, wellbeing is largely an outcome of sustainable livelihoods. In the words of *Chambers and Conway (1992)*, “livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term”. The DFID’s sustainable livelihood framework (SLF) (*DFID, 1999*) illustrates five major components of and influences on livelihoods, such as;

- Vulnerability context
- Livelihood assets
- Transforming structures and processes
- Livelihood strategy
- Livelihood outcomes



The vulnerability context in the SLF is the external environment or factors people in consideration face involuntarily, such as, diseases, droughts, war, seasonality, price shocks, etc. among others. The transforming structures and processes (in the form of

regulations, policy implementation, grants. etc by Government and private enterprises) then attempt to improve response to vulnerability of these people/HHs, thereby improving the livelihood outcomes (in the form of increased income, reduced vulnerability, increased wellbeing, etc.) of the people by adopting various livelihood strategies, using and/or enhancing the asset bases (Chart 4 for reference).

Assets among the five components of SLF is one of the most influential factors affecting livelihoods and hence wellbeing of people/HHs. Analysis of rural livelihoods requires knowledge of the concerned people's access to the livelihood assets, interaction between these assets as well as expansion of the asset bases by establishing interactions with the state, market and civil societies (*Bebbington, 1999*). Livelihood assets are the resources available with HHs for attaining multitude of outcomes in the forms of higher income, better well-being, lesser vulnerability, etc. among others. In other words, assets are “a broad array of resources that enable people and communities to exert control over their lives and to participate in their societies in meaningful and effective ways” (*Ford Foundation, 2004*). *Ellis (2000)* considers livelihood assets of HHs as the building blocks to carry out production, participate in labour markets and in reciprocal exchange with other households. In the words of *Liu et al. (2018)*, “livelihood assets refer to the natural and manpower resources essential for people to survive, and they can be stored, exchanged or allocated to generate revenue streams or other benefits.” According to *Chambers and Conway (1992)*, livelihood assets comprise of both tangible and intangible components; resources like land, water, livestock, farm equipment, etc. and stores like cash, savings, jewellery, food stock etc. form HH's tangible assets, whereas, claims and access are intangible components of these assets. Claims are demands for support from individuals, agencies, NGOs, Governments etc. during stresses or shocks in the form of gifts, food, work etc. and access represents the opportunity of a HH to use resources (water, land, etc.) and services (education, health, etc.), as well as the opportunity to obtain technology (high yielding seeds, etc.), employment, food and income.

Livelihood assets may have different classifications. The works of *Carney (1998)*, *Scoones (1998)* and *Ellis (2000)* have been instrumental in classifying the asset bases. Depending on their works, various organisations and thinkers have modified, altered, and added asset classifications. Most famous among these is the *DFID's (1999)* classification of livelihood assets into five categories, such as;

- *Physical assets* consist of infrastructure and producer goods required for supporting livelihoods, for e.g., roads, housing, tools and equipment for agriculture or any other income generating activity, etc. Inaccessibility to physical assets may have detrimental effects on other livelihood assets and/or livelihood outcomes. For e.g., lack of proper road connectivity to market may increase transportation costs for those in need of transporting their products to market for sale, thereby imposing extra cost burden on the HH.
- *Human assets* represent “skills, knowledge, ability to labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives” (DFID, 1999). It is considered as necessary, if not sufficient for leveraging the remaining four assets. For instance, health issues may make it difficult for people to work on agricultural land (natural capital), which reduces food security and other aspects of their quality of life.
- *Natural assets* consist of the natural resources which may be intangible public goods like biodiversity and atmosphere as well as divisible assets which can be used directly in the production process such as land, tree, water, etc. (DFID, 1999; Thulstrup, 2015, as cited in Sharifi and Nooripoor, 2018).
- *Financial assets* comprise the financial resources of the people in the forms of savings, grants, jewellery, remittances, income, investment, etc. It is the most versatile of the five livelihood assets due to its easy convertibility to the other four assets as well as its usability in direct fulfilment of one or more livelihood outcomes, such as, purchasing food from market to counter food insecurity, etc. (DFID, 1999).
- While defining *social assets*, Bourdieu (1986) says, “Social capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition—or in other words, to membership in a group—which provides each of its members with the backing of the collectively owned capital, a ‘credential’ which entitles them to credit, in the various senses of the word”. In simpler words, social

capital or asset is built on the three pillars of networks and connections, formalised group memberships and trust and reciprocity.

UNDP (2017) also follows this classification. Among others, *May et al. (2009)* have classified livelihood assets into human, social, physical, financial and public assets. Public assets in this case have wider scope than social assets as the former include public services of local organisations and groups like libraries, provision of housing by local authorities, public transportation, etc. and participation of people in broader social groups, beyond friends and family. *Cooperative for Assistance and Relief Everywhere (CARE) (2002)* as well as *Food and Agriculture Association of United Nations (FAO) and International Labour Organisation (ILO) (2009)* have divided assets into six categories. They have incorporated political asset or capital as the sixth asset, apart from the ones described by DFID and UNDP. The political assets focus on power relations. Owning adequate political capital is a determining factor of a HH's ability to access and influence government policies and processes. Another form of asset that has been talked about extensively by *Bourdieu (1986)* is cultural capital or asset. It is distinct for different societies and communities. Cultural capital has three features, viz, “*embodied*, such as knowledge and skills that help people use cultural power; *objectified*, such as concrete assets that have cultural values like antiques and artwork; and *institutionalized*, including institutional intervention and cultural morality” (*Bourdieu, 1993*, as cited in *Kitipadung and Jaiborisudhi, 2021*). According to *Bebbington (1999)*, cultural assets are “another important ‘input’ to livelihood production and poverty alleviation”.

2.3 Relationship between Livelihood Assets and Other Components of SLF

The relationship between livelihood assets and the other four components of DFID's SLF is complex. These assets impact as well as get impacted by the rest four components of SLF, such as;

- The ‘vulnerability context’ in the form of shocks, trends and seasonality may destroy or create assets.
- The institutions and policies of the ‘transforming structures and processes’ may exert influence on assets by creating assets (government investment in

creating basic infrastructure /physical assets), and determining access to assets (regulation of common property resources). Transforming structures and processes are also influenced by people's asset endowment. The greater the assets endowment of the HH/people, the greater they can exert influence on the institutions and policies in their favour.

- The greater and/or diverse the asset stock of a HH, the more options it has in terms of 'livelihood strategies'.
- Poverty reduction as well as enhancing wellbeing of a HH are dependent on its access to different livelihood assets (*DFID, 1999*).

Several developmental thinkers have empirically explored the relation between assets and the other components of SLF over the years. *Bazezew et al. (2013)* have conducted case studies in Dega, Woina-Dega and Kolla agro-ecological zones of drought-prone Lay Gaint district in Ethiopia to investigate the livelihood assets conditions, strategies and livelihood outcomes of the people residing in that area. It is found that the people in the Lay Gaint district face chronic droughts and associated rainfall variability (vulnerability context) and as such mostly engage in crop production (wheat and barley mainly), followed by livestock rearing (small ruminants and cattle mainly) and a small fraction doing non-farm and off-farm activities (casual labour, grain milling and trading, fuelwood sale, etc.) (livelihood strategies of HHs). Livestock ownership, fruits and trees production, engagement in non-farm activities and access to credit (financial assets), agro-ecology and number of plots (natural assets), family size (human assets) significantly influence annual household incomes (livelihood outcome). All the livelihood assets except agro-ecology positively influence the HH annual incomes and in case of agro-ecology, people residing in Dega zone are found to earn more incomes than those in the other two zones due to locational advantage, accessibility and good infrastructure. Despite the significant contributions of these assets in generating positive livelihood outcomes, institutional support mechanism (structures and processes) fails to provide for the development of the asset bases of these people due to lack of transparency and accountability in targeting safety nets beneficiaries, excessively high interest rates imposed by microfinance institutions, poor infrastructure, tenurial insecurity, unfair food distribution systems, etc.

Another study recently conducted by *Tora et al., (2022)* have explored the influence of physical (production tools, fertilizers, seeds, secure shelter & buildings, water supply & sanitation, etc.), human (health, nutrition, education, knowledge, skill, capacity to work and adapt), natural (trees, land, water, environmental services, biodiversity, etc.), financial (wages, remittances, pensions, savings, livestock), social (networks, reciprocity, formal and informal groups, leadership, collective participation in decision-making, etc.) and a new information asset (weather forecast, pre-information on human and animal health constraints, market fluctuations) on the livelihood security in the forms of economy, basic education, health, habitat and community participation of the people of drought-prone Gamo lowland zone of Ethiopia. It is found that the people of this region are most rich in natural assets, followed by human and physical assets. On the contrary, the most access-deficient assets for these people are the financial ones, followed by information assets and social assets. Through the binary regression model, it is found that except for human assets, access to the other five assets have declining probability of livelihood security attainment on the part of the people. Apart from these two, there are substantial amount of literature available in the same line of thoughts which have explored the effect of livelihood assets on the lives and livelihoods of the people of various countries of Sub-Saharan Africa (*Antwi-Agyei, 2012; Makame et al., 2018; Kasim, 2019*).

Liu et al. (2018) has explored the role of livelihood assets on selecting suitable livelihood strategies by the HHs in Zunyi City of the western mountainous region of China. HHs in this region have three major livelihood strategies- rural farming (HHs having less than 10% contribution in family income from non-agricultural activities), part-time farming (HHs having 10% to 90% contribution in family income from non-agriculture) and non-farming (HHs having more than 90% contribution in family income from non-agricultural activities). It is found that HHs owning more natural (farm land and woodland) and man-made assets (living space, housing quality, HH fixed assets and production infrastructure) are likely to remain in rural farming category, whereas, owning more manpower (family labour force, education of family labour force and participation in skill training) and financial assets (cash income per capita, access to borrowing and family property income) make HHs more likely to be part-time and non-farming in nature. Interestingly, social assets (family transfer income, access to non-agricultural occupations and communication expenditures) in

the study are found to exert no significant influence on HHs' choice of livelihood strategies and as such describes its poor status among the HHs in the region.

Using an almost similar framework, *Wang et al. (2021)* has investigated the role of livelihood assets of the herdsmen in the rich grassland resources-dominant Gansu and Qinghai provinces of China to determine their preferences among the three livelihood strategies, viz., pure herding (earning less than 10% income from non-herding activities), agriculture-dependent herding (earning between 10% and 80% income from non-herding activities) and non-herding (earn more than 80% income from non-herding activities). The paper argues that HHs with more natural (per capita farmland and per capita grassland) and physical assets (number of livestock, housing, tents and barns) are likely to remain pure herdsmen and do not seem to transform to the other two livelihood options. On the contrary, HHs with more financial (access to loans, subsidies and insurance) and human assets (education of HH head, per capita investment in HH and HH labour force) are likely to shift to agriculture-dependent herding and non-herding. In case of social assets (betrothal gifts and social spending, number of close relatives and trust in village officials), better endowed HHs prefer doing agriculture-dependent herding and not non-herding due to hesitancy on their parts to let go the networks and connections they have built among themselves while doing herding for a long period of time. Additionally, the paper has also investigated the role of environmental perception (consists of ecological awareness and sense of responsibility towards the surrounding environment) as a moderating variable in the relationship between assets and strategies of the herdsmen. It is found that herdsmen with a strong ecological awareness make more intensive use of the grasslands within limited time span whereas, those with strong sense of responsibility towards environmental protection tend to invest more resources to carry out environmentally sound grassland management practices and hence with increased sunk cost they prefer to stay in herding and do not change livelihood activity.

Chu et al. (2019) have studied the impact of livelihood assets on the forest-dependent communities' incomes (livelihood outcome) in the Da river basin region of Vietnam. Forestry land area, access to non-timber forest products (NTFPS) and payments for environmental services (natural assets), along with sex, ethnicity, farming experience (human assets), access to credit (financial assets) and training attendance on agricultural production (social assets) are found to influence HH income

status significantly. In other words, male headed-HHs with more farming experience belonging to the Kinh community having access to rural and other forms of credits, NTFPS, training programmes on agricultural production, payments for environmental services and larger forestry lands intend to earn higher incomes in Da river basin region.

Ahmad et al. (2019) have investigated the role of livelihood assets of the livestock farmers on their annual incomes derived from livestock in Punjab province of Pakistan. The paper argues that physical (herd size), human (farmer's education and farmer's level of participation in livestock rearing activities), natural (own farm land size) and financial assets (annual income from crops and non-farm sources) of the farmers have significantly contributed in determining incomes from sale of livestock and milk (livelihood outcome). Livestock farmers having higher education and more farm lands tend to earn less from livestock due to greater scope of non-farm diversification and more scope of earning from cropping respectively. On the contrary, farmers with greater herd size, more incomes from crops and non-farm sources and higher participation in livestock rearing activities, are found to earn more income from livestock due to generation of more livestock products for sale, greater monetary resources to invest in livestock health, breeding practices, nutrition, etc. and use of family labour to avoid additional labour costs, respectively.

2.4 Livelihood Assets and Tribal Communities in India

Tribal livelihoods are to a large extent dependent on forest and forest-based resources (*GOI, TRIFED, 2019*). However, accessing forest resources by the Tribal communities has become challenging over the years despite having progressive laws like Panchayats Extension to Scheduled Area (PESA) Act, 1996 and Forest Rights Act (FRA), 2006. The reasons include passing of several other laws and acts which interfere in the applicability of these two acts, such as, Wild Life Protection (Amendment) Act, 2006, Forest Conservation Act (Amendment) Rules, 2014, Compensatory Afforestation Fund Act (CAFA), 2016, etc. (*Haq, 2020*) as well as ongoing forest degradation due to land cover change (*Vijayan et al., 2021*), fire, excessive grazing, critical livelihood–forest linkage of forest dependent population, fuelwood collection, urbanisation, illegal felling, etc. (*MOEF, 2006, 2009; Aggarwal et al, 2009; Davidar et al., 2010*).

According to *Gopu and Velusamy (2020)*, the *Paliyar* Tribes of Dindigul district of Tamil Nadu have been struggling to earn decent livelihoods due to loss of rights over forest resources and lands. Most of these people are labourers in the agriculture sector, followed by being involved in collection of minor forest produces (MFPs). They have identified physical (house ownership, type of dwelling houses, possession of livestock, possession of vehicles, availability of basic amenities, availability of media and communication facilities, and availability of household appliances), human (number of working members in family, work throughout the year, education level of family members, status of nourishment of the family, the extent of comfortable clothing, levels of the overall health of the families and degree of capacities to work by the family working members), financial (savings, investment in any business, insurance, procurement of gold/jewellery, borrowing, financial ability to obtain social, economic, health, and educational benefits) and social assets (memberships in self-help groups, political parties and other organizations, elected family members in the panchayat raj, participation in grama sabha meetings, level of satisfaction with village people and the relationship with family members, neighbours, relatives, elected members of local self-government, members of non-tribal communities in hills and plains) to be significant determinants of the livelihood outcomes (comprising of family income, increased family well-being, extent of food security in the family, having access to local resources and feeling of dignity by your occupation) of the *Paliyars*. However, natural assets (agricultural landholding, engagement in collection of MFPs, participation in collection of medicinal plants and status of tourism as livelihood means in family) do not significantly contribute to their livelihood outcomes mostly due to the declining contribution of forests and its resources on the livelihoods of these Tribal people.

In the Bundu block of Ranchi district, Jharkhand, the *Lohara*, *Munda* and *Oraon* Tribal communities derive direct employment from forests in the form of contractual daily wage-labour engaging in land preparation, plantation work, tendu leaf collection, soil and water conservation related activities, etc. and indirect self-employment by selling NTFPs (sal leaf, mohua, fodder, fuel wood, mango, etc.). Education, more social participation, larger family size (socio-personal variables), larger land holding, housing status, farm power, farm implements, livestock possession, material possession, higher income from forestry, higher gross annual income (economic

variables), higher level of aspiration towards future wellbeing, considerable knowledge of forestry practices, positive attitude towards forestry (psychological variables), better use of information sources (communication variable), secure employment, lower migration and better use of forest resources (situational variables) positively influence the livelihood assets status of these forest-dependent Tribal communities in Bundu (*Islam et al., 2013; Islam et al., 2014*).

Bhat et al. (2021) have investigated the livelihood assets and livelihood security status of the Tribals residing at the forest fringes of Srinagar and Ganderbal areas of Central Kashmir. The dependence on forests and forest-related resources among the Tribes of this region is limited due to degradation of forests, natural calamities and governmental restrictions on access to forests. These people mostly earn their livelihood through labouring in construction sites and irrigation projects, being employed in defence and government services and by rearing livestock. The authors of the paper have formulated indices for human (active population, family size, sex ratio, illiterate family heads and family heads with experience of farming/domestication of livestock), physical (land, residential structure, land development structures and plantation, machine and implements and others), natural (operational area, fruit area, irrigated area, animals ownership and average landholding size), economic (annual HH income, annual HH income from livestock, annual HH income from crops, annual HH savings and annual HH credit) and social assets (participation in organisations and extension programmes) as well as for the livelihood security (function of all the five assets status, workers share in family, income share from forests and livestock possession) of these Tribal people of Central Kashmir. Tribal families at the forest fringes near towns have most secured human assets due to more family members working in farms and favourable sex ratios, whereas, those living far away from towns show better natural assets security due to better access to irrigation and more area under cultivation. In fact, except natural assets, in the case of the rest four assets Tribals living in the forest fringes near town have ranked better than those far from town due to locational advantage. Natural, economic and human assets are found to be significant and positive determinants and physical and social assets negative and insignificant determinants of livelihood security of these people.

Satpati and Sharma (2021) have classified the south-western plateau and highland region in West Bengal majorly consisting of Birbhum, Bardhaman, West Midnapur, Purulia and Bankura districts into four livelihood resources regions based on the five livelihood assets endowment status of the local Tribes, viz., high, medium, low and very low livelihood resources regions (in short, HLRR, MLRR, LLRR and VLLRR, respectively). HLRR and MLRR are better endowed in physical (percentage of the area to the total area of a particular CD block and elevation in metre of each CD block), human (ST literacy rate, percentage of total workers, percentage of rural people served by the educational facility and percentage of rural people served by the medical facility), financial (Percentage of rural people served by banking facility, total number of banks per one lakh population and net collection from small savings in Rupees), natural (forest land in hectares, percentage of cultivable area to the total area, percentage of irrigated area to total cultivable area, pisciculture area in hectares and percentage number of livestock to total region) and social assets (number of cooperative societies per 100 thousand population and percentage of rural people served by agricultural credit societies), whereas, LLRR and VLLRR are rich in mining and forest resources only. Across the four regions, physical assets are the most possessed assets whereas social assets are the least possessed ones. Largest inequality is also found in the distribution of social assets across the regions due to non-uniform existence of co-operative societies and inefficient services of agricultural credit societies between HLRR and VLLRR.

Another livelihood practice observed among the Tribes of forested hills of North-East Indian states is shifting cultivation. Shifting cultivation encompasses “any temporal and spatially cyclical agricultural system that involves clearing of land—usually with the assistance of fire—followed by phases of cultivation and fallow periods” (*Thrupp et al., 1997*). Although data on area, production and families related to shifting cultivation in this region are not consistent, it is believed that around 7.76 lakh families have been engaged in this primitive agricultural practice by 2015 (*Marchang, 2021*). *Datta et al. (2014)* have investigated the perception of the indigenous shifting cultivators on their existing livelihood assets conditions in the Gomati district of the North-Eastern state of Tripura. Among natural assets, most of the Tribal cultivators are satisfied with land size due to free access to land in hilly areas of the state. However, in terms of livestock and forest resources (timber, wood),

most of them are unsatisfied due to limited capacity livestock rearing at the house yards and restriction from forest departments in accessing forest resources, respectively. In case of social assets, they are highly satisfied with their kinship within the community as they receive support from family, friends and community in times of emergency. On the contrary, they expressed dissatisfaction towards membership to formal or semi-formal groups due to non-existence and/or inactivity of such groups in the vicinity. In terms of reporting of human assets status, the Tribal cultivators are found to be highly satisfied with their health and fitness and satisfied with the quality of labour available in the HH, whereas, less satisfied with educational status because of illiteracy and low educational attainments. Physical assets status (roads, electricity, improved equipment and housing) of these people are found to be unsatisfactory due to poor infrastructure development in the remote hilly terrains of the state. The savings and cash stock components of the financial assets of the Tribal shifting cultivators are unsatisfactory due to less income generation. However, credit services are found to be satisfactory in this area due to support from governmental programmes.

Malsawmtluangi (2013) explored the livelihood conditions of the cane and bamboo handicraft artisans belonging to *Mawlsawi, Yram, Lai, Misa* etc. sub-tribes in Mizoram, another state from North-East India. The paper identifies significant positive correlation of per capita annual HH income and per capita monthly HH expenditure (proxies of livelihood condition) with most of the components of human assets (mean years of adult education, proportion of earners in the family, number of artisans in the family, attendance to skill development programmes and participation in exhibitions/mela), natural assets (number of livestock), social assets (community participation), physical assets (house, television, furniture, utensils, etc.) and financial assets (savings and debt). Only family size under human assets and political affiliation under social assets have demonstrated significant negative correlation with income and expenditure of the artisan HHs.

In the case of non-forest related livelihoods of the Tribes, *Kumar et al. (2016)* have explored the contribution of dairy based production systems on the livelihoods of Tribal people of Dhanbad and Ranchi districts of Jharkhand. Use of traditional knowledge in dairy production systems, farm energy (human assets), ICT tools, livestock density (physical assets), access to natural resources (social asset) and land improvement activity (natural asset) out of 19 listed livelihood asset components

exhibit greatest influence on sustainable livelihoods of these indigenous people. Overall, human assets and social assets status of the dairy-dependent Tribal HHs have been identified as the poorest of the five assets due to inadequate education, inaccessibility to information, lack of awareness of rights and regulations of Tribal people and isolated living away from the reach of panchayats and other social organisations.

Arun (2008) has explored the deprivation in terms of livelihood assets portfolios of the *Kattunaikan, Irula, Adiya* and *Paniya* Tribes of Wayanad and Palakkad districts in Kerala from a gendered perspective. The *Adivasis* of the study areas engage as wage labour in rice cultivation, banana cultivation, brick factories and as migrant labour in ginger cultivation in Karnataka borders. The *Adivasi* women are often paid less than their male counterparts, exploited sexually as well as monetarily as migrant workers by their co-workers or employers. Moreover, issues of alcoholism, consumption of intoxicants as well as involvement in criminal activities have also been existent among these people. Land is the most important natural asset for the Tribes, but often found in dispossession. *Adiya* and *Paniya* Tribes hold very little to no land and depend mostly on wage labour, while *Irulas* hold lands and engage in agricultural activities. Tribal women lag in land ownership status. Land utilisation is found to be limited by non-cooperation from Agricultural offices, lack of land deeds, animal attacks due to forest proximity, etc. Women's possession of physical assets (goats, hens, etc.) is better than that of men in their society due to involvement in self-help groups by the former. However, housing conditions (physical asset) are found to be unsuitable to provide support for carrying economic activities like tailoring due to leakage, poor toilet facility, non-functional electrical systems, etc. Sources of financial assets of these Tribal HHs are wage labour, agriculture and debts from money lenders and petty shops which most of them fail to repay and a perpetual loan burden is bestowed on them. These people are also deprived of human assets due to poor health conditions and expensive education. Scabies, tuberculosis, jaundice, complications associated with early age pregnancy, etc. are few prevalent health burdens among the Tribes. On the other hand, due to caregiving work, rearing of livestock, expenses of books and uniforms, transferring schools for higher education, etc. lead to dropping out of schools. The Tribes of this region also lack social assets due to poor communication

skills, lack of education, isolated living away from external communities and limited awareness regarding land rights, etc.

2.5 Livelihood Assets Status of Rubber Growing HHs/Population

2.5.1 The global scenario

Global natural Rubber production is dominated by South-East Asian countries with exceptional inclusions of Côte d'Ivoire (from Africa) and India (from South Asia) in the list (refer table 2-a for details). Majority of the Rubber plantation sector in South-East Asia is dominated by smallholders due to easy integration of Rubber within existing rice based and longer fallow agroforestry systems, possible reduction of risks, increase in income and more resilience to external shocks, as a means of protecting land rights of local communities from external political influences in the form of encroachment of plantation companies or extension of government forest reserves (Fox and Castella, 2013; Byerlee, 2014).

Table 2-a: Contribution of major Rubber producing countries in terms of area, tapped areas, yield and production of natural Rubber (2020p*)			
Area ('000 hectares)	Tapped area ('000 hectares)	Average annual yield (kg per hectare of tapped area)	Production ('000 tonnes)
Indonesia (3681)	Thailand (3292.6)	Vietnam (1682)	Thailand (4863)
Thailand (3520)	Indonesia (2983.6)	Thailand (1477)	Indonesia (3037)
China (1152)	China (745)	Malaysia (1415)	Vietnam (1226)
Malaysia (1106.9)	Vietnam (728.8)	India (1381)	Cote d'Ivoire (950)
Vietnam (932.4)	India (496)	Indonesia (1018)	China (693)
India (823)	Malaysia (400)	China (930)	India (685)
*Provisional			
Source: Rubber Board, 2021b			

Thailand is the largest natural Rubber producing country in the world currently. Along with southern region, which is the traditional 'old Rubber' producing zone, with state support in the form of Rubber Replanting Aid Fund (ORRAF) programme, the North-East region of Thailand has emerged as the non-traditional 'new Rubber' zone (Fox and Castella, 2013). In the Songkhla province of southern Rubber zone, Samboonsuke et al. (2001) have identified prevalence of six major Rubber based

smallholder farming systems, such as, rubber monoculture, rubber intercrop, rubber–rice, rubber–fruits, rubber–livestock and rubber–integrated farming systems. *Longpichai et al. (2012)*, in the process of exploring the role of livelihood capitals in determining Rubber growing HHs’ farming strategies and outcomes, claims that the most efficient among these systems in the region is the rubber-integrated farming systems (with combinations of rubber–fruits–livestock / rubber–rice–livestock / rubber–rice–fruits) which happen to be the most diversified as well and is linked with significantly higher endowments of human (education level, experience in training, knowledge gained from training, representative of community, facilitator in community, family labour and current health status), social (access to agricultural information, participation in Government activity/committee and membership of specific group/committee) and financial assets (amount of savings and access to credit). On the contrary, monoculture and/ or single occupation diversification is less efficient and do not yield the maximum attainable income and production to the HHs.

While *Viswanathan (2008a)*, earlier have drawn similar conclusion on supremacy of Rubber integrated farming systems, particularly Rubber-fruit-indigenous vegetables cultivation in Songkhla region of Thailand over monoculture and two occupation livelihood systems, he differs from *Longpichai et al. (2012)* on assets endowment status. *Viswanathan (2008a)* argues that the Songkhla smallholders are well endowed in natural assets (area under Rubber, land quality and access to safe drinking water), followed by physical assets (access to market and rubber processing facility), but their human assets (experience in rubber farming, education of HH head, availability of family labour, gender participation in rubber farming, children’s education and annual HH expenditure on healthcare), financial assets (income other than rubber farming, savings and value of essential and semi-luxury HH assets), and more specifically, the social assets (access to R&D and institutional support (grants for planting or replanting, subsidy for inputs, plant protection, etc., access to training in rubber tapping and processing, extension activities and local development institutions, cooperatives/ SHGs, etc.) are poor due to inefficient institutional support systems which fail to provide necessary aid for replanting in the old plantations of the region.

Li et al. (2020) while exploring plantation dependence (Rubber and betel nut palm) of rural HHs of central mountain region of Hainan Island in China, claims that income

from plantations is an important determinant of sustaining livelihoods. The dominant livelihood strategies in the region are plantation, plantation + livestock, remittances in the form of payments for ecological services (PES) + out-migration and local off-farm activities. HHs in the plantation group and the plantation + livestock group have mostly been similar in terms of having larger plantation areas (natural asset), smaller family sizes (human asset) and higher savings (financial asset) than the other two groups. However, the plantation + livestock group have the most diversified income sources and plantation systems compared to the rest. HHs in the local off-farm group have the poorest natural assets due to the smallest plantation area, but are better endowed in human assets due to larger families. The PES + outmigration group is the poorest in terms of overall assets endowments due to smallest area of land (natural asset), least availability of HH labour (human asset), weak social bonds (social asset), greater dependence on PES funds (financial asset) and poorer road access. Plantation area, diversified plantation systems (different types of trees) and intercropping under natural assets, PES funds under financial assets and education of HH labour under human assets have significant positive effect on plantation incomes of overall rural HHs of Hainan Island.

Wang et al. (2023) have examined the determinants of income generating activities (IGAs) of Rubber smallholders of monoculture-dominant Xishuangbanna prefecture in China on the face of global Rubber price fall. Five dominant types of IGAs are identified in the region, viz., intercropping (Rubber with tea, lychee, dendrobium, etc.), other cash crop cultivation (reducing or replacing Rubber with cash crops like tea, coffee, mango, etc.), livestock rearing, part-time jobs (off-farm like working in others' plantations during off-season of Rubber cultivation and non-farm like construction work, etc.) and land renting-out (arable land as well as Rubber land for better returns). The paper concludes that adoption of any of these IGAs in the region are mostly determined by economic returns (financial asset), availability of labour and knowledge (human assets), land availability (natural asset) and information (social asset) along with seasonality and price change in Rubber cultivation (vulnerability context) and extension services from government and research institutes (structures and processes).

In South Asia, apart from India, two other countries with Rubber plantation-based livelihood generation among the natives are Sri Lanka and Bangladesh. In Southern

Sri Lanka region, Rubber plantations were introduced a century ago (*Senevirathna, 2006, as cited in Nath et al., 2013*). Later, the war-torn Eastern province, which is endowed with 26% of the country's agricultural land, has been chosen for government-aided Rubber plantation-based livelihood development programme (*Munasinghe et al., 2019*). In Bangladesh, although Rubber had been introduced by the Britishers, its commercial cultivation started in 1961 by the state government (*ADB 1997 and FEPPCAR 2006, as cited in Nath et al., 2013*).

Munasinghe et al. (2019) has explored the impact of Rubber plantations on the rural communities of the Eastern province of Sri Lanka through assessment and comparison of their livelihood assets with those of the non-Rubber farmers in the same region. Except natural assets, the Rubber farmers are better endowed in physical (housing infrastructure, i.e., type of floor, wall, roof and sanitation; convenience in dwelling including electricity, electrical appliances, furniture, water supply to house, etc.; connectivity with the society in the forms of telecommunication, road access and vehicles and improvement in farming including livestock, farm vehicles and farm equipment), human (age, gender, education, literacy, occupation and details of labour force, number of dependents and expenditure pattern), financial (HH income and securities or safe keepings) and social assets (borrowing and lending capacity, participation in religious and charitable activities, participation and leadership in community activities, interaction with relatives and friends) compared to their counterparts. The Rubber farmers are found to earn significantly higher income annually, most of which are generated from Rubber compared to the non-Rubber farmers. Savings in rural banks are also observed among the Rubber farmers. Rubber farmers' annual expenditure are significantly higher than the non-Rubber farmers in the region. Moreover, the Rubber-dependant ones have been found to invest significantly more on children's education and healthcare than their counterparts. Also, they own better houses (cement walls and tile roof) equipped with electricity, electrical appliances, water supply and concrete road connectivity as well as exhibit significant improvement in buying farm machinery and vehicles compared to the non-Rubber farmers. Rubber farmers have also shown improved relation and connection with fellow villagers, enhanced community participation and significantly higher lending capacity and more charity work. However, no significant difference is found between the two farmer groups in natural assets status as both have access to safe

drinking water sources and ownership of fertile landholdings, though the Rubber farmers utilize lesser proportion of the available land on subsistence farming compared to the non-Rubber farmers.

Nath et al. (2013) claims that Rubber plantation has improved the livelihood conditions of the erstwhile shifting cultivators of Chittagong Hills Tracts region of Bangladesh, as reflected in their enhanced livelihood assets status. With the financing of Asian Development Bank and technical, material as well as financial support from Chittagong Hill Tracts Development Board (CHTDB), the shifting cultivators of the region were encouraged to participate in Upland Settlement Project (USP) for developing Rubber plantations along with agroforestry as a livelihood generating avenue. The project participation has improved their human capital through skill development (resulting from receiving training on Rubber tapping, plantation management and latex processing from the CHTDB) and better education of their children. Most participants' houses are made of mud wall and sun-grass roofs and some of them own expensive HH appliances reflecting better economic status (physical assets). Enhanced financial capital of the participants have been highlighted by their increased incomes compared to the pre-USP incomes. Around 50% of the HH income is generated from tapping, latex sale and revenue sharing by the CHTDB. However, their income opportunity from tapping is limited by small tappable Rubber tree stock resulting from poor management of project funds by the officials resulting in irregular disbursement of funds for replanting, lack of timely project monitoring and consequent de-motivation of the participants in plantation management. Thus, the natural capital conditions of these participants are the least developed ones among all the livelihood assets. Social capital formation is also observed among the USP participants through networking with various NGOs and government officials. However, ethnicity problems have hampered further development of the social assets among the participants.

2.5.2 The Indian context

In India, Rubber plantation as an estate-based system was first introduced by Britishers in the early 1900s in Kerala whose ownership resided with the Britishers only. Soon they were faced with problems relating to operations as vast plantations needed a considerably large yet cheap labour force which had been locally unavailable due to

sparse population density in these remote regions. In such conditions, several immigrant families from distant regions who had been suffering from caste-based deprivations, famines and low wages provided cheap labour supply in these plantations. Post Independence, especially since the late 1950s, native farmers have flocked in the plantations as grower-cum-owner due to favourable institutional support from Rubber Board, along with agro-climatic suitability of the region and led to fragmentation of large estates and emergence of native smallholder sector (*Viswanathan and Shivakoti, 2008; Rajasenan, 2010*). The Plantation Labour Act (PLA), 1951 has paved the way for betterment of working as well as living conditions for plantation labour by way of formulation of trade unions, provision of housing, drinking water, medical facilities, maternity benefits, etc. Though the implementation of the act is not entirely satisfactory, it has certainly been more effective in improving the working and living conditions of the plantation workers, especially of those associated with Rubber, in the southern states of Kerala and Tamil Nadu compared to tea and spices plantations of different parts of the country (*Sumitha, 2012*).

Rajasenan (2010) and Rajesh (2015) while addressing the livelihood and employment conditions of workers of Rubber and spices plantations of Kerala, have explored six livelihood assets of these plantation workers, viz., physical (landholding, housing condition, ownership of house, government benefit receipt status, etc.), natural (water supply), financial (bank account, insurance coverage, wage rate, gender-based wage differential), human (education and skill), social (*Kudumbashree* membership) and political (political party affiliation and voting). Assets of workers in large scale estate Rubber plantations (> 10 hectares) and small-scale Rubber plantations (< 10 hectares) are explored separately in this study. Most of the large plantation workers do not hold land as they have migrated from other areas for work to these estates, whereas, most small-scale Rubber workers have landholdings of size up to 10 cents (1 cent=0.004 hectare). Both the large and the small-scale plantation workers live in semi-pucca houses, while the former receive housing quarters or rented houses near estates, the latter stay in self-owned houses. Most workers' houses are electrified and sanitary latrines are with roofs and walls, but no water connection. In terms of receipt of government benefits, due to the organised nature of estate plantations, workers here receive government benefits in the form of housing, sanitation, education etc. On the contrary, the small-scale Rubber plantation workers

mostly are ignorant of such schemes and hence hardly receive any of the government benefits. While considering the natural assets conditions of these workers, water scarcity is more prevalent among large scale plantation workers due to dependence on public tap water which is available for a fixed duration in a day. Small-scale plantation workers own tube wells at their houses and receive round-the-clock water supply. However, none of the large and small-scale plantation workers need to travel more than 100 meters to access water. In the case of human assets, most of the workers in both types of plantations possess secondary education. The workers in both types of plantations are found to be skilled in tapping due to their involvement in Rubber tapping related short apprenticeships. Labouring in Rubber plantations is the primary type of employment among these workers, followed by being involved as agricultural labour. The women of these plantation workers' HHs mostly take part in Mahatma Gandhi National Rural Employment Guarantee Schemes (MGNREGS) for subsidiary incomes. In terms of financial assets, *Rajasenan (2010)* has found that small-scale Rubber workers enjoy higher wages with lesser days of work in a month than their large-scale counterparts (small scale plantation workers earn between Rs. 5001-7500 in a month by working 20.4 days in a month whereas, workers in large scale plantations earn Rs. 2501-5000 by working 23.9 days in a month). On the contrary, *Rajesh (2015)* argues that although both types of plantation workers mostly earn Rs 6001-7500 a month, the proportion of workers falling in this income bracket is higher among large scale workers. Gender-based wage discrimination is more prevalent among small-scale workers as women in large scale plantations receive uniform wages fixed by the Labour department on a quarterly basis. In terms of possession of bank accounts, although small-scale Rubber workers stand ahead of large-scale plantation workers, overall holding of bank accounts by both types of workers is not satisfactory. Small scale Rubber workers are mostly insured by Rubber Board whereas large scale estate workers fare poorer in insurance coverage. *Rajasenan (2010)* and *Rajesh (2015)* have provided contrasting pictures of social asset status of the plantation workers. While both have placed evidence of higher membership of the Rubber workers in *Kudumbashree* (it is a women-centric poverty eradication programme implemented by Kerala Government), memberships have drastically reduced for both type of workers between 2010 and 2013-14. Regarding political assets, though active as well as high participation in voting for general election of 2009 and Kerala assembly election of 2011 are observed among both the groups, a higher number of large-scale

plantation workers are found to have membership of political parties than their small-scale counterparts due to the organised working environment of the estate plantations.

Kerala has been the centre of Rubber cultivation till date. However, possibility of further expansion of Rubber area in the state is bleak due to saturation of agro-climatically suitable land (*Viswanathan and Bhowmik, 2014*). NER along with parts of Karnataka, Goa, Maharashtra, Andhra Pradesh and Orissa, etc., have been identified as the non-traditional Rubber growing regions in the country (*Rubber Board*). Among these regions, NER, especially states like Tripura, Assam and Meghalaya are the emerging major natural Rubber producing zone in India. Over the years Rubber areas in both Kerala and NER have increased in absolute terms, but the share of the same in all India Rubber area has declined for Kerala from 85.8% to 67.01% and increased for NER from 7.1% to 22.93% during 1990-91 to 2019-20 respectively (refer table 2-b). The growing importance of the region has earned it the title of ‘*hub of Rubber production*’ in the country (*Viswanathan and Bhowmik, 2014*).

Table 2-b: Rubber producing area (hectare) in main traditional and non-traditional areas of India between 1990-91 and 2019-20				
State/region	1990-91	2000-01	2011-12	2019-20
Kerala (traditional region)	407821 (85.8)	4,74,365 (84.3)	539565 (73.4)	551030 (67.01)
NER (non-traditional region)	33619 (7.1)	46885 (8.3)	128470 (17.5)	188565 (22.93)
India	475083 (100)	562670 (100)	734780 (100)	822300 (100)
Figures in parentheses represent percentage shares				
Source: i. Viswanathan and Shah, 2013 ii. Rubber Board, 2021b				

Tripura is the highest Rubber producing state in NER (refer table 1-a from Chapter 1 for state-wise figures) and is being considered ‘*second Rubber capital*’ of India. Development of Rubber plantations in Tripura has been entirely state-led in its initial days. Rubber cultivation was initiated by the state’s forest department during the 1960s as part of an afforestation programme. Subsequently, state-led Tripura Forest Development and Plantation Corporation Ltd. (TFDPC), Tripura Rehabilitation and Plantation Corporation (TRPC) and Rubber Board offices have been established to accelerate plantation expansion in the state. Both TFDPC and TRPC’s primary aim

was to raise Rubber plantations and at the same time rehabilitate Tribal shifting cultivators by engaging them into these plantations. Under TFDPC, plantations are raised on government lands, but the usufructuary rights rest with the Tribal beneficiaries who work as plantation labour during the first 6-7 years of immature phase of plantations and post that, beneficiaries sell latex to TFDPC's processing centres at fixed price equivalent to ongoing market rate. In the case of TRPC, a similar model is followed except the land ownership remains private. Rubber expansion in Tripura was further accelerated with the introduction of the World Bank aided 'block plantation scheme' (BPS) by the Rubber Board during the 1990s. Under BPS, compact lands identified as 'blocks' of a few ST HHs are used to raise Rubber plantations where financial and institutional support is provided by Rubber Board and state government while the HHs provide wage labour during immature phase, followed by transferring the lands with mature plantation to these HHs (*Viswanathan and Bhowmik, 2014*).

Rubber plantations has proven not only as a viable source of income and employment, especially to the Tribal HHs of Tripura, but also is generating positive externalities in terms of long-term assets holding, better education of children, better utilisation of barren and fallow lands resulted from shifting cultivation practices, etc. (*Viswanathan and Bhowmik, 2014*). Though the real wages of Rubber tappers have been lower than agricultural workers and unskilled workers in the state, the rate of growth of the wages is higher for the former. Moreover, the plantations provide almost round the year employment unlike other cropping systems found seasonally in the state (*Chouhan and Bhowmik, 2017*).

Participation in Rubber Board's BPS has led many Tribal families to come out of poverty, with six times higher income earnings from Rubber compared to shifting cultivation. Along with increased income, the living conditions of these families have improved. They are found to own lands, possess improved housing (brick wall and tin roof houses replacing mud wall and straw covered houses), access improved drinking water (municipality supply and tube wells), better sanitation (brick toilets replacing open defecation), cleaner cooking fuel (gas replacing forest wood) and power use (electricity replacing kerosene). More Tribal children are going to schools due to improved living conditions. Increased health consciousness along with reduced consumption of addictive substances like alcohol has been observed among these

people. Their financial literacy has also improved due to which inclination towards savings in banks and formal financial institutions is also on the rise (*Ray, 2020*).

Rubber Board has taken an 'integrated approach' of Tribal development through various Rubber development schemes which focus on extension of various services like, nursery schools, drinking water and sanitation facilities, health camps, road connectivity at village level, utilisation of fallow and barren lands, providing alternative income sources, generating year-long employment, enhancement of community participation and development of social capital through Rubber Growers' Societies (RGS), facilitating women's empowerment through formation of Self Help Groups (SHGs), provisions for common processing and marketing of Rubber products, etc. More than 8,300 families are found to be benefitted from these programmes. The Tribal Rubber growers and tappers of South, West, Gomti and Sepahijala districts of Tripura have shown improvements in human (share of working population, literacy, political associations), physical (health care facilities, electricity, water supply and sanitation, possession of jewels and consumer durables) and social assets (membership in RGSs, membership in SHGs, beneficiaries from government schemes, participation in meetings and training programmes, awareness level, time spent for RGS related activities, attitude of members, collective leadership, and responsibility). On the contrary, they are lacking in natural assets due to land constraints as most of them own small and marginal landholdings which are inherited and homestead in nature (*Mohapatra, 2022*).

Bhowmik and Chouhan (2013) claims that engagement of labour is essential in every stage of Rubber plantation development, starting from land preparation, fertiliser application, weeding, etc. in the immature phase to tapping, processing and marketing in the mature phase. Among all these activities, tapping requires highly skilled labour in order to get optimum latex without causing any major damage to the tree. The paper explores status of production assets (land, cow, goat, pig and poultry) and consumption assets (mobile and bicycle) of the tappers of TFDPC-owned old and new large Rubber estates in Tripura which they are able to own due to Rubber-induced improvement in their income status. Most of these tappers are found to own lands, followed by mobiles, pigs, cows and goats. Moreover, tappers in new estate plantations are better endowed in overall production assets than their older counterparts due to higher average income generated from Rubber tapping and greater

participation in MGNREGS activities which enable them to invest more in these assets.

Not only tappers, but Rubber growers who, during the immature phase of plantations, work as wage labours in TFDPC's plantations and later gain rights over plantation land as well as Rubber output have improved their livelihood status through gaining access to and ownership of various livelihood assets. Their human assets have improved as TFDPC provided them with training support relating to plantation management, tapping and processing of Rubber, resulting in improvement of productivity. Also, they are being able to send their children to schools due to enhanced economic conditions. In terms of natural assets, all the Rubber growing HHs in the study area own Rubber plots as well as non-Rubber plots. Moreover, adequate supervision and support from TFDPC and Rubber Board on plantation management have resulted in as high as 85% of tree survival rate and better tapping experience. Incomes from tapping as well as sale of latex are found to be highly collinear with total HH income and Rubber plantation contributes around 74% of total HH income (financial capital). Social capital has also improved due to participation in SHGs and beneficiary committees which help the Rubber growers to raise seedlings and sell to TFDPC, maintain mandatory savings and request for loans in need, thereby enhancing the communal bonding, trust and cooperation (*Nath et al., 2013*).

Kuki et al. (2018) have explored the livelihood capital conditions of two types of Rubber stakeholders in Tripura under smallholding setup, viz., the Rubber farmers who are the beneficiaries of Rubber based rehabilitation programmes through TFPDC and TRPC, etc., currently owning as well as providing family labour in Rubber plantations and secondly, the Rubber labourers who provide wage labour in others' plantations against nominal payments or in crop sharing basis. Although differences in overall livelihood assets conditions between these two Rubber stakeholders are insignificant, Rubber farmers are found to be better endowed with natural (proprietary household average land resource area and average actual household in-field area), physical (housing instance and households assets) and financial capitals (opportunity to obtain loan, opportunity to obtain unpaid financial assistance and household income) whereas, Rubber labourers are richer in social (social activity and organizational participation, financial assistance, substance assistance and technological assistance) and human capitals (total labour ability of a family, labour

force of one adult male and education level of adult labour force). Apart from financial capitals, differences between the two groups of Rubber stakeholders in terms of the other four livelihood capitals are significant. Highest difference is observed in natural capitals between the groups favouring the Rubber farmer group due to higher proprietary landholdings. On the contrary, the lowest difference is observed in social capitals, favouring Rubber labourers due to better social interaction and higher participation in government assistance schemes and programmes on their part.

Meghalaya is the 3rd largest Rubber producing state in NER (refer table 1-a). With 16,330 hectare of Rubber land, the state contributes around 8.66% Rubber area in the NER (2019-20) (*Rubber Board, 2021b*). Rubber plantations development initiative was taken by the Central Government through Rubber Board intervention during the 1980s in the Garo Hills districts of Meghalaya. However, in the initial days of Rubber sale, the Tribal growers of the region could not harness much of the benefits of cash crop cultivation due to existing unfair trade practices. Despite having a licensing system in place to authorize the sale of Rubber sheets, the hill districts' isolation, bad road access, the Rubber Board's regional offices' remote location, the lack of experience of the Tribal growers with regard to the development, management, and processing of rubber plantations, as well as their ignorance of the current market price, had all contributed to the influx of unlicensed rubber traders who used to offer much lower prices to the growers in the name of 'high transaction cost'. At this backdrop, the Mendipathar Multi-purpose Co-operative Society (MMCS) was established in the East Garo hills district in the year 1997, with the objective of developing an efficient marketing system for Rubber and other agricultural produce and empower the local communities by involving them in various development activities as well as through interventions. The MMCS acts as a mediating agency between the Rubber growers of the Garo hills region and the Rubber Board in terms of supply of farm inputs, subsidies and other institutional and extension support services provided by the Rubber Board. The member-growers can sell Rubber sheets to the MMCS at market price by avoiding the unscrupulous Rubber traders. Besides promoting fair trade of Rubber in the Meghalaya hills region, it also supports the member-growers in managing dairy and poultry farms, establishing SHGs, mobilising savings of the growers as well as improving literacy, eradicating malaria and creating awareness about sustainable agriculture, etc. In short, the MMCS plays a significant role in social capital formation

in the region among the Tribal Rubber growers through its ‘bonding,’ ‘bridging,’ and ‘linking’ functions (*Viswanathan, 2008b; Viswanathan and Bhowmik, 2014*).

Year	Rubber collected from growers (in tonne) (sheet + scrape)	Annual income earned by member growers (in Rs.)
1999-91	81.35	22,022
2005-07	203.69	67,042
2011-13	235.04	1,59,844

Source: Viswanathan and Bhowmik, 2014

The successful intervention of the MMCS is also reflected in manyfold increase in the sales of Rubber collected from the member-growers and the annual incomes earned by these growers between 1999 and 2013 period (refer table 2-c). The member-growers have gained more in terms of price margins compared to the RGS and private dealers due to adoption of ‘graded Rubber procurement system’ in the Garo Hills by the MMCS. This system has ensured similar market prices at Kottayam or Cochin markets for graded Rubber sheets which otherwise is not possible due to sale of ungraded sheets through the other two channels (*Viswanathan, 2008b*). Also, there is an impressive increase in the number of memberships in the MMCS, from 101 in 1998 to 275 in 2014 (*Viswanathan and Bhowmik, 2014*). Along with income from Rubber, the member-Rubber growers of MMCS are found to be better endowed in all the five forms of livelihood assets, viz., physical (access to market and rubber processing facility), human (experience in rubber farming, education of the HH head, family labour availability, gender participation in rubber farming, children’s education and annual expenditure on healthcare), natural (rubber-grown area, quality of land and access to safe drinking water), financial (income other than rubber farming, savings and value of household assets including essential and semi-luxury items) and social assets (access to R&D and institutional support like planting/replanting grant, input subsidy, plant protection, etc, access to training in rubber tapping and processing, extension activities and local development institutions, cooperatives/ SHGs, etc.) than those selling Rubber sheets through private dealers and/or through RGSs (*Viswanathan, 2008b*).

Viswanathan (2008a), while comparing the high-income generating Rubber-based farming systems among Meghalaya, Assam, Tripura and Thailand, identifies Rubber + fishery to be at the top, followed by Rubber + Livestock while Rubber monoculture to be at the bottom in case of Meghalaya. Considering similar set of sub-components under the five livelihood assets as used by *Viswanathan (2008b)*, the paper also shows that Meghalaya Rubber growers are best endowed in natural assets (highly sustainable), followed by social assets (moderately sustainable) whereas, they fall behind in terms of human assets endowments (moderately sustainable), followed by financial assets endowments (unsustainable). Moreover, the natural as well as social assets status of the Rubber growers in Meghalaya are found to be even better than those of Tripura.

2.5.3 Literature on Assam's Rubber plantation sector and identification of research gap

Assam is the 2nd largest Rubber producing state in NER in terms of area, average yield and production (refer table 1-a from chapter 1). Currently the state has a total of 48,952 Rubber growers (*Rubber Board*). Table 2-d shows the area, tapping area, production and employment generation in Assam's Rubber plantations as a whole as well as those of the three highest contributing districts of the state for the year 2019-20. The state's Rubber plantation sector manages to employ 1,92,503 individuals during 2019-20 and it has shown around 37.12% growth in employment generation since 2013-14 (refer chart 3(b) from chapter 1 for employment figures). Interestingly, from table 2-d, it is seen that slightly less than half of the Rubber area of Assam are untapped. This may be due to existence of considerable number of newer, immature plantations in the state. District-wise, Goalpara, Karbi Anglong and Karimganj are the most prominent Rubber growing districts of the state. These three districts together contribute 59.59% of total Rubber area, 61.47% of tapping area, 65.48% of production and 62.61% of employment generation in the state.

Table 2-d: Top 3 largest Rubber producing districts of Assam, 2019-20				
District/State	Area under Rubber (hectare)	Tapping area (hectare)	Production (metric ton)	Employment generation (numbers)
Goalpara	9610.50	6919.56	8615.00	28832
Karbi Anglong	8601.01	5553.67	5964.64	27770

Karimganj	16429.00	3915.00	4365.00	63932
Assam	58128.55	26658.68	28930.95	192503
Source: Government of Assam, 2021				

Pradeep et al. (2017), using remote sensing technology, has identified about 24,783 hectares of wasteland suitable for expansion of Rubber plantation in the state, excluding land under major vegetation, food crops, valleys as well as flood-prone areas, most of which are present in Karimganj (6,969 hectare), Karbi Anglong (6,052 hectare), Kamrup (4,525 hectare), Goalpara (2,988 hectare) and Dima Hasao districts (1,010 hectare). Apart from the central government initiative of developing Rubber-based livelihoods among the erstwhile shifting cultivation-dependent Tribal population of NER, adoption of Rubber plantation as a source of livelihood in Assam may also be attributed to its economic feasibility.

Table 2-e: Cost-returns of small-scale Rubber plantation in Assam (in US\$/hectare)		
Variable Cost	Manure and fertiliser and its application	66.60
	Intercultural operations	17.30
	Pruning and plant protection	51.40
	Tapping	199.70
	Processing charges	41.60
	Miscellaneous	13.40
	Interest on working capital	46.80
Total variable cost (A)		436.80
Fixed Cost	Share of establishment	38.50
	Depreciation	24.00
	Land revenue	3.60
	Rental value of land	74.10
	Interest on fixed capital	15.40
Total fixed cost (B)		155.60
Total cost (A+B)		592.40
Returns	Sheet Rubber value (i)	1123.80
	Scrape Rubber value (ii)	105.60
Gross returns (i+ii)		1229.40
Net returns over total cost		637.00
1 US\$ = Rs.43.65 as on 20-04-2000 (The Sentinel, 2000, as cited in Maibangsa and Subramanian, 2000)		

Source: Maibangsa and Subramanian, 2000

Several scholars have studied the cost-revenue-profits structure and/or the economic feasibility of Rubber plantation development by smallholders in Assam. *Maibangsa and Subramanian (2000)* have estimated the total cost of Rubber cultivation in a small-scale set up to be US\$ 592.40/hectare, which comprises of variable and fixed components. Highest cost is accrued for carrying out tapping activity, followed by rental value of land and manure and fertilizers (refer table 2-e). The authors claim that despite high production costs, Rubber plantations generate US\$ 637/hectare/year of net returns with benefit-cost ratio (BCR) of 1.71 and modified internal rate of return (IRR) of 17.58%.

Nath and Bezbaruah (2010) have supported the claim of economic viability of Rubber plantations in Assam as well. The paper argues that a small Rubber farmer in Assam may earn an annual profit of Rs.1,08,997.88/- per hectare of plantation and the BCR and IRR for the farmer stand at 2.49 and 35.4% respectively. *Nath and Bezbaruah (2010)*, along with economic feasibility of Rubber plantation, have also estimated the growth trends in production and yields, organisational set up and environmental consequences of small-scale Rubber plantations as well as the food security conditions of small-scale Rubber growers in Goalpara district. The authors have estimated the annual compound growth rates of acreage, production and yield of Rubber to be 17.5%, 19% and 2.9% respectively between 1986-87 and 2006-07. Most Rubber holdings of the district are less than one hectare, averaging around 0.68 hectare and are under individual ownership. The Rubber growers in Goalpara district mostly belong to ST/SC communities, with less than tertiary level of education and modest landholdings. The adoption of Rubber plantations by these communities have led to more diversified and resilient livelihoods compared to erstwhile shifting cultivation. The authors also claim that Rubber plantations have created positive impact on the environment as the plantations are mostly grown in degraded forest and barren lands, thereby improving green cover, carbon sequestration, soil and water conservation. Since, the plantations are grown in non-food crop lands, the district's food production remains unaffected. In fact, with enhanced incomes of the Rubber growers, their access to food has also increased.

Saud (2018) have estimated the cost structure of the growers of Rubber in Goalpara and Bongaigaon districts. Among the cost components, the growers of both the districts incur maximum cost on labour wage, followed by fencing, interest on borrowed money, pesticides and planting materials. At the end of immature phase, i.e., the 6th year of plantation, the growers generally incur losses. However, 7th year onwards, when the plantation attains maturity, Rubber growers in Goalpara and Bongaigaon districts tend to earn profits equivalent to 1,80,471.80/- and 74,860.40/- per hectare respectively (refer table 2-f). However, the author has also pointed out existence of technical inefficiency in the Rubber plantations of Goalpara and Bongaigaon districts. Further, the sector suffers from problems relating to lack of defined government policy, planting support from public agencies, pre-mature tapping, tree damage due to pest attack and cyclone, ignorance of growers on insurance schemes, growing presence of middlemen, etc. among others.

Table 2-f: Cost-revenue of Rubber plantation in two districts of Assam			
(Rs/hectare)			
Establishment to 6th year of plantation			
Cost/revenue/profit	Items	Goalpara	Bongaigaon
Establishment cost	Bamboo Fencing & boundary drainage	29725.30	28624.00
	Planting materials	7417.00	5541.70
	Fertilizers & Manure	6857.30	4053.10
	Pesticides & Weedicides	2050.75	2601.45
	Labour Cost (Payment for wage labour for land preparation, lining and pitting, planting and weed removing + imputed value of family labour for various plantation related activity)	84832.85	75626.90
	Interest on borrowed money	40760.00	8692.60
	Imputed interest cost	14400.00	16800.00
Total establishment cost (A)		186043.20	141939.80
Maintenance cost	Fertilizer & Manure and Plant Protection	2246.00	1834.00
	Expenditure on Tapping & Processing (Labour & material) in a year	33818.40	33587.50
	Expenditure on Selling in a year	746.00	-
Total maintenance cost (B)		36810.40	35421.5
Total Cost/Expenditure up to 1st year of tapping (A + B)		222853.60	177361.30
Total Revenue earned at the 1st year of tapping		217282.20	110281.90

Profit (+)/ Loss (-) at the 1st year of tapping	(-) 5571.40	(-) 67079.40
7th year onwards		
Total expenditure	36810.40	35421.5
Total revenue	217282.20	110281.90
Total profit	180471.80	74860.40
Source: Saud, 2018		

Although Rubber monoculture is expected to be profitable in the state, if remunerative Rubber prices and efficient marketing practices exist, the reality is mostly asymmetric due to price instability in Rubber market. Moreover, Rubber is mostly integrated into the existing farming systems with livestock, rice and other crops, fishery, etc. in NER. In this regard, Rubber + livestock is found to be the highest HH income generating avenues in Assam, followed by Rubber + piggery and Rubber + rice. It is also seen that experienced full-time farmers belonging to Tribal communities, but having newer plantations as well as higher non-Rubber area are more likely to adopt integrated farming practices in the region (*Viswanathan and Shivakoti, 2007; Viswanathan and Shivakoti, 2008*).

According to *Tokbi (2017)*, there are around 5000 Rubber growers in Karbi Anglong district, most of whom belong to various Tribal communities and are erstwhile shifting cultivators. The author claims that the Rubber Board intends to develop plantations in one lakh hectare of land in Karbi Anglong district alone. Unlike shifting cultivation, Rubber has brought profits as well as more employment opportunities to the district's growers. However, these growers are subjected to exploitation and vulnerability due to fluctuating Rubber prices, existence of middlemen and wholesalers, ignorance of the growers regarding price differentials for graded Rubber sheets and lack of collective strength (*Tokbi, 2017*).

Ahmed and Kalita (2020) have also identified the existence of middlemen in the marketing of Rubber produce in Kamrup district. Most growers of the district sell Rubber to the agents of various Rubber companies who collect the produce from the growers. In some cases, intermediaries are found to arrange for selling of Rubber produce in exchange of hefty service charge from the growers. In case of co-operative marketing of Rubber, the growers in the district sell their Rubber produce at pre-determined unified price to the intermediaries.

In contrast to Tripura and Meghalaya, the government's engagement in Assam's development of its rubber plantations is minimal. So is the case with cooperatives. Growers receive limited financial and advisory support from the Rubber Board (*Viswanathan and Bhowmik, 2014*). Lack of strong state support has also hindered development and flourishing of state-specific Rubber plantation models taking into consideration the developmental needs of the local population in Assam as against the TFDPC and TRPC-led Tribal rehabilitation model and Rubber Board-led BPS in Tripura as well as interventions from new generation co-operative like MMCS observed in Meghalaya.

Along with economic feasibility, the potential of two lakh hectares of Rubber plantation expansion in Assam (*Maibangsa and Subramanian, 2000*) also depends on the betterment of the socio-economic conditions and livelihoods of current Rubber growers in the state, majority of whom belong to various Tribal communities. However, most available literature on Assam's Rubber plantations and Rubber growers have explored the monetary outcomes of cultivation of such a cash crop in terms of income, cost, benefit, return and profit only. In course of the current literature review, it has been identified that sustainable livelihood outcomes comprise not only attainment of monetary affluence alone, but also encompass reduced vulnerability, better food security, enhanced wellbeing and better utilisation of natural resource base. Adequate access to or ownership of livelihood assets is an important contributor to the attainment of such livelihood outcomes. Despite earlier emergence of commercial Rubber plantations in Assam compared to that in Tripura by a decade, the initiatives to Rubber-based development of livelihoods in Assam have not been as aggressive and prominent as Tripura, partially due to lack of state initiatives. Consequently, there is a scarcity in literature on the status of livelihood assets as well as livelihood conditions of the Rubber growers in the state. Literary works like *Viswanathan and Shivakoti (2007)* and *Viswanathan (2008a)* have briefly explored the livelihood assets status of the three NER states, viz., Tripura, Assam and Meghalaya. Both the papers have found Assam's Rubber growers livelihood scores to be lower than the other two NER states implying poorer overall livelihood assets conditions of the Rubber growers of Assam. Amongst the five livelihood assets, Assam's growers are found to be most well-endowed in natural assets (Rubber-grown area, quality of land and access to safe drinking water), followed by social assets (access to R&D and institutional support

like planting/replanting grant, input subsidy, plant protection, etc, access to training in rubber tapping and processing, extension activities and local development institutions, cooperatives/ SHGs, etc.) while they are poorest in human assets (experience in rubber farming, education of the HH head, family labour availability, women's participation in rubber farming, children's education and annual expenditure on healthcare). However, the papers have taken in to consideration rather small sample sizes in case of Assam (94), as well as the two other states (Tripura= 129 and Meghalaya= 88), which may surmise the generalisation of the results. At this backdrop, the current study intends to explore the livelihood assets status of the Tribal Rubber growers of Assam in an extensive scale.

CHAPTER 3: LIVELIHOOD ASSETS STATUS OF TRIBAL RUBBER GROWERS IN ASSAM

3.1 Introduction

The present chapter explores the livelihood assets conditions of Tribal Rubber growers of Assam. The chapter starts with a basic description of assets, housing, and amenities status of the general population of Assam, followed by explanation of research design, research findings and discussions on the Tribal Rubber Growers' current livelihood assets status in the state. To get a clearer picture of the position of these Tribal growers of Assam, the chapter also aims to make comparisons of their asset conditions with those of the non-Tribal growers of Assam and the growers of Tripura.

3.2 Asset poverty, housing, and basic amenities status

'Asset poverty' is a broader measure of poverty compared to income and consumption. It does not constrain a HH's wellbeing status in terms of income only, but considers the HH's ability to maintain material standard of living at least for a short duration of time with the available wealth within the HH, even if income falls. A HH is considered asset poor if it is "having insufficient wealth to meet their basic needs over time..... having net liquid financial wealth insufficient to cover three months of 60% of median income, taking account of household composition using an appropriate equivalisation scale....." (UNECE, 2017, p.159).

Dutta and Kumar (2013) have ranked the Indian states and union territories based on their asset poverty status. Table 3-a shows these states' ranks for the years 1992, 1998 and 2005. According to this study, Assam, with a rank of 15 in the year 2005, is among the poorest states in terms of asset endowment. Moreover, the state's asset poverty status has slightly deteriorated over the years from 1992 to 2005 as there is a one-point decline in its rank from 14th to 15th.

Table 3-a: Asset poverty of Indian States between 1992 and 2005			
Rank	1992	1998	2005
1	Jammu and Kashmir	Jammu and Kashmir	Jammu and Kashmir
2	Delhi	Delhi	Kerala
3	Goa	Goa	Goa
4	Punjab	Kerala	Delhi
5	Kerala	Punjab	Punjab
6	Himachal Pradesh	Himachal Pradesh	Rajasthan
7	Tamil Nadu	Gujrat	Himachal Pradesh
8	Maharashtra	Maharashtra	Madhya Pradesh
9	Rajasthan	Rajasthan	Gujrat
10	West Bengal	Tamil Nadu	Karnataka
11	Gujrat	Haryana	Haryana
12	Haryana	Karnataka	Maharashtra
13	Andhra Pradesh	West Bengal	Tamil Nadu
14	Assam	Andhra Pradesh	West Bengal
15	Karnataka	Assam	Assam
16	Madhya Pradesh	Madhya Pradesh	Andhra Pradesh
17	Odisha	Bihar	Bihar
18	Bihar	Uttar Pradesh	Uttar Pradesh
19	Uttar Pradesh	Odisha	Odisha
Source: Dutta and Kumar, 2013			

In table 3-b, the deprivations of the people of Assam in terms of assets, housing and basic amenities status are displayed. Assam's 70% population is dependent on agriculture for living (*Directorate of Economics and Statistics Assam, 2021*). However, around 69.6% of the state's HHs are found not owning any agricultural asset (i.e., not having ploughs, bullock carts, farm equipment, etc.) In terms of ownership of non-agricultural assets, i.e., handloom or power loom, etc., the state's people are worst affected. Around 87.2% HHs do not own any non-agricultural assets, thereby cutting down their non-farm diversification opportunities to a great extent. In terms of transport assets, around 79.4% HHs do not own any bicycle, motor bike, animal-drawn cart and car. 91.9%, 71% and 29.7% HHs in the state do not have a car, bike and bicycle, respectively. In terms of HH appliances, most HHs do not own a TV, fridge

or water pump. In contrast, a decent number of HHs are found to own mobile phones and fans (only 8.1% and 15.3% HHs do not own mobile phones and fans respectively). The state's condition seems a bit better in terms of HHs' savings behaviour or savings habit as only 4.3% HHs are found to be devoid of bank account and/or post office account.

Most HHs in Assam live in semi-pucca houses (62.6%), followed by pucca houses (31.6%). Also, a small fraction of HHs live in kutcha houses (2.9%). In terms of basic amenities, Assam's population is most deprived in accessing clean fuel as around 57.9% HHs fail to access so. Also, 7.3% HHs are living without electricity in the state. Around 32.7% of HHs do not have access to basic sanitation and 14.6% HHs do not get basic drinking water service.

Assets poverty	No agricultural asset	69.6	
	No non-agricultural asset	87.2	
	No transport asset (selected)	Car	91.9
		Bicycle	29.7
		Motor bike	71.0
		Animal drawn cart	99.3
		None of the above	79.4
	No HH appliances (selected)	TV	50.0
		Fan	15.3
		Mobile phone	8.1
Water pump		84.1	
No bank account/post office account	4.3		
Housing	Kutcha (houses made from mud, thatch, or other low-quality materials)	2.9	
	Semi-pucca (houses that use partly low-quality and partly high-quality materials)	62.6	
	Pucca (houses made with high quality materials throughout, including the floor, roof, and exterior walls)	31.6	
	Missing	2.9	
Basic amenities	Without electricity	7.3	
	Without basic drinking water service (i.e., deprived of drinking water from an improved source, provided either water is on the premises or round-trip collection time is 30 minutes or less)	14.6	

	Without basic sanitation (i.e., deprived of using improved facilities that are not shared with other households, such as, flush/pour flush to piped sewer system, septic tank, or pit latrine, etc., pit latrine with slab, other ventilated improved pit (VIP) latrine/biogas latrine, and twin pit/composting toilet)	32.7
	Without clean fuel (i.e., without electricity, LPG, biogas)	57.9
Source:		
i. Assam Human Development Report 2014, Government of Assam		
ii. National Family Health Survey (NFHS-5), India, 2019-21: Assam, IIPS and ICF		

3.3 Research design

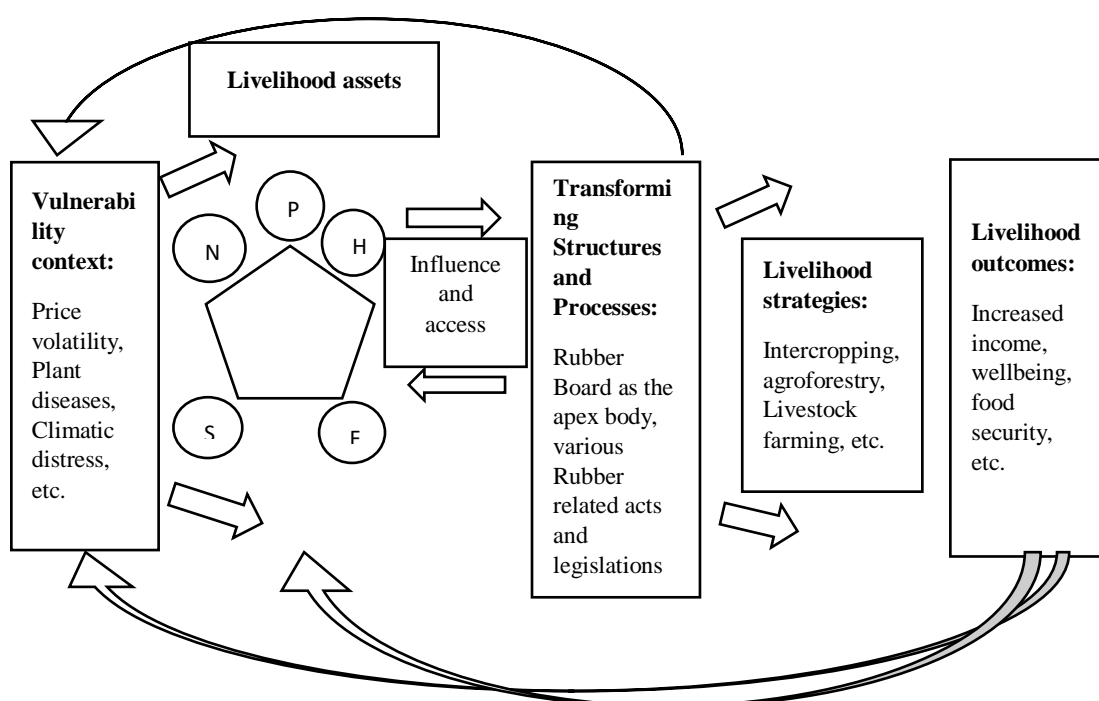
The present section delineates the structural framework for undertaking the study of exploring the livelihood assets status of Tribal Rubber growers in Assam. The current section introduces the theoretical framework of the chosen approach, followed by description of the livelihood assets chosen for the study and the method of calculation of assets' indices. The subsequent sub-sections illustrate the sampling and survey design adopted and crisp description about the primary survey districts.

3.3.1 The Theoretical Framework

The concept of the five livelihood assets or capitals as described in DFID's SLF (viz, physical, human, natural, financial and social) is considered as the basis of the current study. As discussed in chapter 2: Review of Literature, SLF has five major components, viz., vulnerability context, livelihood assets, transforming structures and processes, livelihood strategies and livelihood outcomes. The vulnerability context is the starting point of SLF. It is the external environment where people live and is represented by the detrimental shocks, trends and seasonality which lays focus on the insufficient capability of the people to act properly. Livelihood assets in this regard may be considered people's strengths, ownership of and/or access to which are crucial for coping with vulnerabilities and generating positive livelihood outcomes. Differential accessibility and ownership of these assets by different HHs is represented by differently shaped asset pentagons. Transforming structures and policies are the third component of the SLF that operate from grassroot levels to international arenas

and attempt to manage the ill-effects of vulnerability contexts by influencing access to assets and livelihood strategies of the HHs. Livelihood strategies consist of the actual combination of activities and choices adopted by the HHs keeping in consideration the available assets and contributions from structures and policies to deal with vulnerabilities and enhance livelihood outcomes. Livelihood outcomes are the attained outputs of livelihood strategies, such as, more income, increased well-being, reduced vulnerability, improved food security, and more sustainable use of natural resources.

Chart 5: Rubber Growers' Livelihood Situation in the SLF



Source: Constructed by author based on DFID framework

Livelihood assets are the connecting centres for the HHs with the other five SLF components. The assets are the basis of sustaining livelihoods. Creating new assets and at the same time, strengthening the existing assets stock are prerequisites of generating viable livelihood opportunities. In the present study, Rubber growers' livelihoods scenario can be juxtaposed into each of the five components of the SLF, as shown in chart 5. The plantations as well as the growers are vulnerable to several factors, such as, natural calamities like cyclones, etc. (*Jacob and Pradeep, 2017*), price

fluctuations (*Pareed and Kumaran, 2017*), plant diseases (*Viswanathan et al., 2005*) among others. The formation of Rubber Board under Rubber Act 1947 and its subsequent amendments in 1954, 1960, 1982, 1994 and 2010, latest National Rubber Policy 2019, etc. acts and regulations have been formulated and implemented to reduce the vulnerabilities of the plantations by influencing the livelihood assets and the livelihood strategies of the growers (such as, practising intercropping, agroforestry, livestock rearing, etc.), thereby improving the overall livelihood outcomes of the growers and establish a more resilient Indian Rubber plantation sector. Improved livelihood outcomes, such as better living standard, increased income, enhanced food security, etc. enable the Rubber growers to further invest in their livelihood assets to accelerate further augmentation of their well-being and flourishing of the plantation sector in general. Thus, it is a circular process and livelihood assets of the growers play a vital role in maintaining overall sustainability as well as growth within the framework.

3.3.2 Livelihood Assets

SLF is a *people-centred* approach, *building on strengths* and thus focuses on nurturing and enhancing people's available assets to ensure realization of their livelihood outcomes (*DFID, 1999*). DFID's SLF has identified five broad categories of livelihood assets – physical, human, natural, financial, and social. Each of the five livelihood assets are represented by several sub-components relevant for the current study. The sub-components under the five livelihood assets are elaborated as follows;

Physical Assets: Current study has considered seven sub-components under the physical assets category, such as,

- **HH gadgets/appliances:** Ownership of four durable goods are included in HH gadgets, viz., TV, mobile phone, fan and hand pump. HHs with ownership of all the four gadgets are considered richest in the HH gadgets category and those having none are the poorest.
- **House ownership:** Under this category, ownership of houses of the Rubber growers are divided into 'self' (which considers both cases of own as well as government provided housing) and 'otherwise,' HHs with the former are considered richer than the latter.

- **Ownership of poultry and livestock:** Chicken and duck are included in poultry whereas livestock consist of cattle, pig and goat. HHs owning at least one item from poultry or livestock are considered richer in the category than those owning none.
- **Housing condition:** Housing condition takes into consideration the materials with which the walls and the roof of a house are built. Three types of houses are specified under this category, viz., *kachha* (houses made from mud/thatch/other low-quality materials), *semi-pucca* (houses made with partly low-quality and partly high-quality materials) and *pucca* (houses made with high quality materials throughout, including the floor, roof, and exterior walls) (*IIPS and ICF, 2021*). The HHs having *pucca* housing are considered richest and those with *kachha* housing are considered the poorest in the housing condition category.
- **Distance to market (in Km):** The inputs for Rubber plantation and processing like latex collection cup, knife, polythene bag, formic acid, etc. are usually bought from local markets by Rubber growers. Also, Rubber sheets are mostly processed in the home periphery of the growers. Rubber dealers collect these sheets from the growers' houses or the growers sell them in local markets or to the Rubber Growers' Societies (RGSs). Thus, distance between Rubber growers' houses and local markets is an important physical capital component. Shorter distance between market and growers' houses reduces transportation cost of the growers as well as the dealers and vice versa. The 'distance to market' is categorised into '0-5 Km' and 'more than 5 Km'; the former being more favourable for the growers.
- **Road condition:** Along with distance between Rubber growing HHs and markets, roads connecting these two points and the plantations are also important to lessen transportation costs for delivery of inputs and Rubber sheets for the growers. In this study, roads are categorised into 'bituminous', 'brick', 'kankar' (roads made with limestone) and 'earthen'. HHs with access to bituminous roads have best road connectivity from plantations to homes to markets and those with earthen road connectivity are the worst sufferers, especially during the rainy season that lasts for almost 7-8 months a year in Assam.

- **Ownership of vehicles:** Under this category, HH's ownership of three types of vehicles are considered, viz., car, motor bike and bi-cycle. Owning a vehicle makes a HH less dependent on rented vehicles for transportation of Rubber inputs as well as Rubber sheets to and from the house. Vehicle ownership is also a symbol of social reputation and affluence in our country; owning more sophisticated and expensive vehicles make a HH appear more socio-economically richer to others than those owning none. If a Rubber grower owns all the three vehicles, he is considered the richest in the category while the one who owns none is the poorest.

Human Assets: Seven sub-components are included in this category for the current study, such as;

- **HH size:** This sub-component considers the total number of members in the HH, inclusive of both economically active and dependent members. This sub-component has three categories keeping mean value at the centre (*Chen et al., 2012*), viz., 'less than or equal to mean HH size', 'between mean HH size and less than or equal to 1.5 times mean HH size' and 'more than 1.5 times mean HH size'. The lesser the HH size, the fewer mouths to feed and hence, better is the HH economic condition. Thus, the 'less than or equal to mean' sized HHs are considered the richest in the category.
- **Training:** Under this category those Rubber growing HHs in which at least one member has received training on basic tapping skills and/or latex harvesting from Rubber Board at least once are considered the more skilled ones compared to those with no formal training.
- **Type of labour:** In plantations as well as for Rubber processing, three types of labour may be engaged, viz., family labour i.e., Rubber collection and processing is done by HH members only; secondly, hired labour, i.e., for the mentioned activities labour is hired from outside the HH against wages in monetary form or in crop sharing basis and finally, a combination of both family and hired labour is used and the payment to hired labour is made according to the earlier mentioned conditions. Involvement of family labour is considered most beneficial for the Rubber growing HHs as no extra labour cost is to be paid.

- **Education:** Maximum education level of a HH is considered here, i.e., the highest educated member of a HH is regarded for the scoring of HH education level. Three educational categories are included here, viz., primary education and less, i.e., from infants and/or illiterates to class V; secondly, secondary education, i.e., from class VI to Class X, and finally, higher secondary and above education, i.e., from class XI onwards. For e.g., if one member of a HH of size five has attained higher secondary education and the rest of the four members have less than higher secondary level of education, the HH is placed at 'higher secondary and above' category. The higher educated HHs are considered richer in human assets compared to those having lesser educational attainment.
- **Distance to nearest health centre/hospital (in Km):** Distance to the nearest hospital or health centre is an important factor to consider for easy accessibility of primary health care services. Thus, the HHs located closer to the local hospitals or primary health centres are better off in case of health emergencies. In this category, HHs are divided into two groups depending on distance between their houses and nearest health care facility centre, i.e., located within '0-5 Km' distance and 'more than 5 Km' distance.
- **Cost of health care:** This sub-component considers the proportion of HHs having access to free health care services in the nearest primary health centres or government hospitals. Paid health care is burdensome for the HHs as a considerable portion of the HH budget is spent in the form of out-of-pocket-expenditure in such cases (*Vasudevan et al., 2019*).
- **Source of drinking water:** Drinking water sources are divided into four categories depending on pilot test results, viz., 'hand pump' located at the home premises of the Rubber growers, 'tap water supply by local authorities' in the neighbourhood, 'dug well' in the neighbourhood and 'others' which include ponds, lakes, rivers, canals, community tube wells, etc. HHs owning hand pumps are the best equipped ones in terms of water accessibility and quality whereas, HHs dependant on 'others' category for drinking water are the worst sufferers due to seasonal fluctuations in volume of water, poor quality due to mass usage for multiple domestic purposes and difficult access due to their public ownership or common property resources status.

Natural Assets: The current study considers the natural resources, which are directly used in production under this category. The sub-components considered are as follows;

- **Land under Rubber (in Hectare):** Land is an important natural asset for agriculture and allied activities dependent- HHs. Quantity and quality of land largely influence the quantity and quality of produce. Here the amount of land under Rubber cultivation available with HHs (in hectare) is taken into consideration as a sub-component of natural capital. Three classifications of amount of Rubber land are created based on mean value (*Chen et al., 2012*), viz., ‘less than or equal to mean landholding under Rubber plantation by HHs,’ ‘between mean and less than or equal to 1.5 times mean’ and ‘more than 1.5 times mean’. The HHs with ‘more than 1.5 times of mean’ landholdings under Rubber are the richest ones in terms of land capital.
- **Tappable Rubber tree stock:** The Rubber trees remain tappable for 25 years from 7th year to 32nd year of their lifespan (*Rubber Board*). However, not all the trees planted remain tappable. The reasons may be manifold, such as, uneven growth of trees, damage to some of the plants due to cyclones, pest attack, etc among others. Thus, the number of tappable trees may likely be less than the total planted. Since only tappable trees can yield latex, the present study takes into consideration the total tappable trees available with a HH as a sub-component of natural assets. It is classified into three groups, based on the mean value, such as, ‘less than or equal to mean tappable trees of the community/district,’ ‘between mean and less than or equal to 1.5 times mean’ and ‘more than 1.5 times mean’. Evidently, the HHs having more than 1.5 times mean tappable Rubber trees get the highest yields and thus are the richest in the category.
- **Accessibility to water for Rubber processing:** For processing of latex into Rubber sheets, equal quantities of water and latex are required. Thus, latex processing requires a considerable amount of water. The water sources for Rubber processing are classified into four groups like the sources of drinking water, i.e., ‘hand pump’ located at the home premises of the Rubber growers, ‘tap water supply by local authorities’ in the neighbourhood, ‘dug well’ in home premises or neighbourhood and ‘others’ which include ponds, lakes,

rivers, canals, community tube wells, etc. Accessibility to water is easier when the water source is located closer, availability is independent of seasonal variations and ownership of source of water is private. Thus, HHs with hand pumps have ‘very easy’ access to water, followed by HHs with access to public tap water supply by local authorities having ‘easy’ access, HHs with access to dug wells having ‘difficult’ access and finally, HHs with access to ‘others’ like canal water, pond water, etc. having ‘very difficult’ access.

Financial Assets: In the present study, three sub-components are identified to represent financial assets, such as;

- **Savings:** If at least one member of a Rubber growing HH owns a savings account in a bank or post office or in any other formal financial institution, the HH is considered having positive savings status as well as being financially better equipped compared to a non-account holding HH.
- **Loan burden:** It includes the proportion of surveyed HHs of a study area having outstanding loans with banks or other financial institutions till the end of the previous tapping season. Having outstanding loan, more specifically, if raised for conspicuous consumption is likely to reduce a HH’s financial flexibility as well as independence and hence exhibits negative influence on financial capital. Thus, HHs with no outstanding loans are considered better off in terms of financial capital.
- **Subsidy status:** Rubber Board provides financial assistance for planting and replanting amounting to maximum of 35000/- per hectare for maximum of two hectare of plantations per grower with less than five hectares of land under Rubber plantation and reimbursement of polybagged/root trainer plants up to 5000/- in NER states (*Rubber Board, 2020*). The HHs which have received subsidies for plantation development are financially less likely to be stressed as they are financially taken care of in the initial non-economic phase of Rubber plantations. Thus, proportion of HHs having access to subsidy are considered richer than those with no subsidy in terms of financial assets.

Social Assets: Here, the following three sub-components are considered as representatives of social assets of the Rubber growers of Assam;

- **Rubber Growers' Society (RGS) membership:** RGSs function as cooperatives constituted by small groups of Rubber growers under the supervision of the Rubber Board. The focus areas of these societies are promoting and assisting group approaches for new planting, replanting, productivity enhancement, availing of bank finance, Rubber Board grants etc., marketing of Rubber sheets at remunerative prices, assisting in technology transfer to members, raising nurseries and supplying high yielding planting materials to members, etc. Under this sub-component category, the proportion of Rubber growing HHs having at least one member in RGS as member have better access to social capital than the non-RGS member HHs as the former get access to several benefits from the membership in the RGS compared to the later.
- **Self-Help Group (SHG) membership:** The SHGs are small, economically homogeneous groups of people who mutually agree to contribute to a common fund used for granting loans to the members on collective decision, as well as work together for the socio-economic upliftment of their families and community through economic activities with equitable sharing of benefits (*Karmakar, 1999, as cited in Malathi, 2010*). In the present study the HHs having at least one member in SHGs are considered better off in terms of access to social capital than the non-members. In other words, this sub-component includes the proportion of HHs having at least one member in a SHG.
- **Selling point:** Selling point refers to the marketplace for buying and selling of Rubber sheets. The three identified major selling points of Rubber sheets for the growers are: houses of the grower from where private dealers collect the sheets (home collection), the RGSs where the growers sell their Rubber sheets and the local markets. This sub-component is built on the principle of network and connections of social capital, i.e., it takes into consideration the intra-networks among neighbour Rubber growers as well as inter-networks among growers and Rubber dealers. The ones who sell Rubber sheets through RGSs are the richest in social capital as they can access the common marketing

facilities as well as hold better bargaining positions for their Rubber products as RGSs sell Rubber sheets at rates pre-determined by them at par with the market rate or even higher, thereby avoiding price fluctuations observed in the open market. The HHs who resort to home collection are also well off in terms of social assets as they can avoid a considerable amount of transportation costs by not visiting market physically. The least benefited are the Rubber growers who sell their produce in local markets. They must incur higher transportation charges and sell at open market prices which usually are unstable.

Brief outline of the sub-components of the livelihood assets of Rubber growers in Assam as discussed above are mentioned in a tabular form below (table 3-c);

Table 3-c: Brief Description of Livelihood Assets to be Considered for Analysis			
Livelihood Assets	Sub-components	Reference literature	Explanation of sub-components
Physical	HH gadgets/appliances	<i>Nath et al., 2013</i>	Availability of TV, fan, mobile phone and hand pump in the house
	House ownership	<i>Samsudin and Kamaruddin, 2013</i>	Ownership status of the respondent's house
	Ownership of poultry & livestock	<i>Nath et al., 2013</i>	Availability of chicken, duck, pig, goat, and cattle in the HH
	Housing condition	<i>Nath et al., 2013; IIPS and ICF, 2021</i>	The materials with which the walls and the roof of the house are built
	Distance to market (Km)	<i>Abbassi et al., 2020</i>	Distance between the respondent's house and the nearest local market from where he/she buys inputs for tapping and latex processing
	Road condition	<i>Busono et al., 2017</i>	The material with which the road connecting the respondent's house with the nearest local market is made
	Ownership of vehicles	<i>Ibrahim et al., 2018</i>	Availability of car, motor bike and bicycle in the HH to facilitate transportation of inputs from and/or Rubber sheets to local market
Human	HH size	<i>Xu et al., 2015</i>	Number of HH members
	Training	<i>Nath et al., 2013</i>	Whether at least one member in the HH have received training from Rubber Board on tapping and/or Rubber processing
	Type of labour	<i>Viswanathan and Shivakoti, 2007 (in place of availability of family labour)</i>	Involvement of family or hired or both family and hired labour in Rubber tapping and processing

	Education	<i>Ding et al., 2018</i>	Highest education in a HH
	Distance to nearest health centre/hospital (Km)	<i>Berchoux and Hutton, 2019</i> (in place of distance to nearest medical facility)	Distance between the respondent's house and the nearest health centre or hospital (in Km)
	Cost of healthcare	<i>Munanura et al., 2021</i> (in place of access to healthcare)	Whether the HH can access free health care service available in the nearest public health centre or hospital
	Source of drinking water	<i>Booyesen et al., 2008</i>	Name of the source from which the HH collects drinking water
Natural	Land under Rubber (Hectare)	<i>Nath et al., 2013</i>	Amount of land the HH has under Rubber plantation (in Hectare)
	Tappable Rubber tree stock	<i>Nath et al., 2013</i>	Number of Rubber trees which have been tapped in the previous tapping season by the HH
	Accessibility to water for Rubber processing	<i>Aguilar et al., 2021</i> (in place of direct natural access to water source)	How difficult it is to get water for Rubber or latex processing
Financial	Savings	<i>Dutta and Guchhait, 2018</i>	Whether the HH has savings account
	Loan burden	<i>Dutta and Guchhait, 2018</i>	Whether the HH have any outstanding loan till the end of the last tapping season
	Subsidy status	<i>Ibrahim et al., 2018</i>	Whether the HH have received at least one instalment of subsidy for plantation development from Rubber Board till the end of the last tapping season
Social	Rubber Growers' Society (RGS) membership	<i>Mohapatra (2022); Islam et al., 2021</i> (used in place of member of cooperative society)	Whether a HH is having membership in an RGS
	Self Help Group (SHG) membership	<i>Viswanathan, 2008a</i>	Whether a HH is having membership in a SHG
	Selling point	<i>Author's contribution</i>	Where did the HH sell Rubber sheets during the previous tapping season

3.3.3 Livelihood Assets' Indices Calculation Method

The sub-components of each of the capital or asset indices have been assigned weights using rating scales in any of the following ways depending on suitability (*Chen et al., 2013; Qian et al., 2017; Dutta and Guchhait, 2018*);

- Sub-components with five classifications have weights of 0, 0.25, 0.50, 0.75 and 1 indicating 'very poor', 'poor', 'somewhat poor', 'good' and 'very good' status respectively. The sub-component 'HH gadgets' of physical capital falls in this category where the classifications are ownership of no gadget, any one, any two, any three and all four gadgets, i.e., T.V, mobile phone, hand pump and fan. Corresponding weightings are 'no gadget' having weight of 0 indicating 'very poor' status, followed by 'any one gadget' (for e.g., a TV) with weight 0.25 (poor), any two gadgets (for e.g., a TV and a mobile phone) with weight 0.50 (somewhat poor), 'any three gadgets' (for e.g., fan, mobile phone and TV) with weight 0.75 (good) and 'all four gadgets' with weight 1 (very good).
- Sub-components with four classifications have weights of 0.25, 0.50, 0.75 and 1 indicating 'very poor', 'poor', 'good' and 'very good' status respectively. 'Road condition' and 'vehicles' of physical capital, 'education' and 'source of drinking water' of human capital, and 'accessibility to water for Rubber processing' of natural capital fall under this category. For e.g., in case of 'accessibility to water for Rubber processing' four major water sources are identified in the survey districts, viz., hand pumps owned by the HHs, tap water supply provided by local administrative authority (mostly Gram Panchayat) for common use in a locality, dug wells for private or common use by a few HHs in a locality and pond, river, tube well etc are included in 'others' category. HHs with hand pumps are found to be least bothered with water access issues for latex processing as they have ownership over the source of water. So, the HHs with hand pumps have been put in the 'very easy' category for accessibility to water for Rubber processing and are assigned weight of 1. In the areas where local administration provides tap water supply, the HHs get access to water regularly and thus their access to water for Rubber processing is assured despite not owning the water source. Hence, HHs with access to tap water supply by local authorities are put into the 'easy' category with weight

of 0.75. The third category of 'difficult' is attached to HHs which depend on dug wells for water having weight of 0.50. These HHs face water transport difficulty as well as seasonal water shortage. Apart from these three sources of water, all the other sources like river, canal, pond, etc. are put in the 'very difficult' category with the lowest weight of 0.25 due to ownership issues, transport difficulties and seasonal water shortage.

- Sub-components having three classifications are given 'good', 'average' and 'poor' status with weights 1, 0.66 and 0.33, respectively. 'Housing condition' of physical capital, 'HH size' and 'type of labour' of human capital, 'land under Rubber' and 'tappable Rubber tree stock' of natural capital and 'selling point' of social capital fall under this category of weighing. For e.g., in case of 'type of labour,' if the HHs provide family labour in Rubber plantations, they are assigned weight of 1 due to non-existent hired labour cost. If the HHs engage hired labour in Rubber plantations, they incur labour cost and hence are assigned a lower weight of 0.66. Finally, for HHs using both family and hired labour, the assigned weight is the lowest, i.e., 0.33. Moreover, sub-components 'HH size', 'land under Rubber' and 'tappable Rubber tree stock' are weighted based on the 'mean value,' i.e., 'less than or equal to mean', 'between mean and 1.5 times mean' and 'more than 1.5 times mean'. In case of 'land under Rubber' and 'tappable Rubber tree stock', HHs with 'less than or equal to mean', 'between mean and 1.5 times mean' and 'more than 1.5 times mean' amount of land are weighted 0.33, 0.66 and 1 respectively signifying 'poor', 'average' and 'good' Rubber holding and tappable tree status while in the case of 'HH size,' the weighing is reversed.
- Sub-components expressed in 'yes'/'no' formats or only two options in the answer group are assigned weights of 1 or 0 depending on suitability. 'House ownership', 'ownership of poultry and livestock' and 'distance to market' of physical capital, 'training,' 'distance to nearest health care centre/ hospital' and 'cost of healthcare' of human capital, all three sub-components of financial capital, i.e., 'savings', 'loan burden' and 'subsidy status', 'RGS membership' and 'SHG membership' of social capital fall under this category. For e.g., in case of 'loan burden', if a HH has uncleared loan with bank, post office or any

other financial institutions during the survey period, they are assigned weight of 0.

Detailed weighting format of each of the sub-components is mentioned in the ANNEXURES 1(i) to 1(v) for reference.

Followed by the weight calculations, the value of each sub-component (I) is calculated by any of the following formulae depending on suitability (*Chen et al., 2013; Qian et al., 2017; Dutta and Guchhait, 2018*);

- $I = \text{Very good}\% * 1 + \text{Good}\% * 0.75 + \text{Somewhat poor}\% * 0.50 + \text{Poor}\% * 0.25 + \text{Very poor}\% * 0$ (in case of five classifications of a sub-component)
- $I = \text{Very good}\% * 1 + \text{Good}\% * 0.75 + \text{poor}\% * 0.50 + \text{Very poor}\% * 0.25$ (in case of four classifications of a sub-component)
- $I = \text{Good}\% * 1 + \text{Average}\% * 0.66 + \text{Poor}\% * 0.33$ (in case of three classifications of a sub-component)
- $I = \text{Yes}\% * 1 + \text{No}\% * 0$ (for sub-components expressed either in 'yes/no' format or classified into two categories)

The index value of each type of capital/asset (CI) is calculated by taking simple average of the values of the sub-components under each capital/asset category (*Chen et al., 2013; Qian et al., 2017; Dutta and Guchhait, 2018*);

$$CI = (\sum I)/n, n = 1,2,3, \dots$$

Where, n = no. of sub-components in the livelihood asset category

For e.g., the social capital in this study comprises three sub-components, viz., RGS membership, SHG membership and selling point. Thus, social capital index (SCI) is constructed as;

$$SCI = (\text{RGS membership index} + \text{SHG membership index} + \text{Selling point index})/3$$

Finally, a composite index inclusive of all the five livelihood assets is also formulated to represent the overall livelihood assets conditions of the concerned population. It is called the sustainable livelihood index (SLI) in this study. The SLI is

calculated taking simple average of the index values of the five capital/assets (*Chen et al., 2013; Qian et al., 2017*), i.e.,

$$SLI = (\sum CI)/N, N = 1, 2, 3, 4, 5$$

Where, N = No. of livelihood assets

In case of the current study, with five livelihood capital/assets indices, the SLI for a surveyed community is given by,

$$SLI = (PCI + HCI + NCI + FCI + SCI) / 5$$

where, PCI = Physical Capital Index

HCI = Human Capital Index

NCI = Natural Capital Index

FCI = Financial Capital Index

SCI = Social Capital Index

It is to be noted, $0 \leq SLI \leq 1$, which signifies that the closer the SLI value to 1, the better the overall livelihoods assets condition of the people in consideration and vice versa. More specifically,

- $0 \leq SLI \leq 0.33 \approx$ unsustainable
- $0.34 \leq SLI \leq 0.66 \approx$ moderately sustainable
- $0.67 \leq SLI \leq 1 \approx$ highly sustainable (*Viswanathan & Shivakoti, 2007; Viswanathan, 2008a*).

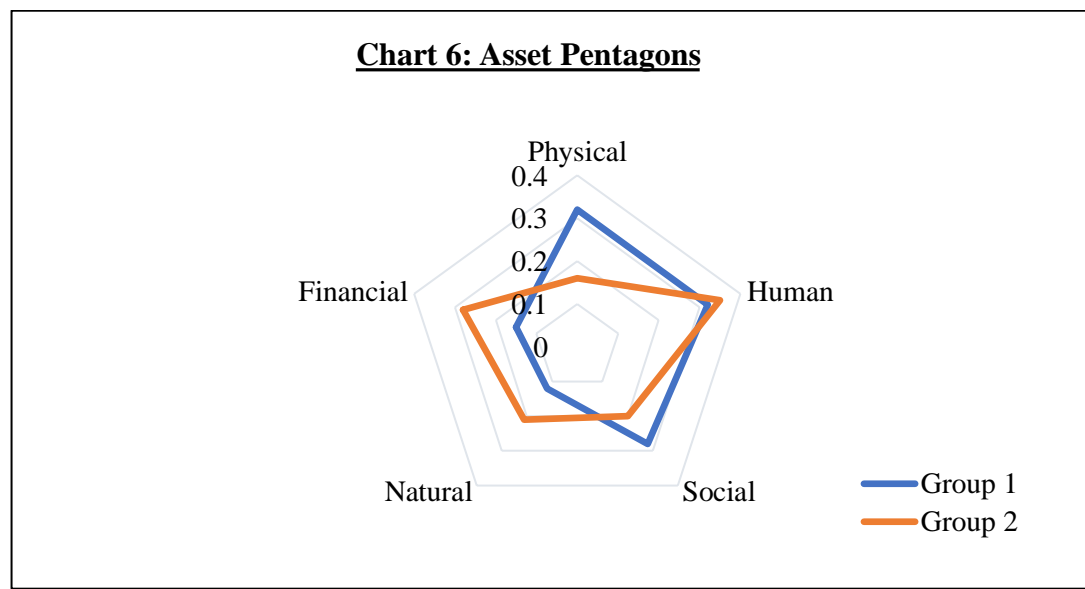
Similar classification applies for individual asset indices as well (*Viswanathan, 2008a*).

In the case of intra-Tribal Rubber growing HHs, separate asset indices are formulated for each of the Tribal groups while for Tribal and non-Tribal Rubber HHs' assets status, all the Tribal groups' assets are combined.

3.3.4 Assets Pentagon (Polygon)

The assets pentagon is a visual tool of representing the livelihoods assets status of the concerned population. The centre point of the pentagon represents no access to assets whereas the outer perimeter represents maximum access to assets. It can be used to make comparisons between spatial as well as temporal changes in assets status.

Different shapes of the pentagon reveal different access or ownership status of livelihood assets. For e.g., in chart 6, two asset pentagons representing varying asset status of two hypothetical population groups 1 and 2 are shown. Visual inspection of the pentagons reveals that group 1 has better access to or more endowment of physical and social assets whereas group 2 is richer in human, financial and natural assets, though difference in human assets between the groups is negligible.



In the case of the present study, asset pentagons represent differences in the asset status of intra-Tribal as well as Tribal and non-Tribal Rubber growers, across different study areas in the same time frame. Similar structures are used to represent the sub-components status also and these are termed as ‘assets polygons’ due to existence of more or less than five vertices each representing a different sub-component under a livelihood asset.

3.3.5 Two Sample t Test and ANOVA

Here ANOVA test is used to know whether deviations, if any, among the sub-component indices of the five livelihood assets among the various Tribal communities growing Rubber are significant (since three major Tribal groups are found in course of sampling). Similarly, a t test is performed to identify significance level of the difference between Tribal and non-Tribal growers of the state. In this regard, testing of the following two null hypotheses at $\alpha = 0.05$ level of significance are carried out;

- H_0^1 : No difference among Rubber growers of different Tribal communities in terms of livelihood assets status.

- H_0^2 : No difference between the Tribal and non-Tribal growers in terms of livelihood assets status.

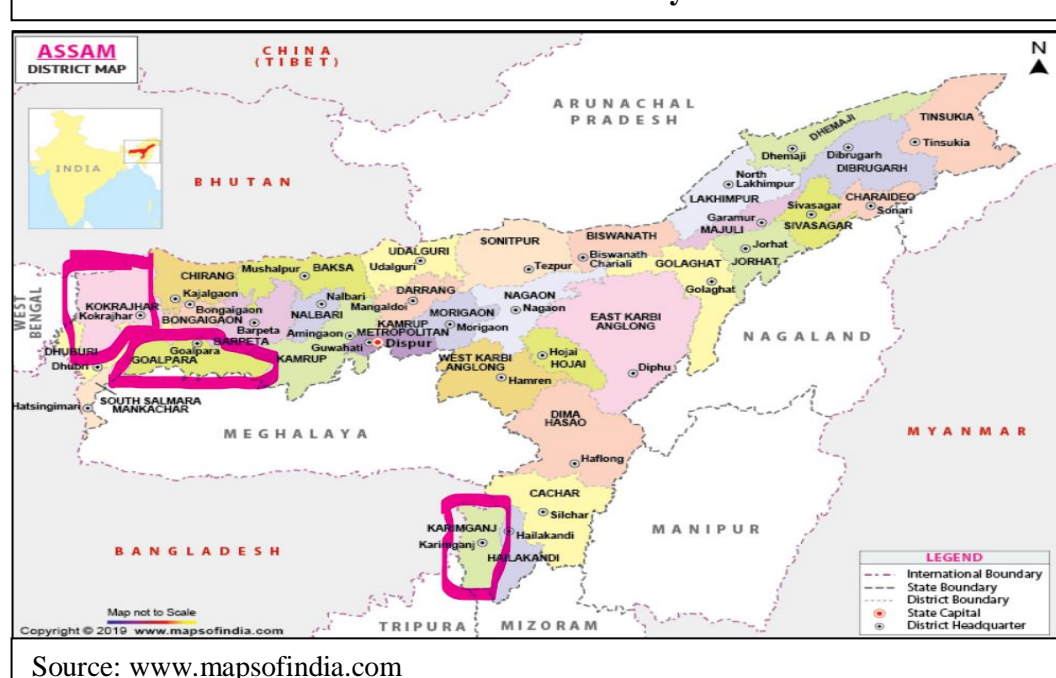
3.3.6 Data Sources and Sample Survey

Both primary and secondary data are used in the study. The secondary data provide state, district and village level insights regarding geographical area, population, S.T. profile, rubber plantation area, total production and employment generation status, etc. However, household level details are needed as well to reflect the ground level scenario of the Rubber Growers. Hence, the need for a primary survey arises here.

Secondary data are gathered from Census 2011, Government of Assam State portal, Baseline Surveys of Minority Concentrated Districts – Goalpara, Kokrajhar and Karimganj, District Census Handbooks – Goalpara, Kokrajhar and Karimganj, Statistical Handbooks of Assam for various years and Regional and Zonal offices of Rubber Board in Guwahati, Agia (Goalpara), Kajalgaon (for Kokrajhar) and Silchar (for Karimganj).

HH level data on area of production, tappable tree stock, education status of members, income status, subsidy status, water source, housing condition, selling point for Rubber produces, etc are collected through field surveys conducted in selected villages across the districts of Goalpara, Kokrajhar and Karimganj.

Chart 7: Location of the Study Districts



For HH level data, three districts are chosen through purposive sampling technique, viz., Goalpara, Kokrajhar and Karimganj (refer chart 7 for relative location of the three study districts). The three districts are selected based on their steady contribution in Assam's Rubber plantations in terms of area, production and employment generation, the ST share in district population, concentration of ST Rubber growers as well as accessibility to HHs for gathering data. As can be seen from the table 3-d, the three selected districts have contributed consistently to Assam's total Rubber area, tappable area, production and employment generation since 2015-16 till 2019-20. In the year 2019-20, Goalpara has been the highest Rubber producing district and is having the highest tappable Rubber area in the state, whereas, it stands 3rd in terms of total area under Rubber and employment generation. The district's share of STs in total district population is 11.23% (*Census, 2011*). Kokrajhar holds the position of the 4th highest contributing district of Assam in terms of Rubber area, tappable area, production quantity and employment generation in the year 2019-20. It is one of the highest Tribal dense districts of Assam having 31.41% of its population belonging to various ST communities (*Census, 2011*). Karimganj district has been the highest contributing district in the state's total area under Rubber plantation and employment generation in Rubber plantation sector and 2nd highest in terms of tappable area and amount of Rubber production. As per *Census 2011*, the district's share of ST population in total district population is a mere 0.15%. Accordingly, the districts of Goalpara and Kokrajhar are selected for studying Tribal Rubber growers and Karimganj district has been chosen for studying non - Tribal growers (for understanding comparative position of Tribes). Brief profiles of the three selected districts are given in section 3.3.7.

Table 3-d: Top 6 highest contributing districts in Assam's Rubber area, tapping area, production and employment generation from 2015-16 to 2019-20					
	2015-16	2016-17	2017-18	2018-19	2019-20
Area under Rubber	Karimganj (33.12)	Karimganj (32.52)	Karimganj (28.29)	Karimganj (28.27)	Karimganj (28.26)
	Goalpara (17.14)	Goalpara (15.43)	Goalpara (16.59)	Goalpara (16.54)	Goalpara (16.53)
	Karbi Anglong	Karbi Anglong	Karbi Anglong	Karbi Anglong	Karbi Anglong

	(15.76)	(14.04)	(14.82)	(14.80)	(14.79)
	Kamrup (5.35)	Kamrup (5.25)	Kokrajhar (5.85)	Kokrajhar (5.83)	Kokrajhar (5.83)
	Kokrajhar (5.22)	Kokrajhar (5.08)	Kamrup (5.49)	Kamrup (5.48)	Kamrup (5.47)
	Bongaigaon (5.06)	Cachar (4.81)	Cachar (4.96)	Cachar (4.96)	Cachar (4.96)
Tapping area	Goalpara (40.84)	Goalpara (29.88)	Goalpara (28.76)	Goalpara (27.02)	Goalpara (25.95)
	Karbi Anglong (20.60)	Karimganj (18.49)	Karimganj (18.79)	Karbi Anglong (21.56)	Karbi Anglong (20.83)
	Karimganj (17.50)	Karbi Anglong (13.86)	Karbi Anglong (12.43)	Karimganj (14.98)	Karimganj (14.68)
	Dhubri (3.78)	Bongaigaon (6.64)	Kokrajhar (8.28)	Kokrajhar (6.72)	Kokrajhar (9.76)
	Kamrup (3.17)	Kokrajhar (5.45)	Chirang (5.90)	Chirang (5.77)	Chirang (6.24)
	Kokrajhar (3.01)	Chirang (4.82)	Bongaigaon (4.97)	Bongaigaon (5.49)	Bongaigaon (5.26)
Production	Goalpara (40.85)	Goalpara (28.35)	Goalpara (30.41)	Goalpara (26.97)	Goalpara (29.77)
	Karbi Anglong (20.11)	Karimganj (18.55)	Karimganj (18.79)	Karbi Anglong (19.28)	Karbi Anglong (20.61)
	Karimganj (17.44)	Karbi Anglong (14.33)	Karbi Anglong (13.10)	Karimganj (13.61)	Karimganj (15.08)
	Dhubri (3.78)	Bongaigaon (6.86)	Kokrajhar (7.47)	Kokrajhar (8.74)	Kokrajhar (7.62)
	Kamrup (3.16)	Kokrajhar (5.87)	Bongaigaon (5.76)	Bongaigaon (7.15)	Chirang (5.82)
	Kokrajhar (3.01)	Chirang (4.98)	Chirang (5.32)	Chirang (6.67)	Bongaigaon (4.25)
Employment generation	Karimganj (32.47)	Karimganj (32.52)	Karimganj (28.29)	Karimganj (28.75)	Karimganj (33.21)
	Goalpara	Goalpara	Goalpara	Goalpara	Goalpara

	(17.46)	(15.43)	(16.59)	(16.40)	(14.97)
	Karbi Anglong (15.45)	Karbi Anglong (14.04)	Karbi Anglong (14.67)	Karbi Anglong (14.67)	Karbi Anglong (14.42)
	Kokrajhar (6.25)	Kamrup (5.25)	Kokrajhar (5.80)	Kokrajhar (5.80)	Kokrajhar (5.58)
	Kamrup (5.25)	Kokrajhar (5.08)	Kamrup (5.45)	Kamrup (5.45)	Cachar (5.18)
	Bongaigaon (5.15)	Cachar (4.81)	Cachar (4.92)	Cachar (4.92)	Kamrup (5.17)
Figures in parenthesis represent respective district's share in total state output					
Source: Government of Assam, 2017, 2019, 2020 and 2021.					

Regional Rubber Board Offices in Agia, Kajalgaon and Silchar have been requested to provide contact details of the Presidents of the active Rubber Growers' Societies (RGS) as well as that of some of the prominent Rubber growers of respective districts. From the contact lists of the Presidents and the growers, three Presidents or/and Rubber growers from each of the three chosen districts are contacted randomly for identifying villages with high concentration of Rubber growers. In Goalpara, the President of the Charpak RGS, Goraimari village has agreed to act as a key informant in this regard. A total of 10 villages in Goalpara are selected randomly from the suggested list of villages for conducting field surveys. In the case of Kokrajhar, out of three randomly selected prominent Rubber growers and/or RGS Presidents, one grower who also engages in dealership of Rubber sheets in the district has acted as key informant. A total of 8 villages in Kokrajhar have been selected randomly for the survey. Out of three randomly selected RGS Presidents in Karimganj, President of Ratabari RGS who also used to be a resource personnel conducting trainings on Rubber tapping for the Ratabari RGS Rubber growers has acted as the key informant of Rubber grower-intensive villages in the district. From his suggested list of villages, 6 are selected randomly for the HH surveys. The village name, community development blocks and number of households surveyed are mentioned in table 3-e;

District	Village	Development block	No. of samples collected
Goalpara	Goraimari	Balijana	16
	Sarapara	Balijana	30

	Hadlapara/Kalyanpur	Balijana	29
	Dosorapara Matia	Balijana	7
	Kuruwa Bhasa	Balijana	19
	Barajara No. 1	Balijana	9
	Bamundanga Pt I	Balijana	7
	Gendamari	Balijana	19
	Bhaiskuli	Balijana	10
	Bhalukdubi (town)	Balijana	18
Total	10	1	164
Kokrajhar	Baksamara/Ketengajhora	Kokrajhar	8
	Tilapara	Kokrajhar	16
	Daimaguri Pt II	Gossaigaon	16
	Debitola Pt IV	Debitola (Part)	10
	Ambari F.V.	Kachugaon	7
	Hatibandha	Debitola (Part)	21
	Bedlangmari	Chapar – Salkocha	14
	Ramsarovar	Debitola (Part)	8
Total	8	5	100
Karimganj	Barapunjee I	North Karimganj	32
	Maizgram II	North Karimganj	7
	East Chanmari	Dullavchera	13
	Tongibari II	Dullavchera	8
	Daluachera Grant	Dullavchera	44
	South Jagannathpur	Dullavchera	32
Total	6	2	136
Grand total	24	8	400

To arrive at a suitable yet practically achievable sample size, the formula given by Yamane (*Yamane, 1973*) has been used, the formula being,

$$n = N / [1 + N (e^2)]$$

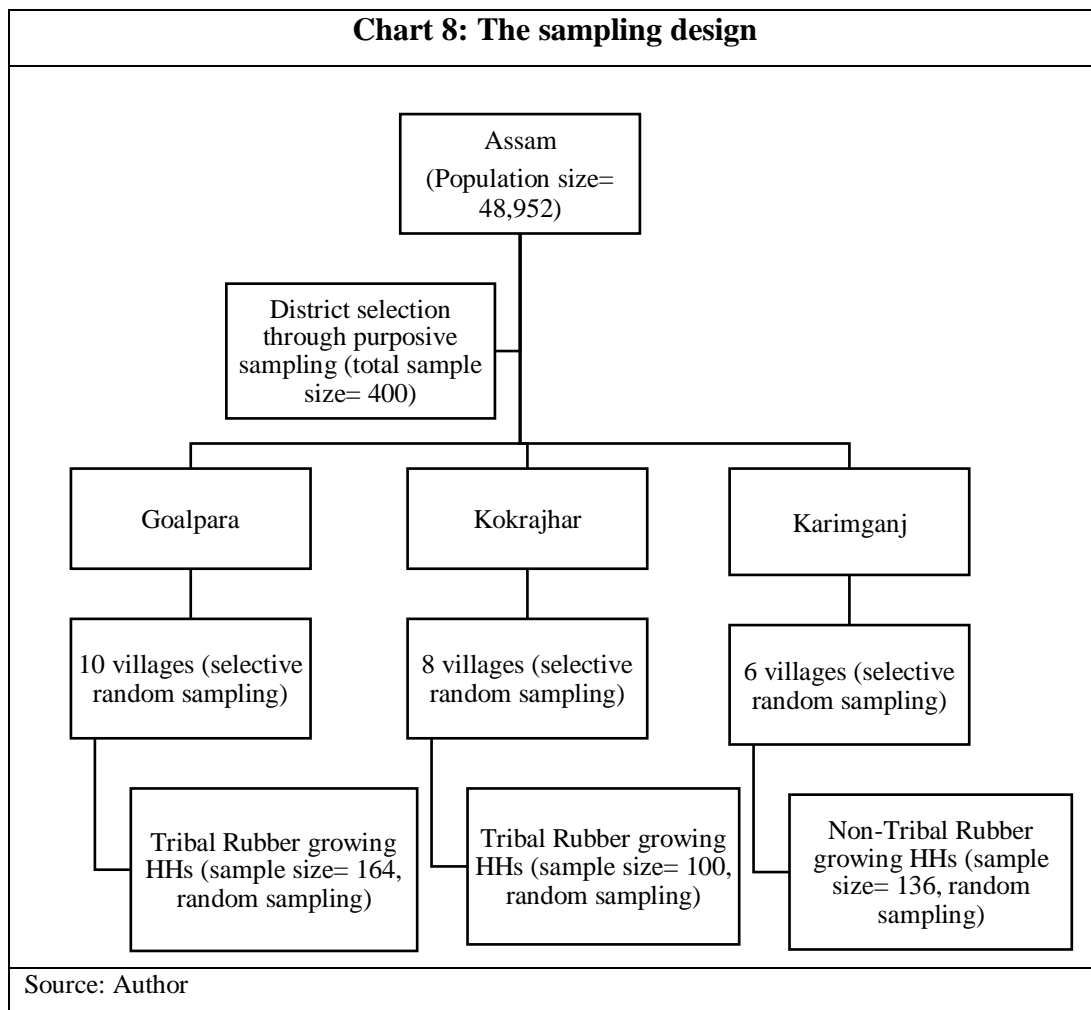
where, n = desired sample size

N = Population size (= 48,952 in our study)

e² = level of precision (= ± 5% in our study)

The sample size is 396.75 and has been rounded off to be 400. According to the Regional office of Rubber Board, Guwahati as of 31.03.2019, the share of S.T Rubber growers in Assam's total Rubber growers is around 66% (Number of total growers = 48,952; S.T growers = 32,526) and the rest belong to general, S.C and OBC category. The same distributive share is maintained while choosing S.T and non – S.T. growers in the sample, i.e., out of 400, 264 are S.T growers (i.e., 66%) (164 from Goalpara and

100 from Kokrajhar) and 136 are non – S.T growers (from Karimganj district). The sampling design of the current study is represented in a pictorial format in chart 8.



It is to be noted that while considering for sample selection, only those Rubber growers are included,

- who have plantations of economic age, i.e., having Rubber trees of age 7-32 years and are producing latex for at least one tapping season,
- who are Rubber plantation owners; those working as tappers and/or labourers in others' Rubber plantations only and not owning Rubber plantations themselves are excluded from consideration in the study,
- who sell Rubber sheets, more specifically, Ribbed smoked sheets of grade 4 (RSS 4).

The data were collected in the months of January and February, 2021. Semi-structured questionnaires are used for the survey. The questionnaires are constructed

to capture information on the households' demographic profile and various aspects related to the five capital indices and have been pilot tested before finalizing. The Questionnaire format is mentioned in ANNEXURE 2 for reference.

3.3.7 General Profiles of Survey Districts

Goalpara:

Goalpara district is situated in western part of Assam, on the south bank of river Brahmaputra. It was made a part of Assam province in the year 1874 by the Colonial Government. However, the current Goalpara district was formed in 1989 after taking away parts of it as Bongaigaon district and before that, in 1983 as Dhubri and Kokrajhar districts (*goalpara.gov.in*). It covers a geographical area of 1824 Sq. Km (*goalpara.gov.in*) and is bounded by Meghalaya in the south, Dhubri in the west, river Brahmaputra all along the north and Kamrup Rural in the east. The topography of the district is characterized by flat plains with occasional small forested hills. A few large lakes (locally known as 'beel') can be seen here, viz. Urpad beel, Hasila beel, Kumari beel, etc (*Directorate of Census Operations Assam, 2014*). Another unique feature of this region is the existence of 'Char lands' which are sandy river islands appearing and disappearing seasonally. Climate here is mild in winters and hot and humid in summers. During monsoons downpouring continues from July to October and flooding in low lying areas along Brahmaputra River is a common every year occurrence.

Goalpara district is divided into five revenue circles- Lakhipur, Balijana, Matia, Dudhnoi and Rangjuli and eight development blocks – Jaleswar, Lakhipur, Kharmuja, Balijana, Krishnai, Matia, Dudhnoi and Kushdhowa. It has 837 villages, one Zilla Parishad and 81 Gaon Panchayats (*goalpara.gov.in*). As per *Census (2011)*, total population of Goalpara is 10.08 lakhs (5.13 lakhs male and 4.94 lakhs females), out of which 11.23% belongs to Scheduled Tribes (ST) category and 2.92% belongs to Scheduled Caste (SC) category. Also, here Muslims are the major religious community (57.52%), followed by Hindus (34.50%). The district literacy rate is 68.27% (Male literacy 72%, female literacy 64.53%) (*goalpara.gov.in*).

Almost 90% of Goalpara's population are engaged in agricultural activities (*Assaminfo.com*). The topography along with suitable climatic conditions contribute largely to the flourishing of agricultural activities here. Around 69% of land here is

under agricultural use (1266.91 Sq. Km) (*Government of Assam, 2020*). The district's major crops are rice, wheat, oilseeds, bananas, areca nuts, jute, etc. (*Ministry of Minority Affairs, Government of India, n.da*). Industrial contribution of the district is insignificant. As of 2018-19, there are 67 Micro, Small and Medium Enterprises (MSME) units in Goalpara (*Government of Assam, 2020*).

Table 3-f: Goalpara district at a glance	
Total area (Sq. Km)	1824
Total Forest area (Sq. Km)	364.59
Total Cropped area (Sq. Km)	1266.91
Length of international boundary (Km)	0
Population (Nos)	Total: 10,08,959 Scheduled Caste (SC): 29,538 Scheduled Tribe (ST): 1,13,401
Literacy (%)	Total: 68.27 Male: 72 Female: 64.53
Revenue Circles ((Nos)	5
Development Blocks (Nos)	8
Total Revenue Villages (Nos)	837
Educational Institutions (Nos)	Lower Primary School: 1501 Upper Primary School: 270 High School: 112 Higher Secondary School: 23 Degree College: 06 B. Ed College: 01 Law College: 01
Health care (Nos)	Hospital: 01 Primary Health Centre: 05 State Dispensary: 06 Sub-Dispensary: 06
Sources: 1. http://goalpara.gov.in/ 2. Government of Assam, 2020	

Kokrajhar:

Kokrajhar was part of Goalpara district till 1957. It was made into a full-fledged district in 1983. In 1989, some parts of the district were taken away to form Bongaigaon district and finally, in 2009 after further curving out some of the areas to form Chirang district, present Kokrajhar district was formed (*Kokrajhar.assam.gov.in*). Kokrajhar district covers a geographical area of 3169.22 Sq. Km (*Kokrajhar.assam.gov.in*), bordered by Bhutan in the north, West Bengal in

the west, Dhubri in the south and Bongaigaon and Chirang in the east. The climate here is subtropical in nature, warm and humid in summers, heavy downpouring in monsoons and cold and dry in winters.

Kokrajhar district is divided into three sub-divisions – Kokrajhar Sadar, Gossaigaon and Parbatijhora, five revenue circles – Kokrajhar, Dotoma, Bhowraguri, Gossaigaon and Bagribari, eleven development blocks - Kokrajhar (Titaguri), Dotoma, Kachugaon, Gossaigaon, Hatidhura, Bilasipara (Part), Chapar-Salkocha (Part), Rupshi (Part), Mahamaya (Part), Golokganj (Part), Debitola (Part) (*Kokrajhar.assam.gov.in*). It has four towns and 1068 villages (*Directorate of Census Operations Assam, 2014*). Kokrajhar comes under Bodoland Territorial Regional (BTR) which comprises four districts in Assam, viz. Kokrajhar, Chirang, Baksa and Udulgiri. It comes under an autonomous council, viz. Bodoland Territorial Council (BTC), formed under 6th schedule of the Constitution of India by a Memorandum of Settlement signed among Governments of India and Assam and Bodoland Liberation Tiger Force (BLFT) in the year 2003. The aim was to bring in development of the Bodo people of the backward regions of Assam by preserving land rights, ethnic and cultural identity, fulfilling educational, economic and linguistic aspirations and accelerating infrastructure development of the region (*wptbc.assam.gov.in*).

As per *Census 2011*, the population of Kokrajhar district is 8.87 lakhs (4.52 lakhs male and 4.34 lakhs female), out of which 3.33% belongs to SC category and 31.41% belongs to ST category. 59.63% of the total district population are Hindu, 28.43% are Muslim and 11.39% follow Christianity. The district literacy rate is 65.22%, male literacy rate to be 71.89% and that of female to be 58.27% (*Government of Assam, 2020*).

Share of agricultural land in Kokrajhar's total geographical area is 47.69% and share of forest cover is 54.73% (*Government of Assam, 2020*). Around 62.46% of the district's total workforce are engaged in agriculture (45.95% as cultivators and 16.51% as agricultural labourers) (*Directorate of Census Operations Assam, 2014*). Major crops produced here are rice, maize, wheat, black gram, banana, pineapple, tea, areca nut, coconut, etc. Kokrajhar is an industrially backward district. Currently there exists only 14 MSME units in the district (*Government of Assam, 2020*).

Table 3-g: Kokrajhar district at a glance	
Total area (Sq. Km)	3169.22
Total Forest area (Sq. Km)	1734.65
Total Cropped area (Sq. Km)	1511.68
Length of international boundary (Km)	88
Population (Nos)	Total: 8,87,142 Scheduled Caste (SC): 29,570 Scheduled Tribe (ST): 2,78,665
Literacy (%)	Total: 66.63 Male: 73.44 Female: 59.54
Revenue Circles ((Nos)	5
Development Blocks (Nos)	11
Villages (Nos)	1010
Educational Institutions (Nos)	Lower Primary School: 1311 Upper Primary School: 220 High School: 78 Higher Secondary School: 15 Degree College: 03 Engineering College: 02 State University: 01
Health care (Nos)	Hospital: 01 Primary Health Centre: 27 State Dispensary: 19 Community Health Centres: 02
Sources : 1. https://kokrajhar.assam.gov.in/ 2. Government of Assam, 2020	

Karimganj:

Karimganj district is situated in the Barak valley, the southernmost part of the state of Assam. Until 1982, Karimganj was one of the four subdivisions of Cachar district. It was upgraded into an independent district in 1983. The district covers a total geographical area of 1809 Sq. Km (<https://karimganj.gov.in/>) and is bordered by Cachar and Bangladesh in the north, Hailakandi in the east, Mizoram in the south and Tripura and Bangladesh in the west. The terrain of the district consists of flood plains, wetlands, hills and forests; the north and north-eastern portion being covered by plains whereas, the south and south-western parts are forested areas (*Ministry of Minority Affairs, Government of India. (n.db); <https://karimganj.gov.in/>*). The district has five revenue circles – Karimganj, Nilambazar, Patherkandi, Badarpur and Ramkrishnanagar; seven development blocks – North Karimganj, South Karimganj,

Dullavchera, Lowaipowa, Ramkrishnanagar, Badarpur and Patherkandi; one municipal board and 96 Gaon Panchayats (<https://karimganj.gov.in/>). Karimganj has a total of 936 villages and 7 towns (*Government of Assam, 2020*).

As per *Census 2011*, Karimganj district has a population of 12.28 lakhs (6.25 lakhs male and 6.02 lakhs female), out of which 12.85% belong to SC category and a meagre 0.15% belong to the ST category. The two dominant religious communities of the district are Muslims (56.36% of total district population) and Hindus (42.48% of total district population). Around 79.72% of inhabitants here are literate and female literacy contribution is 73.49% (<https://karimganj.gov.in/>).

Agriculture is the primary source of income for most of the district population. Around 40.43% of total workforce are involved in agriculture (23.64% as cultivator and 16.79% as agricultural labourer) (*Directorate of Census Operations Assam, 2014*). Major crops produced here are rice, rubber, sugarcane, potato, etc. Due to the existence of several rivers, ponds, lakes and other water bodies, fishery is another sound source of income here. Forest resources like bamboo, timber, cane, sand, etc are other important livelihood sources for many in Karimganj as around 27% of its geographical area is under forest cover (*Ministry of Minority Affairs, Government of India, n.db; Government of Assam, 2020*). There are only 7 registered MSME units operational in the district in the year 2018-19 (*Government of Assam, 2020*). Karimganj also acts as a border trade centre wherein trade with Bangladesh takes place through Sutarkandi Custom Station and Dukbangla Ghat.

Total area (Sq. Km)	1809
Total Forest area (Sq. Km)	481.20
Total Cropped area (Sq. Km)	741.41
Length of international boundary (Km)	92
Population (Nos)	Total: 12,28,686 Scheduled Caste (SC): 1,57,890 Scheduled Tribe (ST): 1940
Literacy (%)	Total: 79.72 Male: 85.70 Female: 73.49
Revenue Circles ((Nos)	5
Development Blocks (Nos)	7
Villages (Nos)	1280
Educational Institutions (Nos)	Lower Primary School: 1637 Upper Primary School: 271

	High and Higher Secondary School: 107 Degree College: 10 Polytechnic Institution: 01 Industrial Training Institute: 01
Health care (Nos)	Hospital: 01 Primary Health Centre: 10 Community Health Centres: 03 Sub Centres: 217
Sources : 1. https://karimganj.gov.in/ 2. Government of Assam, 2020	

3.4 Findings

The current section sets out the findings and the results obtained from analysing the data collected from the three surveyed districts in Assam, viz, Goalpara, Kokrajhar and Karimganj. It explores the characteristic details of the surveyed HHs in terms of their community specifications, religion, mean HH size, mean Rubber holding size, education status etc. It also puts forth the comparative status of the computed values of the livelihood assets indices as well as their sub-component indices among various Tribal groups as well as between Tribal and non-Tribal communities, pictorial representations of the same using assets polygons and testing whether deviations among the intra-Tribal as well as between the Tribal and non-Tribal Rubber growers' livelihood assets status are significant using the ANOVA and t tests respectively.

3.4.1 Livelihood assets status of intra-Tribal Rubber growing HHs

3.4.1.1 Profiles of the Surveyed HHs

Based on the field survey conducted in the three districts of Assam, three Tribal communities are identified across the districts of Goalpara and Kokrajhar, viz, *Rabha*, *Bodo* and *Garo*.

Rabha is an indigenous Tibeto-Burman Tribal community, inhabiting Assam, Meghalaya and West Bengal, along with Nepal, Bhutan, Thailand, Myanmar and Bangladesh. Around 7.62% of total Tribal population in Assam belong to the Rabha community (*Government of Assam, 2020*). They follow a patrilineal social system. In Assam, they are considered as plain Tribes, mostly residing in Goalpara, Kokrajhar, Udalguri and Kamrup districts. In the current study, a total of 191 Tribal Rubber growing HHs are found to belong to the Rabha community.

The Bodos are the largest ethnolinguistic group in Assam, whose prominent residence is the current Bodoland Territorial Region (BTR) comprising Kokrajhar, Baksa, Chirang and Udalguri districts. Around 35.05% of Tribal population of Assam belong to the Bodo community (*Government of Assam, 2020*). The Bodos are currently a settled agriculturist community. However, prior to the 18th century, they were forest dwellers, relying on shifting cultivation practices. Like the Rabhas, they have a patrilineal social structure and the property ownership resides with the male lineage. In the current study, 54 Bodo Rubber growing HHs contribute to the Tribal sample size of 264.

The Garos are a Tibeto-Burmese Tribal community, migrating from Tibet around 400 BC and settling in the Brahmaputra valley. They are hill tribes, mostly found in Meghalaya, Kokrajhar, Goalpara, Kamrup, Karbi Anglong and Sivasagar districts of Assam, parts of Nagaland, Tripura and Bangladesh. Current share of Garos in Assam's Tribal population is a mere 4.15% (*Government of Assam, 2020*). The Garos are one of the few remaining matrilineal Tribal groups, whose inheritance rights reside with the female members of the family. However, males take precedence in village administration and property management. The Garos still practice shifting cultivation. Farming and agriculture are their main occupations. Christianity is the dominant religion among Garos brought by the Christian Missionaries in the Garo-dominated regions, although a few of them still practice traditional animist-Hindu religion. The current sample consists of 19 Garo Rubber growing HHs.

Salient features of the surveyed Tribal Rubber growing HHs of these three communities are mentioned in table 3-i;

HH characteristics	Community name		
	Rabha (n=191)	Bodo (n=54)	Garos (n=19)
Religion (%)	Hindu (82.72) Christian (17.27)	Hindu (100)	Christian (100)
Mean HH size	4.75	4.83	5.15
Female headed HH (%)	4.18	-	15.78
Mean age of plantation owners	38.86	37.83	45.84

HHs with highest education (%)	Primary and less (1.57) Secondary (55.49) Higher secondary and above (42.93)	Primary and less (1.85) Secondary (48.14) Higher secondary and above (50)	Primary and less (15.78) Secondary (36.84) Higher secondary and above (47.36)
HHs practising Rubber monoculture (%)	2.09	1.85	10.52
Rubber + poultry/livestock (%)	91.09	88.88	84.21
Rubber + paddy (%)	83.76	85.18	36.84
Rubber + betel nuts (%)	3.14	7.40	5.26
Rubber + betel leaves (%)	0.52	5.55	-
Rubber + bamboo (%)	1.57	-	-
Rubber + wage labour or tapping (%)	1.57	-	-
Rubber + formal employment (%)	1.04	1.85	5.26
Rubber + others (%)	3.14	-	-
Mean landholding under Rubber (hectare)	0.61	2.08	0.60
HHs earning from Rubber only (%)	80.62	75.92	89.47
Mean annual income from Rubber (Rs.)	90,603.25/-	3,97,131.04/-	98,889.34/-
Mean annual total HH income (Rs.)	1,01,984.45/-	4,12,953/-	1,18,099.87/-
Source: field survey			

From table 3-i, it is evident that most of the Tribal growers belong to the Rabha community (72.34%), followed by Bodo (20.45%) and a meagre share found to be Garos (7.19%). District-wise, the growers of Goalpara mostly belong to Rabha and Garo communities whereas in Kokrajhar, growers from all the three communities are found. Hinduism is the only religion found to be followed by Bodo Rubber growers, whereas all the Garo growers follow Christianity. Among the Rabha growers, the

major chunk of the population follows Hinduism (82.72%). The average HH size is highest at 5.15 among the Garo Rubber growers, followed by Bodo (4.83) and Rabha (4.75). Following the precedence of matrilineal social system, Garo Rubber HHs have the highest proportion of female headed HHs (15.78%), followed by Rabhas (4.18%) and none among the Bodos.

In terms of educational attainment, among the Bodo as well as the Garo Rubber growers, majority of the HHs' highest education is of higher secondary and above level, followed by secondary education. Among the Rabhas, majority HHs have secondary education. It is to be noted that along with a promising performance in higher education, Garos also have a much higher proportion of HHs with primary or less education (15.78%) compared to the other two communities.

Tribal HHs mostly practice Rubber-integrated-livelihood systems where several possible-livelihood sources are maintained along with Rubber, such as, livestock rearing, paddy cultivation, small business, growing other plantations, etc. Overall dependence on Rubber as a monoculture practice is low among the Tribes. Rubber monoculture is highest among the Garo growers at 10.52%; comparatively, only 2.09% and 1.85% Rabhas and Bodos respectively practice monoculture. However, despite such low fractions of HHs across the three groups practicing Rubber monoculture, currently most of the Tribal HHs' only source of income is Rubber. Rubber plantation is the sole income source to as high as 89.47% of Garos, 80.62% of Rabhas and 75.92% of Bodos. Most Tribal Rubber HHs own poultry and/or livestock, followed by engagement in paddy cultivation. As high as 91.09% Rabhas, 88.88% Bodos and 84.21% Garos engage in poultry and/or livestock rearing. Pigs and chicken are the most reared livestock and poultry among these HHs; though ducks, goats and cattle are also found in some HHs. Compared to Rabha (83.76%) and Bodo (85.18%), a smaller fraction of Garo HHs (36.84%) cultivate paddy. More livelihood diversification options are observed among the Rabha Rubber growing HHs compared to the other two Tribal groups. Apart from Rubber and paddy, Rabha HHs also engage in betel nuts and betel leaves plantations, bamboo plantations, work as wage labour or tappers in others' Rubber gardens, formally employed as school tutors, own small businesses like fishery, grocery stores, pharmacy shop, etc. Bodo Rubber growing HHs' livelihood diversification options include paddy, ownership of betel nuts and betel leaves plantations, formal employment in the Indian army or pension from it, etc.

Garos Rubber HHs have shown the least livelihood diversification options with paddy, betel nuts and employment in the Indian army.

The Bodo Rubber growers have almost 3.5 times more land under Rubber plantations (2.08 hectares) than the Rabhas (0.61 hectares) and the Garos (0.60 hectares). Given almost similar HH sizes of the Bodos (4.83) and the Rabhas (4.75) and higher HH size of the Garos (5.15), the Bodos generate higher incomes from Rubber plantations than their other two counterparts due to higher land resources. The Bodos annual earnings from Rubber (Rs. 3,97,131.04/-) are around four times higher than those of the Garos (Rs. 98,889.34/-) and the Rabhas (Rs.90,603.25/-). However, lesser proportion of the Bodo HHs are found to be Rubber income-dependant compared to Rabhas and Garos (share of HHs earning from Rubber alone are 75.92%, 80.62% and 89.47%, respectively). Interestingly, the contribution of Rubber income is as high as 96.16% in annual total HH income of the Bodos, most likely due to the larger Rubber land-induced higher output. On the contrary, Rubber incomes contribute 88.84% and 83.73% in annual total HH incomes of the Rabhas and the Garos, respectively.

3.4.1.2 Livelihood assets status among the three Tribal communities

The table 3-j reflects the comparative status of the livelihood assets and their sub-components among the three Tribal communities, viz., Rabha, Bodo and Garo;

Table 3-j: Index values of livelihood assets of Tribal Rubber growers of different communities			
Assets & sub-components	Name of the Tribal community		
	Rabha (n=191)	Bodo (n=54)	Garos (n=19)
Physical	0.70 (1)	0.69 (1)	0.61 (2)
HH gadgets	0.81	0.70	0.80
House ownership	1	1	1
Ownership of Poultry & Livestock	0.91	0.88	0.84
Housing condition	0.55	0.56	0.59
Distance to market	0.81	0.70	0.31
Road condition	0.31	0.44	0.25
Vehicles	0.53	0.56	0.51
Human	0.82 (1)	0.80 (1)	0.85 (1)

HH size	0.81	0.84	0.83
Training	0.57	0.75	0.36
Type of labour	0.96	0.73	0.94
Education	0.87	0.87	0.82
Distance to hospital	0.61	0.70	1
Cost of healthcare	1	1	1
Source of drinking water	0.93	0.73	1
Natural	0.64 (2)	0.53 (2)	0.65 (2)
Land under Rubber	0.52	0.45	0.52
Tappable Rubber tree stock	0.49	0.42	0.48
Access to water for Rubber processing	0.93	0.72	0.96
Financial	0.69 (1)	0.71 (1)	0.71 (1)
Savings	0.52	0.59	0.26
Loan burden	0.90	0.98	1
Subsidy status	0.67	0.57	0.89
Social	0.58 (2)	0.43 (2)	0.44 (2)
RGS membership	0.62	0.22	0.42
SHG membership	0.50	0.35	0.47
Selling point	0.63	0.72	0.43
SLI	0.68 (1)	0.63 (2)	0.65 (2)

ANOVA

Ho¹: No difference among the three Tribal communities in terms of livelihood assets status

Community	Mean	Std. deviation	Frequency
Bodo	0.67304348	0.2085978	23
Garo	0.68173913	0.2748165	23
Rabha	0.71086957	0.19766623	23
Total	0.68855072	0.22675638	69

Source	Analysis of variance				
	SS	df	MS	F	Prob>F
Between groups	0.018055072	2	0.009027536	0.17	0.8430
Within groups	3.4784	66	0.05270303		
Total	3.49645507	68	0.051418457		

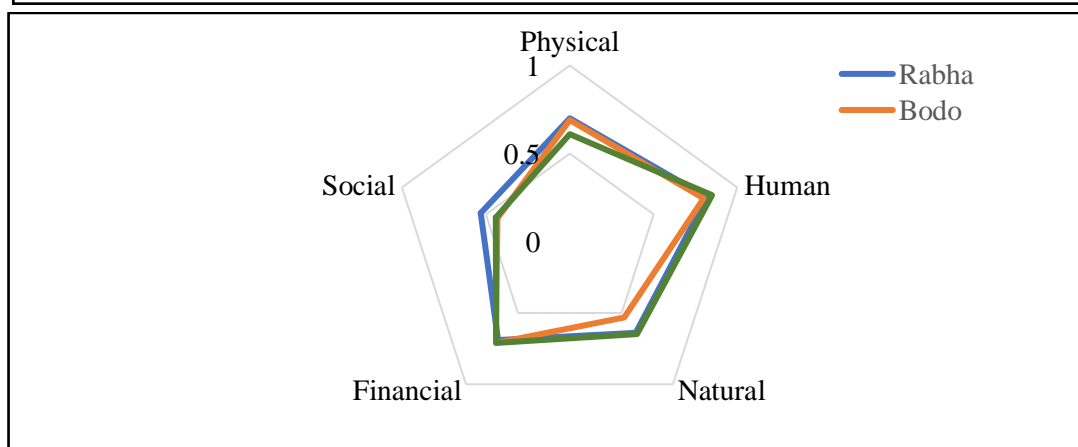
Figures in parenthesis represent range and level of sustainability

1 = (0.67-1) \approx highly sustainable,
 2 = (0.34-0.66) \approx moderately sustainable,
 3 = (0-0.33) \approx unsustainable.

Source: Author's calculation based on field survey data

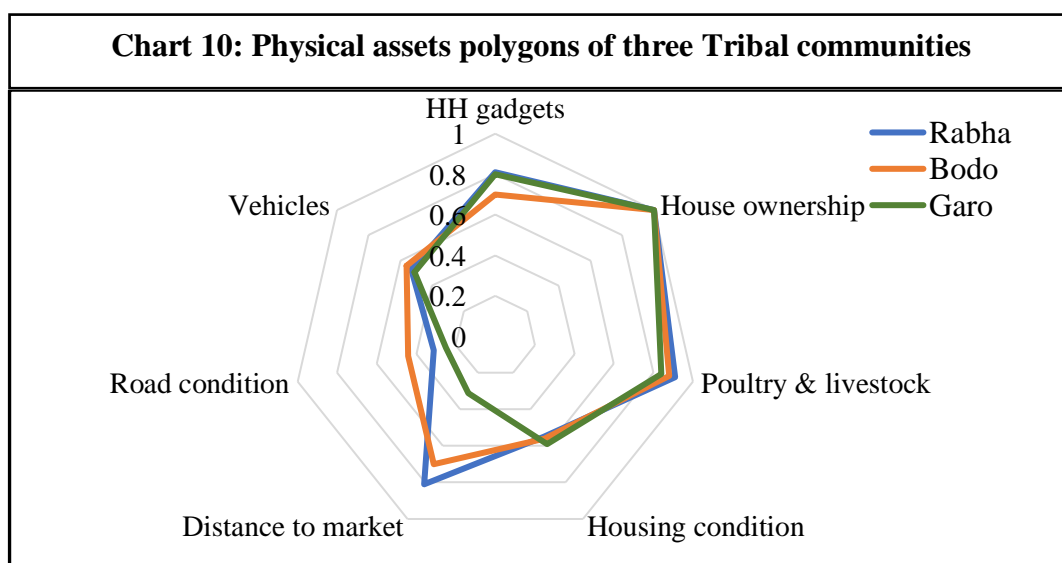
The SLI values of the three Tribal Rubber growing community HHs reveal that the Rabhas are most highly well-endowed in terms of overall livelihood assets status with highly sustainable SLI (0.68), followed by the Garos and the Bodos with moderately sustainable livelihood assets status (0.65 and 0.63 respectively). Chart 9 contains three asset polygons which pictorially depict the five livelihood assets status of the Rabha, Bodo and Garo Rubber growers of Goalpara and Kokrajhar districts, as described through the five assets index values of table 3-j. The closer a vertex to unity, the better the associated assets condition and the closer it is to '0', the worse is the asset status. Table 3-j and chart 9 show that the Rabha, Bodo as well as the Garo Tribal communities are richest in human assets (0.82, 0.80 and 0.85 respectively). On the contrary, social assets conditions are weakest for all the three communities in consideration (0.58, 0.43 and 0.44 for Rabha, Bodo and Garo HHs respectively). In terms of inter-community comparisons, Rabha Rubber growing HHs are highly endowed in physical assets and social assets (0.70 and 0.58 respectively) compared to the Bodos (0.69 and 0.43 respectively) and the Garos (0.61 and 0.44 respectively). Bodo HHs are found to be poorer than Rabhas or Garos or both in at least one livelihood asset. The Garos are richest in human and natural assets (0.85 and 0.65 respectively) amongst the three communities.

Chart 9: Livelihood assets polygons of three Tribal communities



Physical assets status: Table 3-j shows that the physical assets status of the Rabha and Bodo communities are highly sustainable with index values of 0.70 and 0.69 respectively, whereas that of the Garo Tribal growers is moderately sustainable with a lesser index value of 0.61. Hence, the Rabha Rubber growing HHs are richest in terms of physical assets status, followed by the Bodos.

Chart 10 contains three asset polygons which pictorially depict the seven sub-components status under physical assets of the Rabha, Bodo and Garo Rubber growers of Goalpara and Kokrajhar districts, as described through the sub-component index values of table 3-j. The closer a vertex to unity, the better the condition of the associated physical asset sub-component and the closer it is to '0', the worse is the sub-component status. Rabha Rubber HHs are richer in terms of ownership or access to HH gadgets/appliances (0.81), poultry and/or livestock ownership (0.91) and distance to market (0.81) than the Bodos (0.70, 0.88, 0.70 respectively) and the Garos (0.80, 0.84, 0.31 respectively). On the contrary, Bodo HHs are better endowed or have better access to road condition (0.44) and vehicles (0.56) compared to the other two communities. The Garos are better endowed in terms of housing condition (0.59) than the Rabhas (0.55) and the Bodos (0.56). In terms of house ownership status, all the three communities are at par as all the growers have self or family-owned houses. While all the three Tribal communities are well endowed or have adequate accessibility to HH gadgets, house ownership, poultry and/or livestock ownership and distance to market, they have poorer roads and housing conditions as well as lower vehicle ownership.



In case of HH gadgets/appliances, a higher proportion of HHs owning all four gadgets (TV, fan, mobile phone and hand pump) are found among Rabhas (37.17%), followed by Garos (26.31%) and Bodos (20.37%). However, across the three communities, most HHs own three HH gadgets (any three of TV, fan, mobile phone and hand pump); but the proportion of Garos is the highest in this category (68.42%), followed by Rabhas (50.26%) and Bodos (42.59%). Only 5.26% of Garos own any two gadgets as against 12.56% and 37.03% Rabhas and Bodos, respectively.

As high as 91.09% Rabha Rubber growing HHs own poultry and/or livestock, followed by 88.88% Bodos and 84.21% Garos. However, most of these HHs across the three Tribal groups own livestock for self-consumption. Livestock and/or poultry are sold only during economic distress or emergency needs of the HHs. Only 4.02% Rabha and 6.25% Bodo Rubber growing HHs who have livestock are found to sell poultry and/or livestock during the previous tapping season.

Higher proportion of Garo Rubber growers have semi-pucca houses (78.94%) compared to the Rabhas (62.30%) and Bodos (62.96%). Around 35.60%, 33.33% and 21.05% Rabhas, Bodos and Garos respectively own kutchha houses. However, none of the Garos own puccaa houses, whereas 2.09% Rabhas and 3.70% Bodos are found to own the same. Hence, at least some of the Rabha and Bodo HHs have better housing conditions than the Garos.

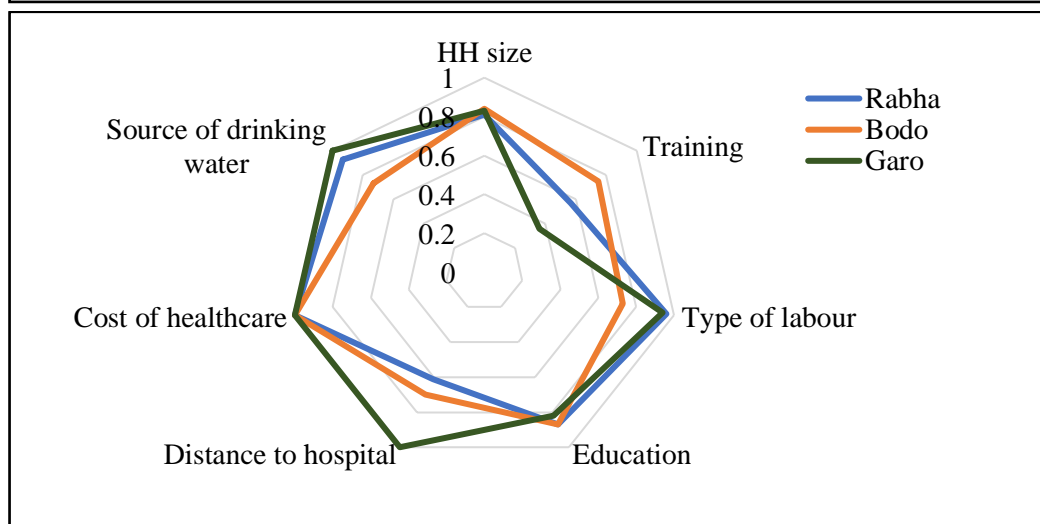
Around 81.15% Rabha HHs can access local markets within five km from their houses. 70.37% Garos and 31.57% Bodos can access markets within five km from their houses. Thus, more Garo Rubber growers must travel larger distances (>5 km) to transport their Rubber produce or inputs of production than the other two communities. Road condition is mostly poor in the survey districts. Around 91.09% Rabha, 74.07% Bodo and all the Garo Rubber growing HHs have reported of having earthen roads in their neighbourhood. Only 25.92% Bodo and 8.90% Rabha HHs have reported having bituminous roads in their vicinity.

In the case of ownership of vehicles, most of the HHs, irrespective of community differences, own one vehicle, which in most of the cases is bi-cycle. Highest proportion of HHs owning a single vehicle is found among the Garos (94.73%), followed by Bodos (83.33% and Rabhas (82.72%). A negligible share of Rabha HHs

(0.52%) are found to own all three types of listed vehicles, i.e., bi-cycle, motor bike and car.

Human Assets Status: All the three Tribal Rubber growing communities are rich in terms of human assets status as reflected in their highly sustainable index values (Rabha: 0.82, Bodo: 0.80 and Garo: 0.85). In fact, among the five livelihood assets, all the Tribal HHs, irrespective of differences in communities, are richest in terms of human assets endowments. Tale 3-j as well as chart 11 reveal that individual sub-component-wise Rabhas are richest in type of labour (0.96) and source of drinking water categories (0.93) while poorest in training status (0.57). Bodos have a better position in terms of HH size (0.84) and training status (0.75) than the other two communities. Garo HHs are better endowed in distance to market (1) and source of drinking water (1) and poorest in training status (0.36) than the rest. In case of the cost of healthcare sub-component, in which case the index values are same for all the three communities (1), similar healthcare cost conditions are found for all in consideration. In this case, it is reported to be free in neighbouring health care centres or local hospitals.

Chart 11: Human assets polygons of three Tribal communities



In the case of HH size, most of the Tribal Rubber HHs across the three communities are of sizes less than or equal to the respective communities' mean HH size (51.30% Rabha, 59.25% Bodo and 52.63% Garo HHs). It is to be noted that the mean HH sizes differ across the groups, with Garos having the highest mean HH size (5.15), followed by Bodos (4.83) and Rabhas (4.75). The Bodos have a higher share of HHs of size

more than 1.5 times its mean (7.40%) than the Rabhas (4.71%), whereas, no Garo HH is of size more than 1.5 times its community mean HH size.

In terms of the training status of the Rubber growing HHs, highest proportion of HHs having received training either on tapping or plantation management or Rubber processing or all at least once is found among the Bodos (75.92%), followed by the Rabhas (57.59%). Most of the Garo HHs are found to be without training (63.16%).

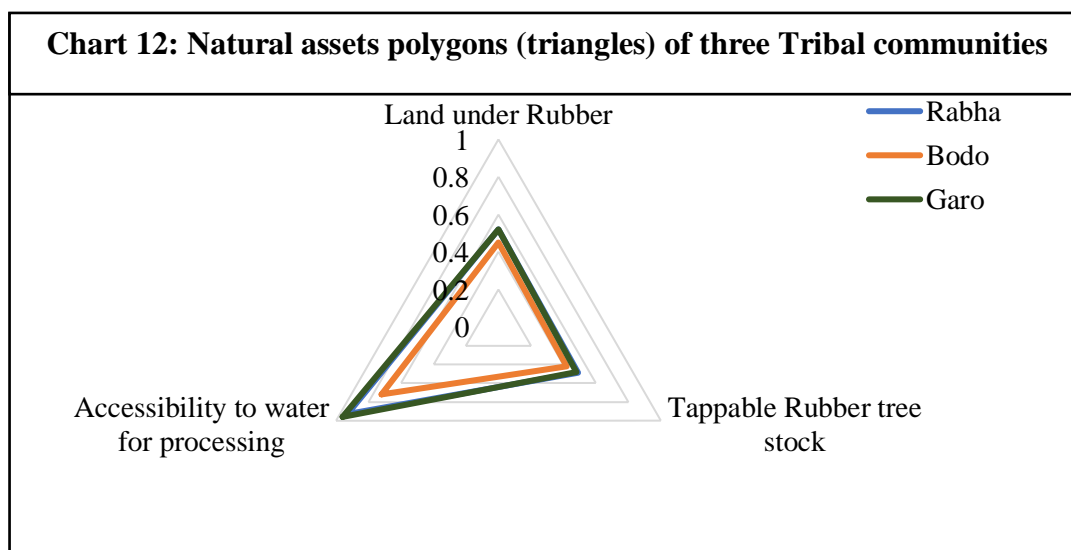
Use of family labour in tapping, plantation management and Rubber processing is observed the most among the Rabhas (94.24%), followed by the Garos (89.47%). The share of the HHs for the same among the Bodos is lesser at 57.40%. A considerably high proportion of Bodo HHs use hired labour in their Rubber plantations (40.74%), as against small shares of Rabha (4.18%) and Garo HHs (5.26%). The rest of the HHs use mix of family and hired labour in plantation-related activities.

Most of the Rabha, Bodo as well as Garo HHs have reported secondary level of education as the highest educational attainment in the respective HHs (55.47%, 48.14% and 36.84% respectively). Considerable proportions of HHs among the three Tribal communities have higher secondary and above level of education, although the share for the same is highest among the Bodos (50%), followed by Garos (47.36%) and Rabhas (42.93%). Neither of the three communities have reported illiteracy in their respective HHs.

All the Garo Rubber growing HHs are situated less than 5 km distance from the nearest local hospital or health centres. Though not all, a considerable share of Rabha and Bodo HHs have reported of not requiring to travel more than 5 kms from their houses for availing primary health care services (61.87% and 70.37% respectively).

The Garo Rubber growing HHs are better off compared to the Rabhas and the Bodos in terms of availability of drinking water. All the Garo HHs have reported owning their source of drinking water which in this case is hand pump, followed by the Rabhas for the same (89.52%). Bodo HHs' accessibility to drinking water is poorer than the other two communities due to higher share of the Bodo HHs being dependent on dug wells for the same (53.70%). However, unlike the Bodos and the Garos, some Rabha HHs are also found to source drinking water from nearby ponds, canals and rivers (4.71%).

Natural Assets Status: Table 3-j shows that the natural assets index values of the surveyed Rubber growers across all the three Tribal communities fall under moderately sustainable category, with the Bodos (0.53) falling behind the Rabhas (0.64) and the Garos (0.65) in terms of overall natural assets status. In the case of the individual sub-components as well, the Bodos' condition is worse than the other two communities, whereas the Rabhas and the Garos exhibit almost similar conditions (refer chart 12).

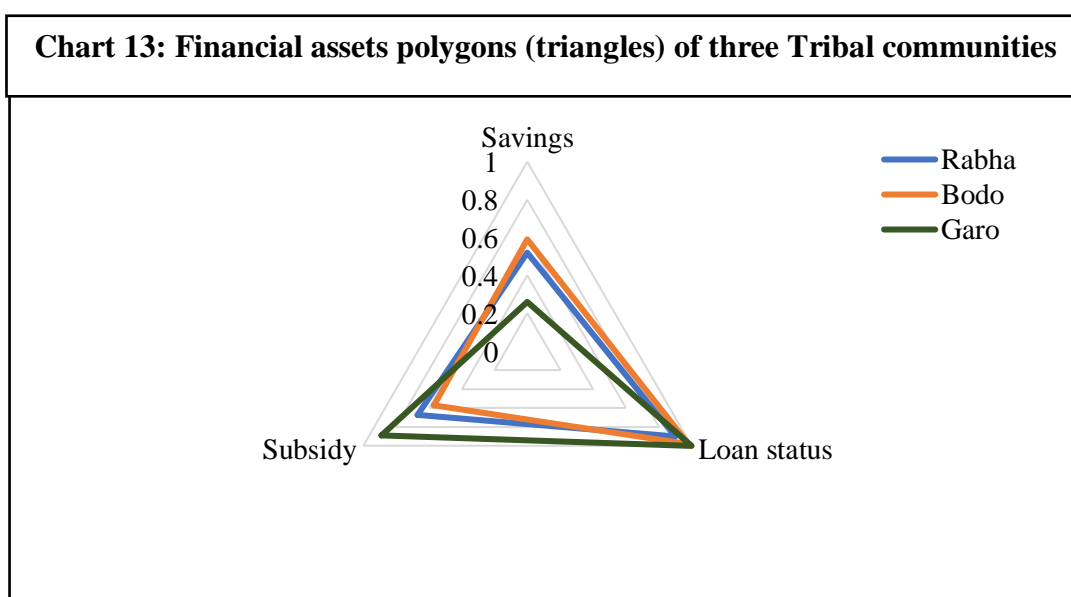


Most of the Tribal HHs across the three communities are land-resource deficient. 61.25% Rabha, 74.07% Bodo and 68.42% Garo HHs have reported having less than the respective communities' mean landholdings under Rubber. However, from table 3-i, the Bodos have more than 3 times higher mean landholding under Rubber (2.08 hectares) than the Rabhas and the Garos (0.61 and 0.60 hectares respectively). In fact, almost all the Rabha (98.42%) and Garo HHs (100%) have less Rubber land than the mean Rubber land of the Bodos, i.e., 2.08 hectares.

Directly related to land availability is possession of productive Rubber trees, i.e., tappable Rubber trees. Most of the Rabha (64.92%), Bodo (83.33%) and Garo HHs (68.42%) have less than the respective communities' mean tappable Rubber tree stock under possession. However, like the amount of land under Rubber, in this case also mean tappable Rubber tree stock of the Bodos (910.55) is much higher than those of the other two communities (Rabha: 207.73 and Garo: 215.42). As such, all the Rabha as well as the Garo HHs own less than 911 tappable trees, i.e., less than the mean tappable tree stock of the Bodos.

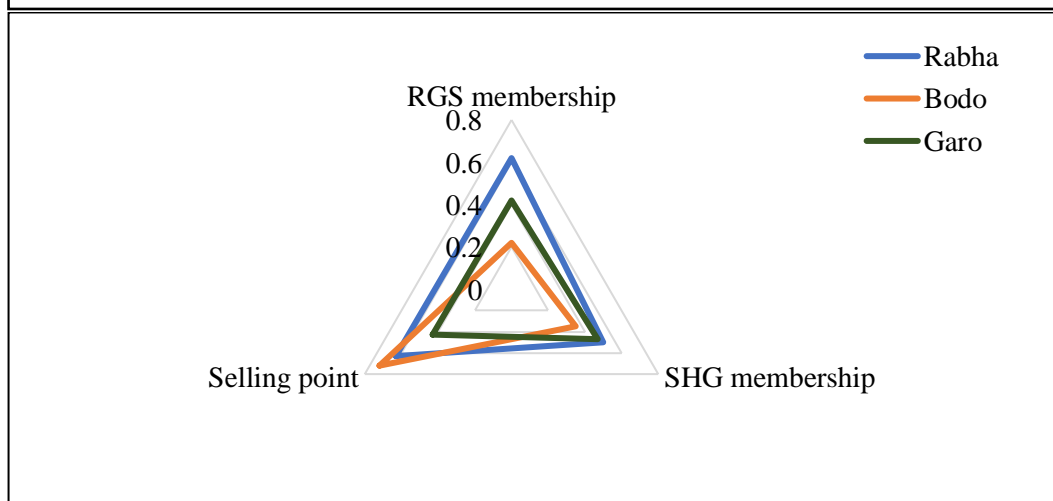
In terms of accessibility to water for Rubber processing, most of the Rabha and the Garo Rubber growers (89.52% and 94.73% respectively) have reported having very easy access to water as they own hand pumps. On the contrary, only 46.29% Bodo HHs own hand pumps and rest of the Bodo HHs face difficulty in accessing water due to non-ownership of water source and dependency on dug wells, ponds, canals, which are mostly public resources and water availability is seasonal in nature.

Financial assets status: Table 3-j and chart 13 show that the overall financial assets status of the three Tribal communities in consideration is almost similar and highly sustainable (Rabha: 0.69, Bodo: 0.71 and Garo: 0.71). In terms of individual sub-components, Garos are richer than the Rabhas and the Bodos in subsidy status as around 89.47% of the Garo HHs have received at least one instalment of subsidy from the Rubber Board compared to 67.01% Rabha and 57.40% Bodo HHs. On the other hand, the Garo HHs are the poorest among the three communities in terms of savings behaviour. As high as 73.68% of Garo Rubber HHs have reported not holding any active savings account in commercial banks, post office or in any financial institution, unlike the Rabha and the Bodo HHs (52.35% and 59.25% respectively own savings accounts). In terms of outstanding loans, the conditions of the Garos and the Bodos are almost similar and slightly better than that of the Rabhas as almost 100%, 98.14% and 90.05% of the respective Tribal groups have reported not having active loan burden till the survey period.



Social assets status: Out of the five livelihood assets, the Tribal Rubber growers irrespective of differences in communities are poorest in social assets. Table 3-j and chart 14 reveals that the Rabhas' social assets status is slightly better (0.58) than the Bodos (0.43) and the Garos (0.44). In terms of individual sub-components, Rabhas are richer in RGS membership status than the other two communities. Around 62.82% Rabha Rubber growing HHs consist of at least one member who has membership in neighbouring RGSs. The share of the HHs among Bodos and Garos for the same are 22.22% and 42.10% respectively. The Bodos have better marketplace conditions for selling the Rubber sheets as reflected by their higher index values for selling point sub-component (0.72) than the Rabhas (0.63) and the Garos (0.43). Though most Bodo HHs (72.22%) sell their Rubber produce through home collection by private dealers, a considerable share of the remaining Bodo HHs sell the produce through RGSs (24.07%), unlike the other two communities. Most Garo HHs (68.43%) sell Rubber sheets in local markets whereas, 91.09% Rabhas sell the sheets to private dealers through home collection. Around 50.78% Rabha HHs are members of neighbouring SHGs, followed by 47.36% Garos and 35.18% of Bodo HHs.

Chart 14: Social assets polygons (triangles) of three Tribal communities



3.4.1.3 ANOVA result

Though there are differences in overall livelihood assets conditions, in individual asset status as well as in individual sub-components status among the Rabha, Bodo and Garo Rubber HHs as discussed above, the ANOVA result mentioned in table 3-j shows that these differences among the three Tribal communities are insignificant at $\alpha = 0.05$.

3.4.2 Livelihood Assets Status of the Tribal vs. non-Tribal Rubber Growers

3.4.2.1 Profiles of the Surveyed HHs

The general characteristics of the Tribal Rubber growing HHs irrespective of community-divisions and that of the non-Tribal Rubber growing HHs as found through field surveys are mentioned in table 3-k. The Tribal growers belong to three major communities, viz., Bodo, Rabha and Garo. The non-Tribal growers mostly belong to the General caste category (97.05), followed by small fractions of Other Backward Castes (OBC) (2.20%) and Scheduled Castes (SC) (0.73%). Hinduism (80.30%), followed by Christianity (19.69%) are the prominent religions practised by the Tribal Rubber growers as against the non-ST growers, most of whom follow Islam (93.38%), with a small fraction following Hinduism (6.61%). In terms of mean HH size, non-Tribal HHs are almost double of that of the Tribal growers (8.02 and 4.80 respectively).

Majority of the HHs among the Tribals as well as non-Tribals have reported secondary level of education as the highest education in the HHs, though the share of the same is higher among the non-Tribals (52.65% and 63.97% respectively). However, a higher proportion of HHs with members having higher secondary or above education are found among the STs compared to their non-ST counterparts (44.69% and 17.64% respectively). No ST HHs have reported having illiterate adult members (18+ age). On the contrary, around 2.94% non-ST HHs are found to be without education.

On average, only 2.65% of ST HHs practice Rubber monoculture. The share of non-STs is much higher at 28.67% for the same. However, the proportion of ST HHs earning from Rubber only is very high at 80.30%, whereas, lesser non-ST HHs solely earn from Rubber (68.38%). Apart from Rubber, other major livelihood sources for Tribal HHs are livestock farming (90.15%) and paddy cultivation (80.68%), unlike the non-Tribal HHs, majority of whom are engaged in paddy cultivation (50%) and wage labour or tapping in others' Rubber gardens (16.91%). Livestock farming is negligible among the non-ST Rubber growing HHs (1.47%), whereas, a very small proportion of Tribal Rubber growing HHs work as wage labour or as tappers in others' Rubber plantations (1.13%). Livestock farming and paddy cultivation are practiced by these

ST growers for HH consumption in most cases. Only 4.16% and 6.57% of the Tribal HHs who engage in livestock farming and paddy cultivation respectively sell their produce in the market. It is to be noted that a lesser proportion of Tribal HHs are engaged into formal employment (mostly in Indian army and school tutoring) (1.51%) compared to their non-Tribal counterparts (mostly teaching in private and public schools) (2.20%). Also, lesser Tribal HHs diversify their livelihoods in terms of livelihood sources like fishery, driving, grocery store, pharmacy shop, etc (2.27%) compared to the non-Tribal HHs (7.35%). The Tribal Rubber growers also engage in different varieties of plantations like betel nuts, betel leaves and bamboos, unlike the non-Tribals some of whom grow betel nuts only in their residential plots. Out-migration for livelihood generation as such is not observed among these Tribal HHs, mostly reflected in their livelihood choices which are closer to their native places. However, except formal employment and small businesses, most of these livelihood sources are seasonal in nature and in many cases do not generate regular additional incomes to the ST as well as the non-ST HHs.

The landholding size under Rubber is lower for the STs (0.91 hectares) than their non-ST counterparts (1.58 hectares). However, the non-ST growers, despite having higher average Rubber landholding compared to the STs, are not benefited enough due to their much larger HHs size (8.02) compared to the STs (4.80). Interestingly, despite a meagre share of Tribal HHs practicing Rubber monoculture (2.65%) as against 28.67% non-Tribal HHs, Rubber is the only income source for 80.30% of the Tribal HHs, much higher than that of the non-Tribals (68.38%). Annual income from Rubber constitutes around 92.67% of annual total HH income of the Tribal growers, 8.4 percentage points higher than the non-Tribals. However, the Tribal HHs' annual earnings from Rubber (Rs. 1,53,543.30) is less than the non-Tribals HHs (Rs. 2,01,635.30).

HH characteristics	Community	
	Tribal (n=264)	Non-Tribal (n=136)
Community specifics (%)	Rabha (72.34) Bodo (20.45) Garo (7.19)	General (97.05) OBC (2.20) SC (0.73)
Religion (%)	Hindu (80.30)	Muslim (93.38)

	Christian (19.69)	Hindu (6.61)
Mean HH size	4.80	8.02
Female headed HH (%)	4.16	6.61
Mean age of plantation owners (years)	39.15	43.52
HHs with highest education (%)	Primary and less (2.65) Secondary (52.65) Higher secondary and above (44.69)	Primary and less (18.38) Secondary (63.97) Higher secondary and above (17.64)
HHs practising Rubber monoculture (%)	2.65	28.67
Rubber + poultry/livestock (%)	90.15	1.47
Rubber + paddy (%)	80.68	50
Rubber + betel nuts (%)	4.16	6.61
Rubber + betel leaves (%)	1.51	-
Rubber + bamboo (%)	1.13	-
Rubber + wage labour or tapping (%)	1.13	16.91
Rubber + formal employment (%)	1.51	2.20
Rubber + others (%)	2.27	7.35
Mean landholding under Rubber (hectare)	0.91	1.58
HHs earning from Rubber only (%)	80.30	68.38
Mean annual income from Rubber (Rs.)	1,53,543.30/-	2,01,635.30/-
Mean annual total HH income (Rs.)	1,65,685.50/-	2,39,248.50/-
Figures in parentheses represent percentage shares		
Source: field survey		

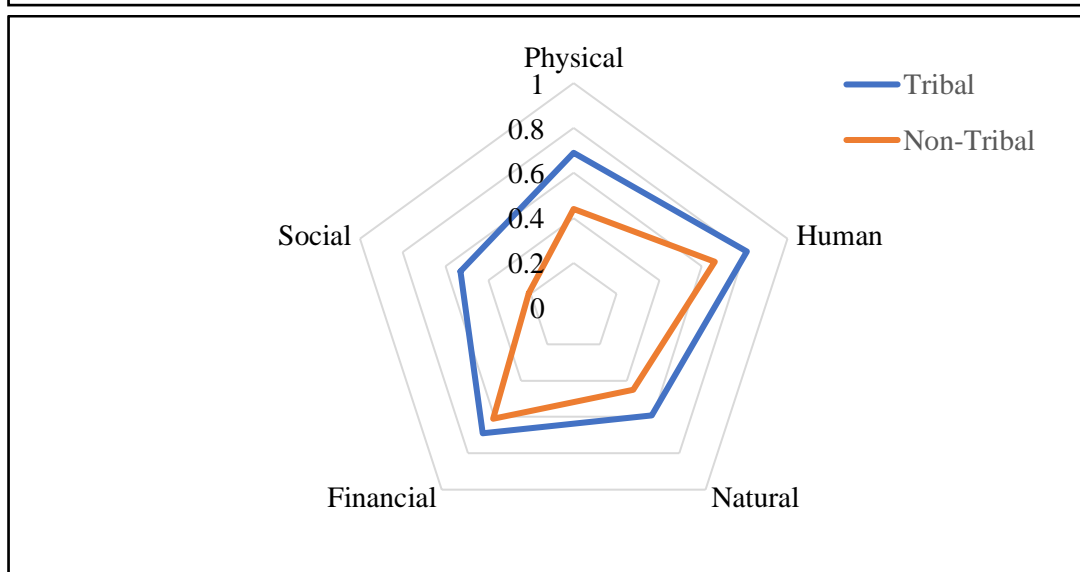
3.4.2.2 Livelihood assets status of the Tribal and non-Tribal Rubber growing HHs

The table 3-1 reflects the comparative status of the livelihood assets and their sub-components between the Tribal and non-Tribal Rubber growers;

Table 3-1: Index values of livelihood assets of Tribal vs. non-Tribal Rubber growers		
Assets & sub-components	Tribal	Non-Tribal
Physical	0.69 (1)	0.44 (2)
HH gadgets	0.78	0.46
House ownership	1	1
Ownership of Poultry & Livestock	0.90	0.01
Housing condition	0.55	0.47
Distance to market	0.75	0.44
Road condition	0.33	0.28
Vehicles	0.52	0.43
Human	0.81 (1)	0.66 (2)
HH size	0.81	0.83
Training	0.59	0.41
Type of labour	0.91	0.78
Education	0.85	0.74
Distance to hospital	0.66	0.44
Cost of healthcare	1	1
Source of drinking water	0.89	0.47
Natural	0.59 (2)	0.45 (2)
Land under Rubber	0.47	0.48
Tappable Rubber tree stock	0.43	0.50
Access to water for Rubber processing	0.89	0.39
Financial	0.69 (1)	0.61 (2)
Savings	0.51	0.38
Loan burden	0.92	0.91
Subsidy status	0.66	0.54
Social	0.53 (2)	0.21 (3)

RGS membership		0.53	0.23			
SHG membership		0.47	0			
Selling point		0.59	0.40			
SLI		0.66 (2)	0.47 (2)			
<u>Two sample T test</u>						
Ho³ : No difference between the Tribal and non-Tribal growers in terms of livelihood assets status						
Community	Observations	Mean	Std error	Std deviation	95% confidence interval	
Non-Tribal	23	0.503913	0.559882	0.26851	0.3878006	0.6200255
Tribal	23	0.696087	0.419568	0.2012176	0.6090739	0.7831
Combined	46	0.6	0.374398	0.2539291	0.5245924	0.6754076
difference		-0.1921739	0.0699646		-0.0001784	-0.0511694
t = -2.7467						
Pr(T > t) = 0.0087***						
Figures in parenthesis represent range and level of sustainability						
1 = (0.67-1) ≈ highly sustainable,						
2 = (0.34-0.66) ≈ moderately sustainable,						
3 = (0-0.33) ≈ unsustainable.						
Source: Author's calculation based on field survey data						

Chart 15: Livelihood assets polygons of Tribal and non-Tribal communities



The SLI values of the Tribal and non-Tribal Rubber growing community HHs reveal that the Tribals are richer than their counterparts in overall assets conditions with moderately sustainable SLI (0.66). Table 3-1 and chart 15 shows that Tribal communities are richest in human assets, followed by physical and financial assets (0.81, 0.69 and 0.69 respectively). On the contrary, social assets conditions are weakest for the Tribals among the five livelihood assets, although still better than the non-Tribal communities in consideration (0.53 and 0.21 respectively). In terms of inter-community comparisons, Tribal Rubber growing HHs are better endowed in all the five livelihood assets compared to the non-Tribal HHs as reflected by the higher values of the assets indices mentioned in table 3-1 as well as the higher lying vertices of the assets polygon of the Tribals in chart 15 than those of the non-Tribals. Highest inter-community differences are found in case of social and physical assets (0.32 and 0.25 points of difference respectively between Tribal and non-Tribal HHs).

Physical Assets Status: The physical assets status of the Tribal Rubber growers is better than that of their non-Tribal counterparts as reflected in the highly sustainable physical assets index of the Tribals (0.69) and moderately sustainable index of the same for the non-Tribals (0.44).

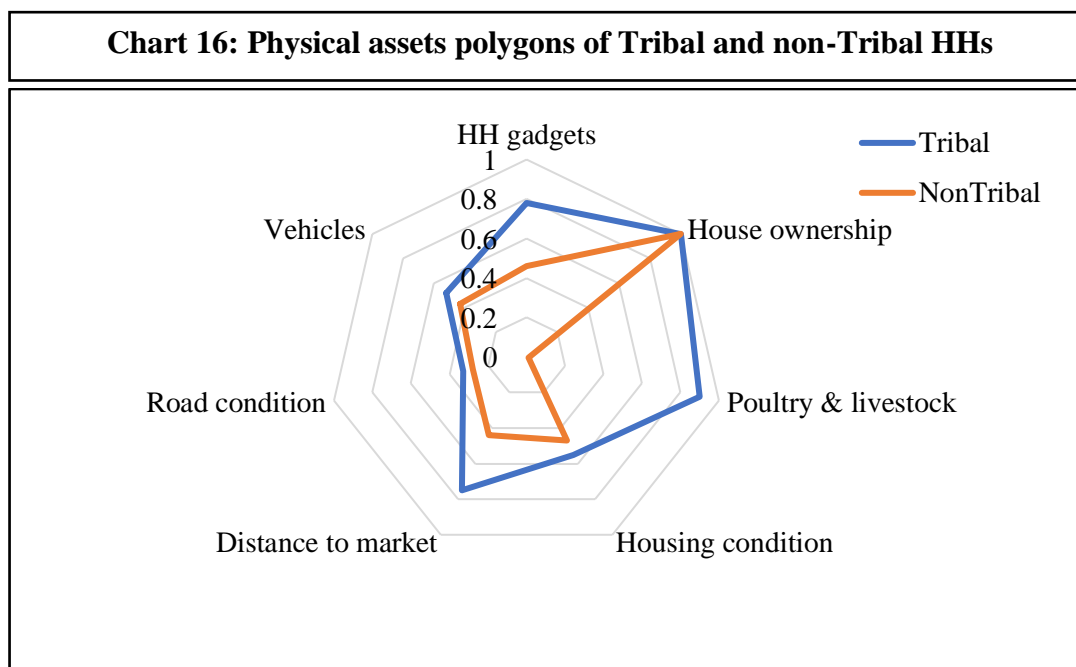


Chart 16 containing the asset polygons of the seven sub-components status under physical assets of the Tribal and non-Tribal Rubber growers and the sub-component index values of table 3-1 reveal that except house ownership, the Tribal Rubber HHs

are richer in terms of ownership of or access to all the six sub-components of physical assets. In terms of house ownership status, both communities are at par as all the growers have self or family-owned houses. The most striking difference is observed in terms of ownership of poultry and/or livestock between the two communities. While as high as 90.15% of Tribal HHs engage in livestock farming, only two non-Tribal HHs are found to own livestock. However, most of the Tribal HHs own poultry and/or livestock for self-consumption. Sale of livestock is observed only during credit crunch or any other emergency.

The Tribals are also rich in terms of HH gadgets (0.78) and distance to market (0.75). Around 32.95%, 50% and 17.04% Tribal Rubber growing HHs own four (TV, fan, mobile phone and hand pump), three and two gadgets, respectively. None of the HHs have reported owning less than two HH gadgets. Individually, 39.77% of Tribal Rubber HHs own TV. The shares of Tribal Rubber HHs owning mobile phone, hand pump and fan individually are 99.62%, 81.81% and 94.69% respectively. On the contrary, only three out of the 136 survey non-Tribal HHs have reported having all the four HH gadgets. Most of these HHs own only two gadgets (50.73%) and around 13.97% HHs own none.

In terms of distance to market, around 75.37% of the Tribal Rubber HHs stay within a 5 km radius from the local market, whereas, majority of the non-Tribal growers have reported staying more than 5 km away from the market (55.88%). However, in terms of road conditions, the ST Rubber growing HHs' conditions are no better than those of the non-STs (0.33 and 0.28 respectively). Only 11.74% ST grower HHs have access to bituminous roads connecting their houses and the local markets compared to 5.14% non-ST growers. The remaining larger share of the HHs have reported accessing markets through earthen roads.

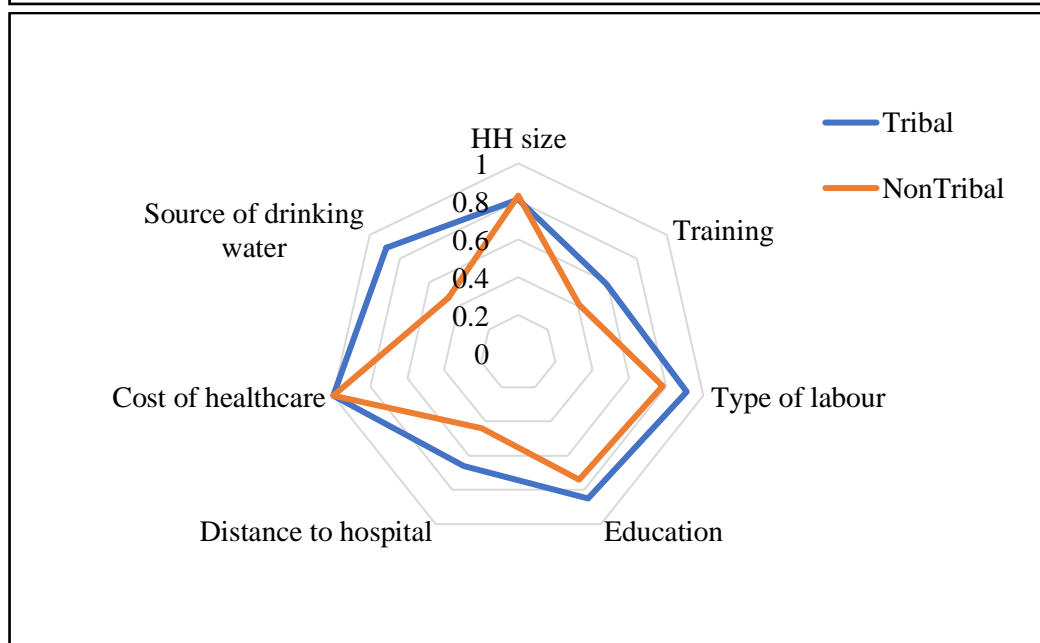
The housing conditions of the Tribals are better than the non-Tribals as most of the Tribal growers own semi-pucca houses (63.63%), with a few even owning pucca houses (2.27%). On the contrary, most of the non-Tribals own kutcha houses (55.14%), followed by semi-pucca houses (44.85%). None of the non-STs own pucca houses.

In the case of ownership of vehicles, though most of the Tribal and the non-Tribal growers own only one vehicle, i.e., bi-cycle, the proportion of HHs owning the same

is higher among the STs (83.71% as against 65.44%). However, a considerable share of Tribal HHs also own three vehicles (13.25%) as against a smaller 4.41% of non-ST growers. Unlike the non-Tribals, a meagre 0.37% of the Tribal HHs are even found to possess all the three vehicles.

Human Assets Status: The human assets/capital indices of table 3-1 show that the STs are better endowed in overall human assets than their non-ST counterparts, the former being highly sustainable (0.81 and 0.66 respectively). Moreover, the ST growers are richest in overall human assets status as reflected by the highest index value of the same compared to the other four assets. Table 3-1 and the chart 17 shows that in case of the individual sub-components, except cost of healthcare and HH size, the ST Rubber growers index values are higher than the non-ST growers suggesting better conditions of the Tribal growers in individual sub-components as well. While the STs are richest in terms of type of labour (0.91), followed by source of drinking water (0.89), the non-STs are best endowed in terms of HH size (0.83), followed by type of labour (0.78). Both the communities' growers are found to be poorest in training status, though in this case also the STs are in better condition than the non-STs (0.59 and 0.41 respectively).

Chart 17: Human assets polygons of Tribal and non-Tribal HHs



In the case of HH size sub-component, 51.13% ST Rubber growers have reported having HHs of size less than or equal to the community mean HH size (4.80) as against

64.70% of the non-STs (mean HH size 8.02). Around 43.93% ST HHs are of the sizes between 4.81 and 7.20 (between mean and 1.5 times mean) compared to 22.05% of their non-ST counterparts between 8.02 and 12.03 (between mean and 1.5 times mean). A small share of ST HHs are of sizes higher than 7.20, compared to 13.23% of the non-STs of sizes higher than 12.03. It is to be noted that due to almost half the mean HH size of the STs compared to the non-STs, as high as 96.59% of the ST Rubber HHs are less than the mean HH size of the non-STs, i.e., less than 8.02. Due to the lesser mean HH size of the STs, despite their slightly inferior HHsize index value compared to the non-STs, they are considered less burdened.

Around 59.84% of ST Rubber growing HHs have reported having at least one member in their HHs who have received training in Rubber tapping, plantation development and/or Rubber processing at least once, unlike the non-STs, among whom almost similar proportion of HHs remain untrained (58.08%).

Though Rubber growers from Tribal as well as non-Tribal communities mostly use family labour in tapping, plantation management and Rubber processing, the share of HHs for the same is much higher among the Tribals than their non-Tribal counterparts (86.36% and 67.64% respectively). A considerable high proportion of HHs among the non-STs are found to employ hired labour in their plantations (30.88%), unlike the STs whose share of HHs for the same is only 11.36%. The remaining HHs employ both family and hired labour for Rubber plantation related activities.

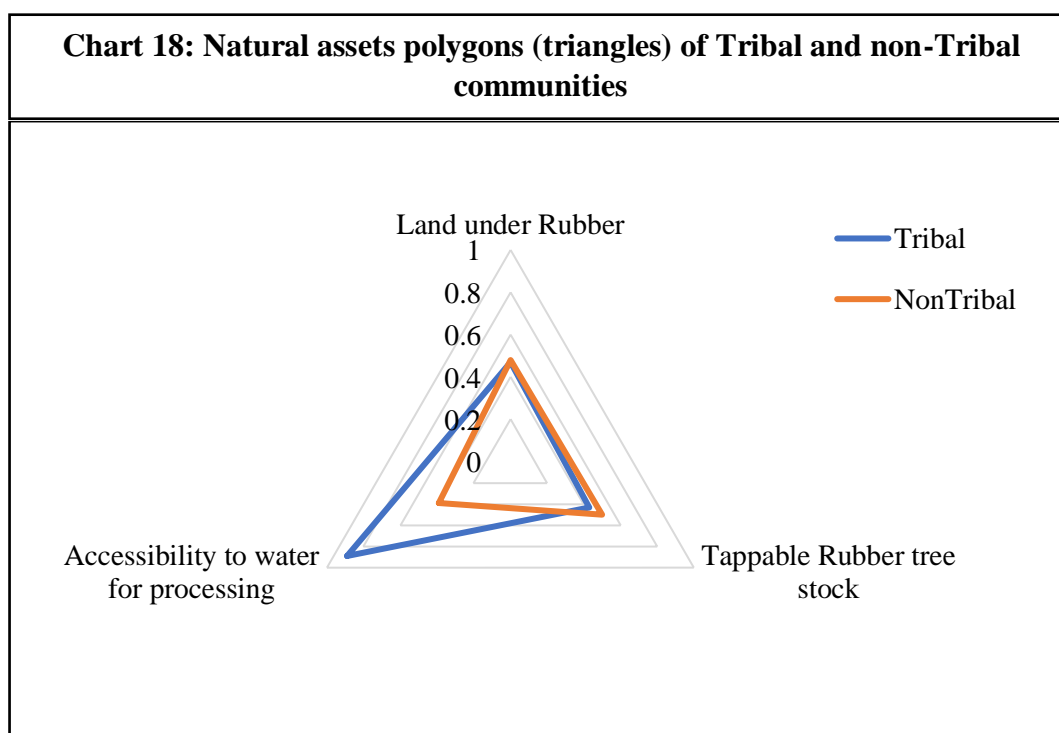
Most of the Tribal and non-Tribal HHs have a secondary level of education as the highest educational attainment in the respective communities' HHs, the share of HHs for the same among Tribal growers (52.65%) is lesser than those of the non-Tribals (63.97%). A considerably higher proportion of HHs among the Tribals have higher secondary and above level of education (44.69%), unlike the non-STs whose share for the same is much lesser at 17.64%. However, among the Tribal Rubber growers none of the HHs have illiterate members whereas, around 2.94% of the non-Tribal HHs have reported illiteracy.

Most of the Tribal HHs travel lesser for accessing primary health care services than their counterparts as around 66.28% of the Tribal HHs are situated within five km or less from local hospitals or health centres, whereas, around 55.88% non-ST HHs have

reported of requiring to travel more than five kms for accessing primary health care. All the Rubber growing HHs irrespective of ST and non-ST status have reported receiving free of cost primary health care services in local hospitals and/or health centres.

The Tribal Rubber growing HHs are better off compared to the non-Tribal HHs in terms of availability of drinking water as most of the Tribal Rubber growing HHs own hand pumps as the primary source of drinking water (81.43%), the rest depend on dug wells, ponds, river, canals, etc. located in their houses or in the vicinity. On the contrary, 74.26% of the non-ST HHs use dug wells for drinking water followed by only 10.29% of the HHs owning hand pumps as drinking water source. The rest few HHs use ponds, tube wells, rivers etc. as drinking water sources.

Natural Assets Status: Table 3-1 shows that the natural assets status of both the ST and non-ST Rubber growers are at moderately sustainable category, though the STs are better off compared to their counterparts (0.59 and 0.45 respectively). In the case of the individual sub-components, the Tribal HHs have much better access to water for Rubber processing than the non-Tribes (0.89 and 0.39 respectively). However, in terms of amount of land under Rubber and tappable Rubber tree stock, the Tribal HHs are less endowed compared to the non-Tribal HHs (refer chart 18).



Most of the Tribal HHs are land-resource deficient. Though almost similar share of Tribal and non-Tribal HHs have reported of having less than the respective communities' mean landholdings under Rubber (69.31% and 68.38% respectively), table 3-k shows that the non-Tribal HHs have higher mean landholding under Rubber (1.58 hectares) than the Tribal HHs (0.91 hectares). Hence, land-shortage problem is more acute among the ST Rubber HHs as only 23.86% of them have more than 1 hectare of land under Rubber compared to 57.35% of the non-STs for the same.

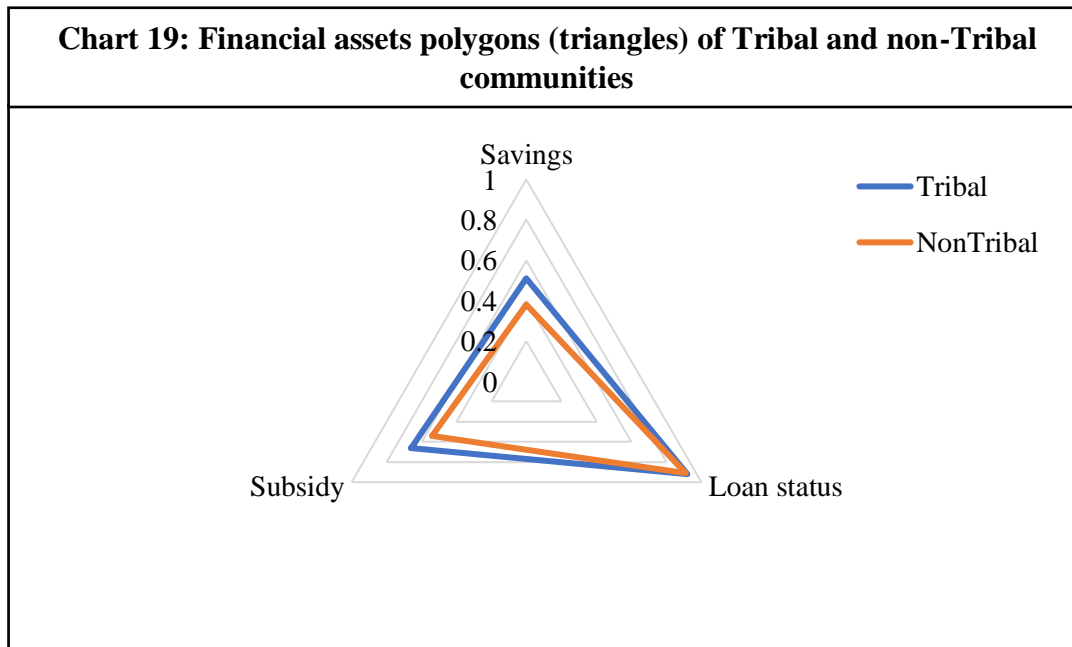
Directly related to land availability is possession of productive Rubber trees, i.e., tappable Rubber trees. Like the land under Rubber, in case of tappable Rubber tree stock also ST HHs have lesser mean tappable Rubber tree stock than their non-ST counterparts (352.04 and 466.35 respectively). Moreover, lesser share of the Tribal HHs (21.96%) have more tappable trees than its community mean tappable tree stock (352.04) compared to the non-Tribal HHs among whom 36.76% have possessions of more than 466 tappable Rubber trees, which is its communities mean tappable Rubber tree stock.

In terms of accessibility to water for Rubber processing, most of the Tribal Rubber growers (81.06%) have reported having very easy access to water for Rubber processing as they own hand pumps. On the contrary, as high as 94.85% non-Tribal HHs face difficulty in accessing water due to non-ownership of water source like hand pump and are forced to depend on dug wells, ponds, canals, which are mostly public resources and water availability is seasonal in nature.

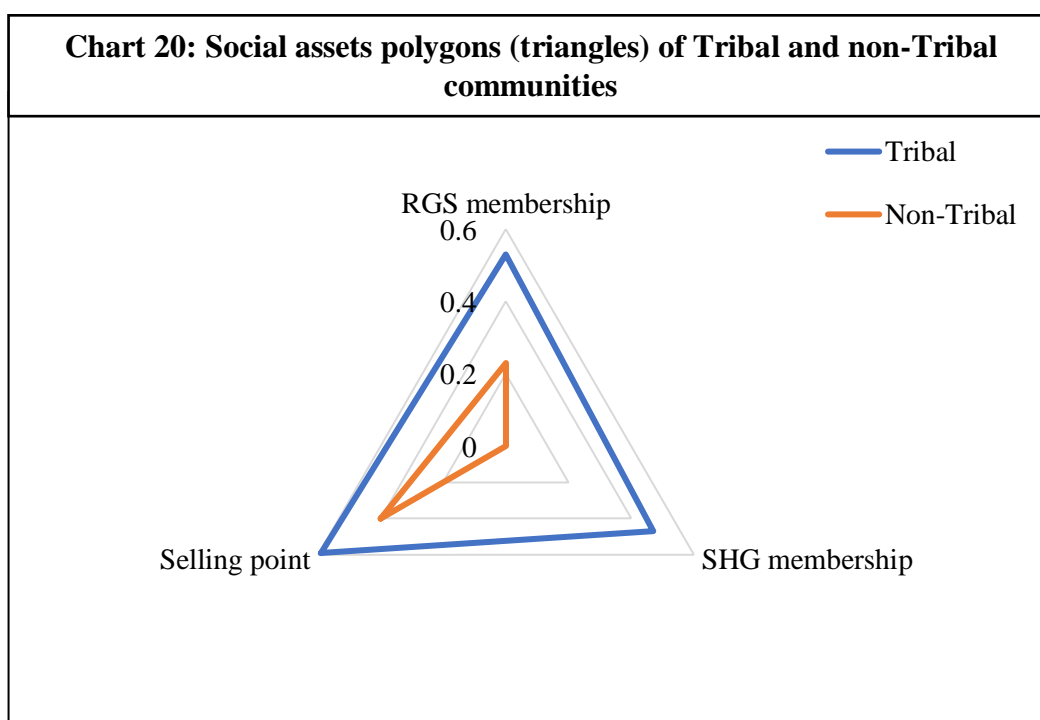
Financial assets status: Table 3-l shows that the overall financial assets status of the Tribal HHs in consideration is highly sustainable (0.69), and better than that of their non-Tribal counterparts (0.61).

In terms of individual sub-components, except loan burden status, in which case both the communities' difference is minute, the Tribal HHs are richer than the non-Tribal HHs in case of savings behaviour and subsidy status. Slightly more than half of the surveyed Tribal HHs (51.89%) have reported maintaining active savings accounts in commercial banks or post offices, the share being higher than that of non-Tribal HHs for the same (38.23%). In terms of outstanding loans, the conditions of the ST and the non-ST Rubber growing HHs are almost similar with 92.42% and 91.17% of the respective communities reported not having active loan burden till the survey

period. The remaining HHs have active loans taken for agricultural activities and building residences, etc mostly from Bandhan Bank and Gramin Bank. In case of subsidy also, more Tribal HHs have received the same from Rubber Board (66.66%) than the non-Tribals (54.41%).



Social assets status: Out of the five livelihood assets, the Tribal Rubber growers are the poorest in social assets, though their social assets conditions are much better than those of the non-Tribal growers (0.53 and 0.21 respectively).



In terms of individual sub-components also, the STs have better endowments compared to the non-STs. Around 53.03% ST Rubber growing HHs consist of at least one member who has membership in RGS. The share of the HHs among the non-STs for the same is almost half at 23.52%. Around 52.65% Tribal HHs are deprived of SHG memberships; though 100% of HHs have reported the same among the non-Tribals. 82.95% The STs have better marketplace conditions for selling the Rubber sheets as reflected by their higher index values for selling point sub-component (0.59) than the non-STs (0.40). Most Tribal HHs (82.95%) sell their Rubber produce through home collection by private dealers, as against 22.05% non-Tribal HHs. Around 4.92% of the ST HHs are found to sell their Rubber sheets in RGSs, unlike the non-STs none of whom sell sheets through RGSs. Remaining HHs of both the communities sell Rubber produce in local markets, the share of non-ST HHs being higher.

3.4.2.3 Two sample T test result

The t test result mentioned in table 3-1 shows that the differences in overall livelihood assets conditions, in individual asset status as well as in individual sub-components status between the Tribal and the non-Tribal Rubber HHs as discussed above are significant at $\alpha = 0.05$.

3.5 Discussion

3.5.1 On livelihood diversification and migration status of Tribal Rubber growing HHs of Assam

Most Tribal HHs earn solely from Rubber, though Rubber as a monoculture crop is grown by a small fraction of these HHs only. Despite many Tribal HHs being educated with higher secondary or above levels of degrees, they prefer not to venture out of their native places for work opportunity, instead wish to stay home and enjoy community living. Some seem to be satisfied with the settled way of living and the assured income brought by the plantations and do not bother about the risks associated with dependence on a single income source like crop failure, price fluctuations etc. Some of the educated Tribal growers have expressed interest in public sector jobs but failed to obtain so. Only two Rabha, one Garo and one Bodo Rubber growing HHs have reported having formally employment in their respective HHs, which is in the Indian Army. Attachment to settled, community living among the Tribal Rubber

growing groups is also reflected in their preference for growing other plantations along with Rubber, such as, betel leaves, betel nuts, bamboo, etc., paddy cultivation and livestock farming, all of which can be grown or managed in their neighbourhood. These HHs growing various plantation crops like betel nuts, betel leaves and bamboo earn consistent incomes every year. Some HHs are found being involved in small businesses like owning grocery stores, tea stalls, fishery, etc. which also support them financially round the year. Few Tribal Rubber growers also work as part-time tappers in others' Rubber plantations for additional income, though such HHs are very rare when compared to the non-STs. On the contrary, although most Tribal Rubber growers are found to engage in poultry and/or livestock farming and paddy cultivation, the share of them earning from these two sources are miniscule. Only 3.78% and 5.30% of ST HHs have reported selling livestock and paddy respectively in the market in the previous tapping season. Most HHs engage in livestock farming for domestic consumption and have sold it during economic distress or credit crunch only. On the other hand, the HHs sell paddy only if there is a surplus after domestic consumption. Therefore, neither livestock nor paddy can be considered consistent income sources for these HHs. However, the importance of livestock and paddy cannot be denied in their livelihood strategy because of their contribution in ensuring food security as well as serving as emergency backup sources of income.

Migration, whether internal or international, is a growing global occurrence. *FAO (2016)* states that the root causes of rural migration are food insecurity, lack of adequate employment and income generating avenues, poverty, inadequate access to social protection, climate change related adverse impacts on resources and livelihoods, etc. However, migration may not always be detrimental to the poor. Migration can be a livelihood strategy of the poor (*Mc Dowells and De Haan, 1997*). It can be undertaken by poor HHs as a source of higher-return employment than the ones available at the native place. Migration may also have various non-economic determinants including gender and caste (*Deshingkar and Start, 2003*). Between July, 2020 and June, 2021, all India migration rate was 28.9%, out of which rural migration rate stood at 26.5%. During the same period, around 67.10% male rural + urban migration was employment related, i.e., in search of new employment, to take up new/better employment, proximity to workplace, business, loss of employment, migration of parent/earning member of the family, etc., unlike the female rural + urban

migrants among whom 86.80% migration had been marriage-related (*Ministry of Statistics and Programme Implementation, 2022*). In case of the Tribal Rubber growers of Assam, out-migration is negligible. This may be due to the decent living conditions brought by Rubber plantations. Rubber has yielded settled agriculture-dependent livelihoods to these erstwhile nomadic shifting cultivators. Moreover, the general affinity of the Tribal communities to stay with their own people, at their native places has also contributed to non-adoption of migration as a livelihood strategy. The results of the current study show that a meagre 1.51% Tribal Rubber HHs have migrated members, due to their employment in Indian Army. Even higher education has not led to migration in search of better, formal employment on the part of these HHs. As discussed above, these HHs prefer growing plantation like betel nuts and leaves, bamboo, etc. along with Rubber at the vicinity of their houses, engage in livestock farming, do small businesses like fish selling, owning grocery and pharmacy shop, tapping in others' plantations, etc. all of which ensure non-displacement from their native places. Moreover, most of the Tribal Rubber growers also grow paddy primarily for HH consumption which ensures food security. With a few exceptions, these Rubber growers have self-owned productive lands and houses which also contribute to economic returns and settled living in their native places. All such livelihood strategies as well as better access or ownership status of livelihood assets of the ST Rubber growers reflect their reluctance for out-migration in Assam.

3.5.2 On livelihood assets status of Tribal Rubber growing HHs of Assam

In terms of the overall livelihood assets conditions, the Rabha Rubber growers are the richest, followed by Garo and Bodo growers respectively, though sub-component wise status or position of the three communities vary. However, the differences in the five livelihood assets and their sub-component status among the three Tribal groups are not statistically significant, which signifies almost similar asset endowments among these groups. In other words, the Tribal Rubber growing HHs, irrespective of their community differences have near identical livelihood assets conditions. Moreover, when livelihood assets conditions of the three Tribal groups combined are compared with those of the non-Tribal Rubber growers, the Tribals exhibit significantly better asset endowments than their non-Tribal counterparts.

3.5.2.1 Analysis of the human assets status:

In terms of individual livelihood assets, the Tribal HHs are most highly endowed in human assets. As the incidence of and vulnerability to poverty rise with family size (*Orbeta, 2005*), larger proportion of the ST Rubber growing HHs are less vulnerable compared to the non-ST HHs due to around half of the former community having HH size of less than four, unlike the non-STs, most of whom have HHs consisting more than seven members. Apart from HH size, the education status of the HH members also determines the quality of human capital. There is a strong positive correlation between education and economic development (*Stryzhak, 2020*), linear or nonlinear (*Marquez-Ramos and Mourelle, 2019*). More than 50% of the Tribal HHs' highest education is of secondary level and among the remaining HHs, more than 40% have higher secondary education as their highest. Moreover, none of the Tribal HH are illiterate. With education in the HHs, some of the young STs are found in formal employment, like army and school teaching. However, such lives, away from Tribal communal living are still few and far between. This may be partially attributed to fulfilment of their necessities and to an existing sense of satisfaction with the settled lifestyle brought by Rubber plantations. Tribal people prefer to live among their communities and do not look out for modern ways of living. This can be corroborated by their preference to involve in various other plantations like betel nuts, bamboo etc as well as poultry and livestock farming in the vicinity of their houses instead of doing formal public or private sector services in a faraway place despite being educationally eligible.

Skilled tapping is necessary for longevity of the Rubber trees and productivity enhancement on the part of the growers as well as of the trees. Since most of the Tribal Rubber growers use family labour in plantations, training for skill development relating to tapping and Rubber processing adds to their productivity and Rubber output. Although most HHs have undergone tapping and processing training from the Rubber Board, the percentage of untrained growers is nonetheless rather large, at about 40%. Given that most of these growers use family labour on their plantations, training is even more crucial. Using trained, family labour also saves labour cost relating to hiring of labour from outside. In the study region, labour hiring is done on contract basis for an entire tapping season in a year, payment terms of which are pre-determined in any of the following ways;

- 40/- per kg of latex produced per labour per day, or
- Rs. 200/- to Rs. 250/- as wage payment per day of tapping per person, or
- Crop sharing basis, i.e., 40% to 50% of the daily produced Rubber sheets given away to the labour(s) as wage payment.

Most of the ST HHs can access free public health services in the neighbourhood hospitals or health centres. However, the situation becomes unfavourable in case of serious illnesses or health emergencies as these local health centres and hospitals lack advanced infrastructure to treat critical illnesses like cancer, heart ailments, critical injury due to accident, etc. The health expenditures in such cases rise manifold, hampering the quality of human capital and financially distressing the HH.

Another good health related requirement is access to clean drinking water. The STs mostly depend on hand pumps for sourcing drinking water. Owning hand pumps ensure independent, regular access to clean drinking water without hassles of seasonal variations. Some of the HHs also use water from dug wells, ponds, canals, etc. which are less than ideal as drinking water sources due to being unprotected water sources, existing chances of contamination and risk of water-borne diseases, lack of ownership rights and seasonal water shortages. However, if table 3-b describing the various aspects of asset poverty of Assam in general are considered, higher proportion of Tribal Rubber growing HHs are basic drinking water-poor compared to the overall state population (18.57% of Tribal Rubber HHs collect drinking water from dug wells, ponds, canals, etc. as against 14.6% of general population of Assam), though their condition for the same is much better than the non-Tribal Rubber HHs.

3.5.2.2 Analysis of the physical assets status:

Physical assets are the second-best endowed assets for the Tribal Rubber growers of Assam, though some of the individual sub-components need improvement. In terms of housing conditions, most Rubber growers have semi-pucca houses almost at par with Assam's average (63.63% and 62.60% respectively). However, a considerably high proportion of ST Rubber HHs have kutcha houses either with bamboo walls and tin roofs or mud walls and tin roofs reflecting their poorer housing conditions than Assam's average population (34.10% and 2.90% respectively). Poorer housing conditions of these considerable chunks of the Tribal Rubber HHs make them vulnerable to natural calamities like floods and cyclones during summer and rainy

seasons. Another sub-component of physical assets vulnerable to Assam's climatic fury is road conditions. Most ST Rubber growing HHs use earthen roads for transporting Rubber inputs and outputs across plantations, their houses and the local markets. Every year the pre-monsoon cyclones and monsoon floods destroy these earthen roads, resulting in obstructions and higher transportation costs for accessing markets. However, these Rubber growers are still at an advantage due to most of their houses being located within 5 Km distance from local markets and thus easing the transport costs burden to some extent.

The ownership of HH durable goods is classified into two categories in the current study - ownership of HH appliances/gadgets and ownership of vehicles. The ST growers are richer in ownership of HH appliances than vehicles as can be derived from the higher value of their HH appliances index compared to that of their vehicles index (refer table 3-1). Most of the ST Rubber HHs own at least three of the four listed HH appliances (TV, fan, mobile phone and hand pump). Around 60.23%, 18.19%, 5.31% and 0.38% Tribal Rubber growing HHs have reported not owning TV, hand pump, fan and mobile phones respectively. Except TV, the Tribal HHs' asset poverty status in terms of HH gadgets is less than average Assam population (refer table 3-b). In the case of vehicles, more than half of the ST Rubber growing HHs own bicycles (57.57%). Owning a bicycle instead of cars or bikes seems reasonable due to its lower price and negligible maintenance cost compared to the others. A considerable share of HHs also own motor bikes (50.75%). However, car ownership is minimal with only 3.03% of the Tribal HHs owning the same. Motorbikes are owned by more Tribal Rubber HHs than the average population as well as non-Tribal Rubber growers, whereas, bi-cycles and car ownership status of the former is better than non-Tribal growers but worse than the average population. In this regard it is to be mentioned that the STs mostly sell their produce to private dealers through home collection. Therefore, they hardly need worry about arranging for large transport vehicles for delivery of Rubber sheets to markets.

Poultry and livestock farming has the potential to be a reliable source of livelihood to rural HHs. Most Tribal Rubber HHs of Assam are found to own poultry and/or livestock unlike their non-Tribal counterparts. However, the purpose of livestock rearing among these people is mainly domestic consumption. Sale of livestock happens only to meet emergency credit crunch and finance economic distress.

Therefore, despite being practiced by many Tribal HHs, livestock farming is not a persistent income source to these HHs.

3.5.2.3 Analysis of the natural assets status:

Even though the ST Rubber growers have overall better access to or ownership of natural assets than the non-ST growers as reflected in their respective asset index values (0.59 and 0.45 respectively), the Tribals' natural assets conditions are worse than other assets except the social one. Contrary to the popular belief of rich natural capital endowments of Tribal population, natural capital is not in abundance for the Tribal Rubber growing HHs in Assam. The ST Rubber growing HHs have average Rubber landholdings of size 0.91 hectares, which is lesser than the non-ST Rubber HHs (1.58 hectares) as well as that of Assam's total population (1.09 hectares) and Tribal population (1.40 hectares) (*Ministry of Agriculture and Farmers Welfare, 2020*). Thus, land resource scarcity is prevalent among the ST Rubber growers.

Interestingly, the mean ST HH size is close to half of the non-ST HH size. Thus, the STs have more Rubber land per capita than their non-ST counterparts. Moreover, unlike the non-STs, due to smaller HH size, surplus labour in Rubber plantation is non-existent among the Tribal growers which ensure higher labour productivity on their part.

Though most Tribal HHs have secured land ownership rights obtained through *land patta* (a legal document issued by Government in the name of the owner of a plot of land), in case of comparatively newer plantations, especially in Kokrajhar district, some of the ST Rubber growers have developed Rubber plantations on encroached forest land. This has resulted in disputes over land ownership with the State Forest Department resulting in non-receipt of subsidy and other monetary benefits from Rubber Board.

Closely related to the issue of land constraints is having inadequate tappable Rubber tree stock. The non-Tribal growers have larger stock of tappable Rubber trees compared to the STs. As high as around 78.40% ST HHs have 375 or less tappable Rubber trees [considering tree density of 375 per hectare (*Gent, 2020*)] which justify their smaller mean Rubber holdings than their non-ST counterparts. Many HHs have reported damage of Rubber trees due to pest attacks and seasonal cyclones. Some of

the Rubber growers, especially in Kokrajhar district have grown big trees like Gamari, Sal and teak, bamboo bushes, etc. in the periphery of the Rubber plantations to protect their plantation from the fury of pre-monsoon cyclones.

The access to water for Rubber processing is comparatively easier for the Tribal Rubber growers, especially in Goalpara district, than the non-Tribal growers. Most of the Tribal HHs here collect water using self-owned hand pumps, thereby lessening problems related to ownership issues and seasonal dryness. However, though smaller in number than the non-STs, some ST growers of Kokrajhar district also depend on dug wells and other sources like ponds, canals, rivers etc. which make the process of accessing water for plantations and latex processing tiresome due to higher distance between water source and plantations/houses, seasonal water shortages and ownership issues etc.

3.5.2.4 Analysis of the financial assets status:

Financial assets along with physical assets are of satisfactory status in case of the ST growers, though further improvements in savings habit and uninterrupted disbursement of subsidy from Rubber Board are expected for more efficient financial capital mobilisation. Around 48% of the ST growers do not maintain active savings accounts, which is strikingly higher than Assam's overall population (refer table 3-b). Also, the subsidy on new planting and replanting of Rubber trees by the Rubber Board is disbursed only through e-transfers to the grower's bank account (*Rubber Board, 2020*). Hence, such a large proportion of HHs cannot access subsidy benefits due to non-existing bank accounts. Moreover, lack of savings also restricts their scope for investment in additional livelihood sources. The HHs' may even find it difficult to meet emergency credit demands without adequate savings.

During 2017-18 to 2019-20, the Rubber Board has approved of paying financial assistance of Rs. 35,000/- per hectare up to two hectares for new planting and replanting subject to the upper ceiling of owning not more than five hectares of Rubber land in NER. In addition to that, growers are entitled for reimbursement of cost of polybagged /root trainer plants of advanced growth at the rate of Rs. 10/- per plant limited to 500 plants per hectare (*Rubber Board, 2020*) (refer table 3-m). Thus, most ST Rubber growers should be entitled for subsidy in Assam due to their small Rubber holding sizes (mean size being 0.91 hectare). However, the field survey reveals that

around 33.34% of Tribal HHs have not received a single instalment of financial assistance from the Board. One of the reasons for non-receipt of subsidy by these Rubber growers is non-existing savings accounts as mentioned earlier. The other reason is found to be related to absence of adequate land documents with the growers, especially in the district of Kokrajhar. Many of the growers do not possess *land patta* and are found to grow Rubber on lands which are under legal ownership of the State Forest department. Due to such disputes on land ownership these Rubber growers' applications for subsidy are mostly rejected by the Rubber Board.

Table 3-m: Schedule of payment of financial assistance for both new planting and replanting in NER during 2017-18 to 2019-20			
Year	Planting subsidy (Rs. Per hectare)	Reimbursement of cost of polybagged/Root trainer Plants (Rs. Per hectare)	Total (Rs. Per hectare)
1 st	0	0	0
2 nd	15,000	5000	20,000
3 rd	10,000	0	10,000
4 th	10,000	0	10,000
Total (Rs.)	35,000	5000	40,000
Source: Rubber Board, 2020			

Both the STs and the non-STs largely are free from loan burdens, though on average the ST growers are slightly better off. Most ST HHs with active loans have reported taking loans under Kisan Credit Card (KCC) scheme from Bandhan Bank and various public sector banks like State Bank of India, Union Bank of India, Central Bank of India etc. Considering the inaccessibility of subsidy benefits, they have inclined towards accessing KCC loans for meeting their credit requirements for plantation development, other agricultural activities as well as for housing development.

3.5.2.5 Analysis of the social assets status:

Possession of rich social capital benefits communities in several ways, such as, by reducing transaction costs of working together, enhancing cooperation, developing confidence to invest in collective activities as they know that others will also do so,

lessening degradation of resources due to avoidance of unrestrained private actions, etc. (Pretty, 2003). Unfortunately, social assets status has been the least favourable of the Tribal growers' five livelihood assets, nonetheless it is still superior to their non-Tribal counterparts, mostly due to the inefficient activity status of the RGSs and the SHGs. The RGSs act as co-operatives. These institutions can benefit their member growers through assistance and training on planting, replanting, maintenance, facilities of group processing and marketing, enhancement of their collective bargaining power to be able to charge better prices for the Rubber products, arrangement of funds and loans, etc. (Balakrishnan et al., 2018; Hameedu, 2014). Thus, RGSs can play a huge role in enhancing the social capital of the member growers. Currently there are 200 RGSs in Assam (Singh et al., 2021). However, many of these RGSs exist only on paper. Though the Tribal Rubber growing HHs have reported higher number of memberships in RGSs than their non-Tribal counterparts, the RGSs are either inactive or inefficient. This can be verified from the finding that Tribal HHs mostly sell their Rubber sheets to private dealers through home collection, followed by selling in local markets. Only 4.92% Tribal growers in Kokrajhar district sell their produce to RGSs.

The case with SHGs is no different than RGSs. SHGs among the Rubber HHs are formed with the female members of these HHs, the objective being mobilisation of funds which are maintained through deposits/investments of the members for the purpose of developing piggery, poultry, animal husbandry, etc. However, these organizations merely exist on paper and do not actively work for the wellbeing of its participants. In Kokrajhar district, most of the SHGs have been formed recently and lack guidance and direction required for efficient functioning and hence fail to serve any economic or other benefits to its members so far.

In terms of arranging for marketplace for sale of Rubber sheets, the Tribal Rubber growers have been exhibiting better networking and connectedness among themselves compared to the non-STs as is reflected in higher number of the ST HHs being able to sell their produce to the private dealers through home collection or through RGSs. The ones who sell Rubber sheets through RGSs can enjoy common marketing facilities as well as lesser price volatility due to prices being uniformly fixed by the RGSs than the other two selling points. However, the share of HHs being able to sell Rubber sheets in RGSs is meagre (4.92%). Home collection of Rubber sheets by private dealers is

the next best marketplace as the growers practically are free from any transportation cost.

3.5.3 Comparison with Tripura Rubber growers' conditions

From the discussions on the Rubber plantation sector and Rubber growers of Tripura in chapter 2: Review of Literature and the discussions on the Tribal Rubber growers' livelihood assets conditions of Assam in the current chapter, a comparative status of the Rubber growers of the two states can be undertaken, such as;

3.5.3.1 Role of state-led agencies:

Rubber plantation-led Tribal rehabilitation has been initiated by the state government agencies TFDPC and TRPC in Tripura. Later, Rubber Board contributed to Tribal development through block plantation schemes (BPS) and subsequently had encouraged private plantation development. Except state-owned large Rubber estates, TFDPC grows Rubber in government land while TRPC does so in private land. However, irrespective of initial land ownership status, HHs under their Rubber development projects work as wage labour in these plantations during the immature phase and receive usufructuary rights of the plantations once matured (*Viswanathan and Bhowmik, 2014*). As such, clear demarcation of land ownership rights and usufructuary rights on the part of the Rubber growers are made and the growers do not face land ownership related legal difficulties in Tripura. On the contrary, most Tribal HHs in Assam grow Rubber in private land whose land ownership rights are secured through possession of *land patta*. A few exceptions exist in which case plantations are grown in forest land. In such cases, the HHs in absence of legal land rights, fail to avail subsidy benefits from the Rubber Board.

State government-led agencies like TFDPC and TRPC have significant contributions in Rubber-based Tribal rehabilitation in Tripura. Later, BPS of Rubber Board has benefited a lot of Rubber-dependent families in the state. TFDPC and TRPC together have benefitted more than 10,000 Rubber growing families (3200 and 7285 families respectively) (*Viswanathan and Bhowmik, 2014*). These institutions do the initial hand-holding of the Rubber growers in the form of round-the-year employment in the plantations as wage labour, financial support, training, supplying seeds, fertilizers, etc. Post maturity of the plantations, these institutions provide the growers access to processing centres to process the latex into sheets, dry them in smoke houses

and sell them to these agencies at fixed prices (*Viswanathan and Bhowmik, 2014*). The BPS has also contributed in the growers' socio-economic upliftment through establishment of nursery schools and health camps, provision of better roads, improved housing, cleaner fuel, establishing group processing units for Rubber processing, encouraging female members of Rubber growing HHs to develop livelihood generation skills through SHG membership, establishing functional RGSs to provide stable marketplace for sale of Rubber, etc. (*Mohapatra, 2022*). However, such active contribution from the state government is not observed in the case of Assam's Rubber-based settlements. As identified by *Viswanathan and Bhowmik (2014)*, unlike TFDPC and TRPC in Tripura, Assam does not have state-led prominent Rubber development agencies. Rubber Board is the only major institution in the state looking after the Rubber plantation development as well as Rubber plantation-based livelihood development. In the absence of direct state agency, there is no intervening force between the growers and the Board to provide financial support as well as highlight the state-specific development needs of the growers to the Board. Without prompt state intervention, in the case of implementation of assistance-based planting and/or re-planting schemes which are applicable to all the North-Eastern states (*Rubber Board, 2020*), Rubber Board's initiatives are found to be rather limited in Assam. Unlike in Tripura, block plantations are non-existent in the state. As mentioned earlier, a considerable proportion of the Rubber growing HHs of Assam are found to be untrained and without financial as well as advisory support from the Board. The state has 200 RGSs, slightly lesser in number than Tripura (*Singh et al., 2021*). However, the activity status of most of these RGSs in Assam are less than satisfactory. Very few Tribal Rubber growers have reported selling Rubber sheets through RGSs. Without active RGSs, the Rubber growers are also deprived of supply of seeds, fertilizer, rain guarding polybags, etc. at subsidised rates, access to group Rubber processing and marketing facility and face market price volatility due to absence of fixed selling price of Rubber set by RGSs. Non-performance on the part of the RGSs in the state also inhibits the growth of SHGs, skilling the growers in intercropping or other subsidiary income generating sources, etc. among others.

3.5.3.2 Status of income from Rubber:

In terms of HH incomes, Tripura's Rubber growers are slightly well off compared to their counterparts in Assam. However, the income differences between the growers of

the two states are trivial. According to *Nath et al. (2013)*, average monthly income of Tripura's Rubber growing HHs is US\$ 366 which is equivalent to Rs.27,131.58/- according to the 2020 exchange rate (<https://www.exchangerates.org.uk/>). *Deb et al. (2019)* have estimated the average monthly income of the Rubber growers belonging to Kuki Tribe in Tripura to be Rs.16,373.33/- for the year 2017. The current study measures the average annual HH income of the Tribal Rubber growers in Assam to be Rs.1,65,685.50/- for the year 2020. Hence, the monthly Rubber income in Assam stands at Rs.13,807.12/-, which is less than that in Tripura as estimated by the mentioned studies. On the contrary, in the case of income from Rubber only, *Mohanakumar (2014)* has observed gross annual income from Rubber plantation for Tripura growers to be Rs.2,55,990/- in the year 2011. The monthly gross income from Rubber in this case stood at Rs.21,332.50/-. Another study, *Chaudhury et al. (2023)* has argued that the monthly income from Rubber among the Rubber growing HHs of Tripura mostly varies between Rs.10,000/- and Rs.20,000/-. Comparatively, the Tribal Rubber growers of Assam earn slightly less or are closer to the lower boundary of the income range observed in Tripura by the mentioned studies (annual income from Rubber in the current study is Rs.1,53,543.30/-, i.e., the monthly income from Rubber is Rs.12,795.27/-).

3.5.3.3 Comparative livelihood assets status:

Several studies have explored Tripura Rubber grower's livelihood assets status and livelihood conditions so far (*Viswanathan, 2008a; Nath et al., 2013; Kuki et al., 2018; Ray, 2020; Mohapatra, 2022, etc.*). Each of these studies claim differential status of the five livelihood assets. *Viswanathan (2008a)* has ranked the natural assets of Tripura's growers at the top while financial assets are ranked at the lowest. On the contrary, *Mohapatra (2022)* has argued that the Rubber growers of Tripura are poorest in terms of natural assets endowment and well-endowed in physical, human and social assets. *Kuki et al. (2018)* has distinguished Tribal Rubber stakeholders of Tripura into Rubber farmers (plantation owners) and Rubber labourers (wage labour in plantations). According to this study, the farmers are better endowed in natural, physical and financial assets, while the labourers are better equipped in social and human assets. Thus, discrepancies are observed in the outcomes of the research works on Tripura Rubber growers' livelihood assets status. Moreover, the composition of sub-components under each of the five livelihood assets are also different across

different scholarly work, for e.g., *Viswanathan (2008a)* has incorporated Rubber area, quality of land and access to safe drinking water as the sub-components of natural assets whereas, *Nath et al. (2013)* consider Rubber land, land excluding Rubber, plantation condition and species composition as the sub-components under natural assets. Hence, the current section considers comparative status of the individual sub-component conditions of the Rubber growers of the states of Tripura and Assam based on various previous scholarly works on Tripura and the current research done on Assam.

Comparative status of physical assets: When compared between the Tribal Rubber growers of Assam and growers of Tripura, the former is better performing in housing condition and vehicle ownership status while lagging in commercialisation of livestock farming.

The housing conditions of the Tribal Rubber growing HHs of Assam are better than that among the Rubber growers of Tripura. Most of Assam's Tribal growers own semi-pucca houses, some even own pucca houses. On the contrary, in Tripura, housings of most of the Rubber growers are of kutchha type (tin house or mud house) (*Viswanathan, 2008a; Nath et al., 2013*) which are far inferior in quality than their counterparts in Assam.

Unlike Assam, Rubber growers of Tripura have commercialised livestock farming. Rubber + Livestock is found to be the most viable integrated farm-livelihood system among the Rubber HHs of Tripura (*Viswanathan, 2008a*). *Nath et al. (2013)* claims that livestock rearing generates incomes to around 54% Rubber HHs in Tripura. On the contrary, livestock farming by the Tribal Rubber growers in Assam mostly serves domestic consumption purposes. They have not yet commercialised livestock farming as such. Livestock is sold in the market only to meet emergency credit demands in the HHs among the Tribal growers of Assam.

In terms of possession of HH gadgets and vehicle ownership, among the Rubber tappers under TFDPC's large estates, 65.08% own mobile phones (*Bhowmik and Chouhan, 2013*). Both *Ray (2020)* and *Chaudhury et al. (2023)* claim that most Rubber HHs in Tripura collect water from tube wells. *Nath et al. (2013)* has estimated that among the participants of TFDPC's rehabilitation-based Rubber development projects, 83% own TV, 79% own bicycle, 13% motor bike and none of them owns a

car. *Chaudhury et al. (2023)* has also estimated the vehicle ownership status of Tripura growers with 71.66% and 20% owning bi-cycles and motorbikes respectively and none owning a car. Quite similarly, most Tribal growers of Assam also possess bi-cycles as the primary mode of transportation. However, unlike those in Tripura, the proportion of the Rubber growers owning motor bikes and cars are higher in Assam, suggesting better vehicle ownership status among the later. In case of HH gadgets, almost all the Tribal Rubber HHs in Assam own mobile phones unlike in Tripura, but their possession status of TV is much lower compared to those in Tripura. Also, unlike Tripura, Assam's Tribal Rubber HHs mostly have hand pumps in their houses as a source of drinking water. Possession of both mobile phone and hand pump by a HH may be regarded as more productive and essential than owning a TV. Thus, Assam's growers outperform their counterparts in Tripura in terms of HH gadgets.

Comparative human assets status: Tribal Rubber growers in Assam are better endowed in terms of smaller HH size, higher educational attainments and cleaner access to drinking water and are almost of similar status in terms of type of labour employed in plantations and access to health care facilities when compared to their counterparts in Tripura. On the contrary, the Assam Tribal Rubber HHs lag in access to training for plantation management.

Mean HH size of the Rubber growers in Tripura is reported to be 5.92 by *Viswanathan (2008a)*. *Chaudhury et al. (2023)* also claims that most of these growers have HH sizes between 5 and 6. The Tribal Rubber growers in Assam with mean HH size of 4.80 thus face lower economic burden of large family compared to their counterparts in Tripura. In terms of educational attainments of Rubber HHs also, Assam is ahead of Tripura due higher proportion of Tribal Rubber HHs having secondary education and above, unlike their counterparts in Tripura among whom only 15% and 11% have primary and secondary levels of education respectively and none have attained higher than secondary level of education (*Nath et al., 2013*).

As observed among the Tribal Rubber growing HHs of Assam, most Rubber growers in Tripura also employ family labour in plantations (*Bhowmik and Viswanathan, 2015; Mohapatra, 2022*). However, instances of employing hired labour in Rubber plantation related activities are on the rise in Tripura (*Bhowmik and Viswanathan, 2015*). Tripura Rubber growers are in a much better state in terms of receiving training

on plantation related activities. According to *Nath et al. (2013)*, 100% Rubber growers under TFDPC are trained in plantation management. *Mohapatra (2022)* claims that 50% of the tappers (including self-growers and tappers) are given training on tapping, 34% are given all types of training including tapping and sheet making, 10% have received training for tapping and sheet collection and the remaining six percent on sheet making. On the contrary, in Assam, the proportion of Tribal Rubber growing HHs receiving training for the same stands at 59.84%. Also, unlike in Assam where Rubber Board provides trainings to the growers, since Rubber-based rehabilitation is promoted by different state-led agencies along with the Rubber Board in Tripura, trainings are organised by TFPDC, TRPC, Rubber Board as well as through private initiatives in the state (*Chouhan et al., 2019*).

In terms of access to health care facilities, Rubber growers of both the states are at par. Most Rubber HHs have reported receiving health care services in primary health centres or local hospitals in Assam as well as in Tripura (*Ray, 2020; Chaudhury et al., 2023*). However, Assam's Tribal growers have better access to clean drinking water than their counterparts in Tripura. Most Tribal Rubber HHs in Assam collect drinking water through self-owned hand pumps, unlike in Tripura, where most growers have to depend on tube wells for the same (*Ray, 2020; Chaudhury et al., 2023*).

Comparative natural assets status: Overall natural assets status of Assam's Tribal Rubber growers is worse than that of Tripura due to smaller Rubber holdings and lesser tappable Rubber tree stock of the former. On average, Rubber holdings of Tribal Rubber growers of Assam are of size 0.91 hectare. On the other hand, according to *Viswanathan (2008a) and Nath et al. (2013)*, average Rubber holding sizes among Tripura growers are 1.81 hectare and 1.1 hectare respectively. Similarly, Assam lags in terms of HH tappable Rubber tree stock. According to current study, average tappable tree stock available with the Tribal Rubber HHs in Assam is 352 while both *Viswanathan (2008a)* and *Nath et al. (2013)* have estimated the tappable tree stock of the Tripura growers to be higher (367 and 401 respectively).

Comparative financial assets status: Financial assets conditions of Tripura Rubber growers are better than those in Assam mostly due to lower savings and limited access to financial assistance. *Ray (2020)* claims that 74.66% Rubber growers in Tripura have savings accounts in banks or post offices. According to *Chaudhury et al. (2023)*, the

share for the same is slightly higher at 80%. Assam's Tribal Rubber HHs fall behind those of Tripura as the share of HHs holding savings account in the former case is 51.89%. However, in terms of loan burden, Assam's Tribal Rubber growers are in a better position as 92.42% of them have no debt burden while according to *Chaudhury et al. (2023)*, the share of Rubber growers with no debt in Tripura stands at 78.83%.

Unlike in the case of Assam where the Rubber growers get subsidy from Rubber Board, Tripura's growers have multiple sources of financial assistance, such as, TFDPC, TRPC, Rubber Board, etc. Moreover, the share of HHs receiving subsidy is also higher in Tripura compared to that in Assam (*Chaudhury et al., 2023*).

Comparative social assets status: Assam's Tribal Rubber HHs are poorer in social capital mostly due to existence of inefficiently functioning RGSs. On the other hand, more active presence of RGSs and SHGs are observed among Tripura Rubber growers. Involvement in rubber plantations has facilitated social capital formation among the Rubber growers in Tripura. Under TFDPC's Rubber-based development schemes, participants form beneficiary committees and SHGs which involve plantation management, maintaining seedling nursery, saving money and providing low-cost interest to the growers (*Nath et al., 2013*). RGSs are also active as a marketplace facilitating selling of Rubber sheets or field latex in Tripura. *Mohapatra (2022)* claims that around 53% of Rubber HHs in Tripura sell Rubber end-products to RGSs, while only 4.92% of the Tribal Rubber HHs in Assam have sold Rubber sheets to RGSs in 2020. Thus, the role of RGSs is more prominent in improving the social capital of the Rubber growers in Tripura than observed in Assam.

Table 3-n summarises the comparative livelihood assets status of the Tribal Rubber growing HHs of Assam and Tripura based on the above discussion on individual sub-components. The table shows that the Tribal Rubber growers of Assam have better access to physical and human assets while their natural, financial and social assets status may be considered worse than their counterparts in Tripura. However, before arriving at a conclusion, it is to be kept in mind that while the overall trends of livelihood assets may remain unchanged, the studies have been conducted over different timelines, with different samples and varied objectives. Hence, it is to be noted that, while the comparative analysis of livelihood assets status of Rubber

growers between the two states may be relevant, the degree of variations as well as the factors influencing these variations may be different for the two states in consideration.

Table 3-n: Better performing Rubber growing state in HH livelihood assets			
Livelihood asset	Sub-component	Name of better performing state in sub-component category	Name of better performing state in asset category
Physical	HH gadgets	Assam	Assam
	Housing condition	Assam	
	Livestock status	Tripura	
	Vehicles	Assam	
Human	HH size	Assam	Assam
	Education	Assam	
	Labour type	Almost similar	
	Training status	Tripura	
	Drinking water source	Assam	
Natural	Rubber holding size	Tripura	Tripura
	Tappable tree stock	Tripura	
Financial	Savings habit	Tripura	Tripura
	Loan burden burden	Assam	
	Subsidy status	Tripura	
Social	RGS status	Tripura	Tripura
	SHG status	Tripura	
	Selling point	Tripura	

CHAPTER 4: INCOME, POVERTY AND LIVELIHOOD ASSETS OF RUBBER GROWERS OF ASSAM

4.1 Introduction

The present chapter investigates the income and poverty status of Rubber growing HHs of Assam along with the influence of their livelihood assets on HH poverty. The chapter has six broad sections. The current introduction section describes the chapter layout. The second section puts forth a brief note on the connections between income, poverty, and livelihood assets. Section 4.3 gives a brief idea about the current poverty related data of Assam. Section 4.4 lays out the methodology used to determine HH income, and HH poverty of the Rubber growers of Assam and explores the role of the sub-components of the five livelihood assets in determining HH poverty status. Section 4.5 describes the results of the study and the chapter ends in section 4.6 with a discussion of the ST growers' poverty status and their livelihood assets conditions based on the results obtained in section.

4.2 HH income, poverty and livelihood assets

Income is often considered as an important variable in the discussions concerning poverty, inequality, and economic growth, both at macro and micro levels (*Perotti, 1996; De Janvry et al., 2005; Skare et al., 2014*). At individual or HH level, income may be defined as the flow of economic resources received by the individual or HH over time which includes wages, salaries, money earned from self-employment, property, pension and social transfers (*OECD, 2013*). Along with reduced vulnerability, increased wellbeing, more sustainable use of the natural resource base and more food security, the ability to generate more income by an economic entity is also a desired livelihood outcome (*DFID, 1999*).

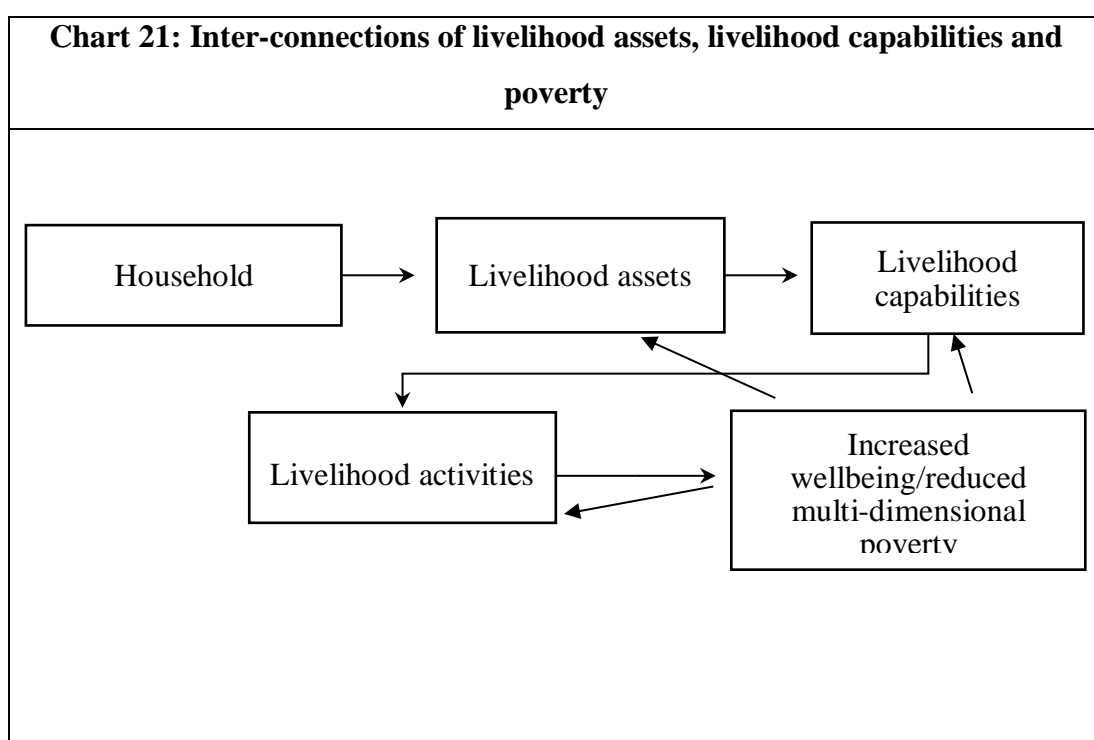
In absolute terms, poverty is defined as a state in which an individual or a HH is below subsistence level of consumption needs. Various international as well as

national organisations and committees have defined poverty lines based on HH calorie needs or individual consumption expenditures over the years to assess absolute poverty. Dr.Y.K Alagh led Task Force on “Projections of Minimum Needs and Effective Consumption Demand” (1979) defined poverty line based on the ability of an individual to earn enough to consume 2100 calories and 2400 calories of food daily in rural and urban areas respectively. The Lakdawala Expert Group (1993) retained the same rural and urban poverty line definitions as suggested by Dr. Alagh’s Task Force, but had disaggregated them into state-specific poverty line to demonstrate the inter-state price differentials. The Tendulkar Committee’s (2005) rural and urban poverty lines were set at Rs.27 and Rs.33 respectively. World Bank in the year 2015 revised its poverty line from \$1.25 a day to \$1.90 a day (*Gaur and Rao, 2020*).

Nonetheless, poverty is a multi-dimensional concept. Considering an individual as poor based on the income status alone does not fully reflect the deprivations he/she faces in non-monetary spheres of life in the form of ill health, lack of access to education, inaccessibility to sanitation and drinking water, etc. among others. In this regard, poverty as described in the World Summit on Social Development in Copenhagen (1995) seems more acceptable, such as " lack of income and productive resources sufficient to ensure sustainable livelihoods; hunger and malnutrition; ill health; limited or lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments; and social discrimination and exclusion. It is also characterized by a lack of participation in decision-making and in civil, social and cultural life..." (*United Nations, 2000*). According to Sen’s capability approach to development, poverty is being associated with the ‘functionings’ and ‘capabilities’ of an individual, i.e., an individual is termed as ‘poor’ or his/her ‘wellbeing’ is compromised if he/she is unable to freely carry out certain ‘doing and being,’ such as, being nourished and comfortably clothed, participating in the life of society, being healthy, etc. among others (*Sen, 1987; Hick, 2012*).

Livelihood capabilities are a subset of Sen’s broader idea of capabilities (*Chambers and Conway, 1992*). A livelihood is a triumvirate of capabilities, assets and activities. In other words, livelihood refers to means of living, which is earned through certain economic activities, such as agriculture, livestock rearing, business, formal jobs etc. To carry out these activities a HH needs to have ownership or access

to several livelihood assets. These livelihood assets generate or enhance the livelihood capabilities of the HH to give it the necessary push for initiating or enhancing livelihood activities. Consequently, HH's wellbeing will be enhanced and the poverty alleviation will follow. Increased wellbeing will strengthen the HH's asset base and livelihood capacities even more, enabling them to enhance or diversify their livelihood sources and further reduce HH poverty (see chart 21). For e.g., in order to generate livelihood through paddy farming, a farmer/HH should own or acquire tenancy of a piece of land, tractor, fertilisers, irrigation facility, farming techniques, etc. among others. These assets would generate production capacity for the HH and aid the activity of farming to begin. Produced paddy will generate monetary as well as non-monetary benefits to the HH (e.g., food security). Earnings from paddy sale would lead to creation of more asset bases and capacities in the form of acquiring more land, adopting advanced production techniques, providing better education to HH members, enhanced social status, etc. This would positively influence existing farming activity and/or create various livelihood diversification opportunities like horticulture, piggery, poultry, etc. Consequently, HH poverty would subside.



The role of livelihood assets in poverty eradication is apparent from the above discussion. The present chapter intends to investigate how livelihood assets influence

the monetary poverty status of Rubber growing HHs of Assam. Relating monetary poverty to other non-monetary deprivations through ownership or access to various livelihood assets may be useful in understanding the multi-dimensional nature of the HH poverty of these Rubber growers.

4.3 Poverty in Assam

Assam is one of the poorest states of India. Around 32% of Assam's population live below the poverty line, 6th highest among Indian states (*World Bank Group, 2017*). The state's consumption inequality, although less than most other Indian states, is rising (*World Bank Group, 2017*). Assam's multidimensional poverty index (MPI) value is 0.156, higher than the national average (0.118) (*NITI Aayog, 2021*), representing higher overall deprivations faced by the state's people across three dimensions of health, education and standard of living. Among the 12 indicators under the three dimensions comprising the MPI, the most striking for the people of Assam are nutrition (39.7% of total population of the state are nutritionally deprived), maternal health (25.4%), cooking fuel (77.1%), sanitation (51.3%) and housing (75.9%) (see table 4-a).

Dimension	Indicator	Percentage of population deprived (%)
Health	Nutrition	39.7 (37.6)
	Child and adolescent mortality	2.9 (2.7)
	Maternal health	25.4 (22.6)
Education	Years of schooling	16.2 (13.9)
	School attendance	6.6 (6.4)
Standard of living	Cooking fuel	77.1 (58.5)
	Sanitation	51.3 (52)
	Drinking water	17.7 (14.6)
	Electricity	21.8 (12.2)
	Housing	75.9 (45.6)
	Assets	19.9 (14)
	Bank account	15.4 (9.7)

Figures in parentheses represent all India averages
Source: India MPI Baseline Report, NITI Aayog, 2021

Among the districts of Assam, Kamrup Metropolitan is the least poverty-stricken (0.052) while Dhubri is the poorest (0.260). Among the three districts where the field surveys for the current study are conducted, Karimganj is the poorest (0.223), followed by Goalpara (0.203) and Kokrajhar (0.148) (see table 4-b).

Districts	MPI	Districts	MPI
Baksa	0.102	Kamrup	0.118
Barpeta	0.183	Kamrup Metropolitan	0.052
Bongaigaon	0.155	Karbi Anglong	0.181
Cachar	0.210	Karimganj	0.223
Chirang	0.165	Kokrajhar	0.148
Darrang	0.189	Lakhimpur	0.113
Dhemaji	0.125	Marigaon	0.175
Dhubri	0.260	Nagaon	0.144
Dibrugarh	0.136	Nalbari	0.076
Dima Hasao	0.156	Sivasagar	0.126
Goalpara	0.203	Sonitpur	0.118
Golaghat	0.094	Tinsukia	0.191
Hailakandi	0.251	Udalguri	0.132
Jorhat	0.088		
Source : National MPI Baseline Report, NITI Aayog, 2021			

4.4 Methodology

To understand how livelihood assets influence Rubber growing HHs' poverty levels, along with livelihood assets details, data relating to HH annual income (in Rs) and poverty status are considered pre-requisites. The HH annual income is composed of two major components, viz., annual income from selling Rubber sheets by a HH and annual income from sources other than selling Rubber sheets such as, bamboo plantations, betel nuts plantations, owning small business, tapping in others' Rubber plantations, being employed in the Army, etc.

The HH annual income is obtained from multiplying average yield of Rubber of a HH (Kg/hectare) and average domestic price of RSS 4 in 2020-21 (Rubber sheets sold as Ribbed smoked sheet of grade 4; price of the same is 141.85/- per Kg for the current study, as obtained from Indian Rubber Statistics, 42nd volume). The average yield of Rubber for a HH is computed using average annual yield of Rubber in Assam during 2020-21 (according to Indian Rubber Statistics, 42nd volume, average annual Rubber yield in Assam for the year is 1153 kg/hectare) multiplied by amount of land under tappable Rubber trees in the HH (hectare). Land under tappable Rubber trees and not land under total number of Rubber trees in a HH is considered to take account of the loss of Rubber produce due to some of the Rubber trees being destroyed by cyclones, pest attacks, diseases, and excessive rainfall. Around 375 to 450 trees can be grown in a hectare of land (*Bhattacharjee et al., 2021*). In the present analysis, 375 tappable Rubber trees/hectare is used for determining land under tappable Rubber trees in a HH. For e.g., if a HH has 200 tappable Rubber trees, it owns 0.533 hectare (=200/375) land under Rubber plantation. To give a clearer idea about the calculation of annual HH income from Rubber, following stepwise calculations have been carried out;

Annual income from Rubber of a HH

= Annual average yield of rubber of a HH * RSS 4 average price in domestic market in 2020-21

= (Land under tappable rubber trees for a HH * Average annual yield of rubber in Assam) * 141.85

= [{No. of tappable trees under a HH * (1/375)} * 1153 * 141.85]

To derive total annual HH income, annual HH Rubber income is added with income from other sources, if any, such as,

Annual total HH income

= Annual HH income from Rubber + Annual HH income from any other sources (plantations other than Rubber, small business, tapping in others' rubber gardens, daily wage labour, etc.)

To know whether significant differences exist between Tribal and non-Tribal Rubber growing HHs of Assam in terms of their annual Rubber income as well as total

annual HH income, the following null hypotheses are tested at 95% level of significance using Two sample t test;

H₀³ : No difference exists between annual Rubber incomes of STs and that of non-STs.

H₀⁴ : No difference exists between total annual HH incomes of STs and that of non-STs.

Also, Lorenz curve and Gini coefficients are formulated using total annual HH incomes of ST and non-ST Rubber growing HHs separately. The Lorenz curve and Gini coefficient are widely used tools of understanding income inequality. A Lorenz curve graphically represents the status of income inequality, the vertical axis measuring cumulative percentage of income and the horizontal axis measuring percentage of population. The curve basically gives an idea about what percentage of income is earned by the bottom X% of the population. The greater the distance between the line of equality, representing perfectly equally distributed income across the population, the greater is the income inequality among various population shares and the vice versa. On the other hand, the Gini coefficient measures the extent of income inequality and can be measured from the Lorenz curve such as,

Gini coefficient = (Area below line of equality – Area below Lorenz curve)/Area below line of equality

The coefficient lies between 0 and 1. The closer the value of the coefficient is to 1, the higher is the income inequality and vice versa.

Finally, the total HH incomes of the Rubber growers are used to determine their HH poverty levels. The World Bank-devised \$1.90 poverty line is used in the current study (= average Rs.74.13 per dollar in 2020, according to <https://www.exchangerates.org.uk/>). Minimum annual income threshold of a HH is the minimum annual income required to just cover the minimum annual consumption expenditure of that HH determined by the \$1.90 poverty line. The minimum annual HH income threshold is determined as follows;

Minimum annual income threshold of a HH (Rs.)

= HH size * Rs.74.13 * \$1.90 * 365 days

= HH size * 51409.15

HHs whose total annual income could not exceed the minimum annual income thresholds are considered **poor** in the study and those having positive difference between total annual HH income and minimum annual income threshold are considered **non-poor**. More specifically,

- HH is **poor** if (Total annual HH income – Minimum annual HH income threshold) < 0, and
- HH is **non-poor** if (Total annual HH income – Minimum annual HH income threshold) > 0.

The present study intends to understand the influence of the livelihood assets on HH poverty levels. In this regard, the logistic regression model seems fit as it can better deal with dichotomous outcome variables (poverty status in this case) than multiple linear regression models.

Thus, taking Poverty status = 1, for non-poor, &

Poverty status = 0, for poor

Logistic regression is conducted to identify as well as get an idea about the effects of the livelihood assets of the 400 surveyed Rubber growing HHs on the HH poverty levels. The left-hand side of the logit (L_i) function is defined as;

$$L_i = \ln [P(\text{Poverty status} = 1) / \{1 - P(\text{Poverty status} = 1)\}]$$

$$\text{i.e., } L_i = \ln [P(\text{Poverty status} = 1) / P(\text{Poverty status} = 0)]$$

If taken anti-log of L_i function, it will be described as the odds ratio in favour of being non-poor.

Out of the 23 sub-components of the five livelihood assets in consideration, as mentioned in the chapter 3, two are dropped from logistic regression model due to constant values of unity ('House ownership' and 'Cost of healthcare') and 'Source of drinking water' and 'Tappable Rubber Trees' sub-components are dropped for being highly correlated with 'Access to rubber water' and 'Land under Rubber' subcomponents respectively ($r = 0.93$ and $r = 0.88$ respectively). Finally, 12 sub-components are found to be individually significantly influencing the L_i function, i.e., the poverty levels of the Rubber growing HHs at or above 90% level of significance

(in case of categorical variables if any one of the categories of the concerned variable is significant, the variable is considered significant). The details of these sub-components, odd ratios (OR) and standard errors (SE) are mentioned in the table 4-c;

Table 4-c: Result of logistic regressions of individual sub-components				
Livelihood Asset	Sub-component		Odds ratio	Standard error
Physical	HH gadgets	1	2.4	3.056796
		2	2.117647	2.269632
		3	3.73913	3.892365
	1.Poultry and livestock		0.6208531*	0.1770666
	1.Housing condition		1.975594**	0.6090038
	1.Distance to market		1.672222	0.5353425
	1.Road condition		1.376977	.6126207
	Vehicles	1	0.6959707	0.295258
		2	2.068966	1.070709
	Human	1.HHsize		4.519525 ***
1.Training		1.771186*	0.5254967	
1.Labour type		0.0816234** *	0.025972	
Education		1	0.12*	0.1406272
		2	0.2579618	0.2385326
1.Distance to hospital		2.239583**	0.7145551	
Natural	1.Land under Rubber		11.81818****	4.064684
	1.Access to water for Rubber processing		0.7205527	0.2049974
Financial	1.Savings		10.77019 ***	4.500512
	1.Loan burden		1.203822	0.6674619
	1.Subsidy		1.691105*	0.5309637
Social	1.RGS membership		0.500236**	0.1541936
	1.SHG membership		0.898374	0.2794312
	1.Selling point		5.521978****	3.180485
*Significant at 0.10 **Significant at 0.05 ***Significant at 0.01				

Along with these 12 independent variables, an interaction term is used in the final logistic model, i.e., interaction of ‘Training’ and ‘Labour type’ to provide an idea of training-led labour productivity enhancement and its effect on HH poverty levels. Thus, the functional form of the logistic regression model stands as follows,

$$L_i = \beta_0 + \beta_1 \text{Poultry and livestock} + \beta_2 \text{Housing condition} + \beta_3 \text{HHsize} + \beta_4 \text{Training} + \beta_5 \text{Labour type} + \beta_6 \text{Training} \# \text{Labour type} + \beta_7 \text{Education} + \beta_8 \text{Distance to hospital} + \beta_9 \text{Land under Rubber} + \beta_{10} \text{Savings} + \beta_{11} \text{Subsidy} + \beta_{12} \text{RGS membership} + \beta_{13} \text{Sellingpoint}$$

Where,

Poultry and livestock = Ownership status of poultry and livestock

= 1, if HH owns at least one of poultry and livestock

= 0, if HH owns none

Housing condition = Type of housing

= 1, if house is semi-pucca or pucca

= 0, otherwise

HHsize = No. of individuals included in a HH

= 1, if size ≤ 4

= 0, if size > 4

Training = Training receipt status of HH

= 1, if HH has trained members

= 0, no trained members in HH

Labour type = Type of labour used in Rubber plantation and processing by a HH

= 1, if only family labour used

= 0, if only hired or both family and hired labour used

Training#Labour type = Interactive effect of training and labour type

= 1, if trained family labour used in plantation

= 0, otherwise

Education = Highest education in a HH

= 2, at least one HH member with secondary or above education

= 1, at least one HH member having primary education which is the highest level of education in the HH

= 0, No education

Distance to hospital = Approx. distance between village of the HH and nearest local hospital or health centre (Km)

= 1, if distance \leq 5 Km

= 0, if distance $>$ 5 Km

Land under Rubber = Amount of landholding under Rubber plantation by a HH

= 1, if landholding size $>$ 2 Hectares

= 0, if landholding size \leq 2 Hectares

Savings = Whether HH member(s) hold active savings account(s)

= 1, if yes

= 0, if no

Subsidy = Whether HH received at least one instalment of subsidy for plantation

= 1, if yes

= 0, if no

RGS membership = Membership status of HH members in RGS

= 1, if membership exists

= 0, if membership does not exist

Selling point = Marketplace for selling Rubber sheets

= 1, if grower sells in RGS

= 0, if grower sells in local market or private dealers collect from their houses

Intercepts and coefficients of respective independent variables are represented by β_i 's, where $i = 0, 1, 2, \dots, 13$.

4.5 Findings

HH income status

Discussions on relative status of ST and non-ST Rubber growing HHs' livelihood assets in the previous chapter reveals that the STs are better endowed with almost all the five livelihood assets than their counterparts. However, as revealed in table 4-d, a similar outcome is not observed when annual HH Rubber incomes and annual total HH incomes of the ST and non-ST Rubber growers are concerned. Two important points are explored from table 4-d, such as;

- The Tribal Rubber growers' annual earnings from Rubber (Rs. 1.53 lakhs) are less than the non-Tribal growers (Rs. 2.01 lakhs). However, the difference of annual Rubber earnings between the two communities' growers is insignificant.
- In terms of total annual HH income also the ST growers fall behind their counterparts by average Rs.73,563. However, in this case, the difference of total annual HH income between STs and non-STs is significant.

Table 4-d: Summary of community-wise HH income			
Community	Number of HHs	Average annual HH income from Rubber (Rs)	Average annual total HH income (Rs)
ST	264	1,53,543.3 (Max = 52,33,698 Min = 17,445.66)	1,65,685.5 (Max = 52,33,698 Min = 17,445.66)
Non-ST	136	2,01,635.3 (Max = 10,90,354 Min = 19,626.37)	2,39,248.5 (Max = 10,90,354 Min = 43,614.15)
Combined	400	1,69,894.5 (Max = 52,33,698 Min = 17,445.66)	1,90,696.9 (Max = 52,33,698 Min = 17,445.66)

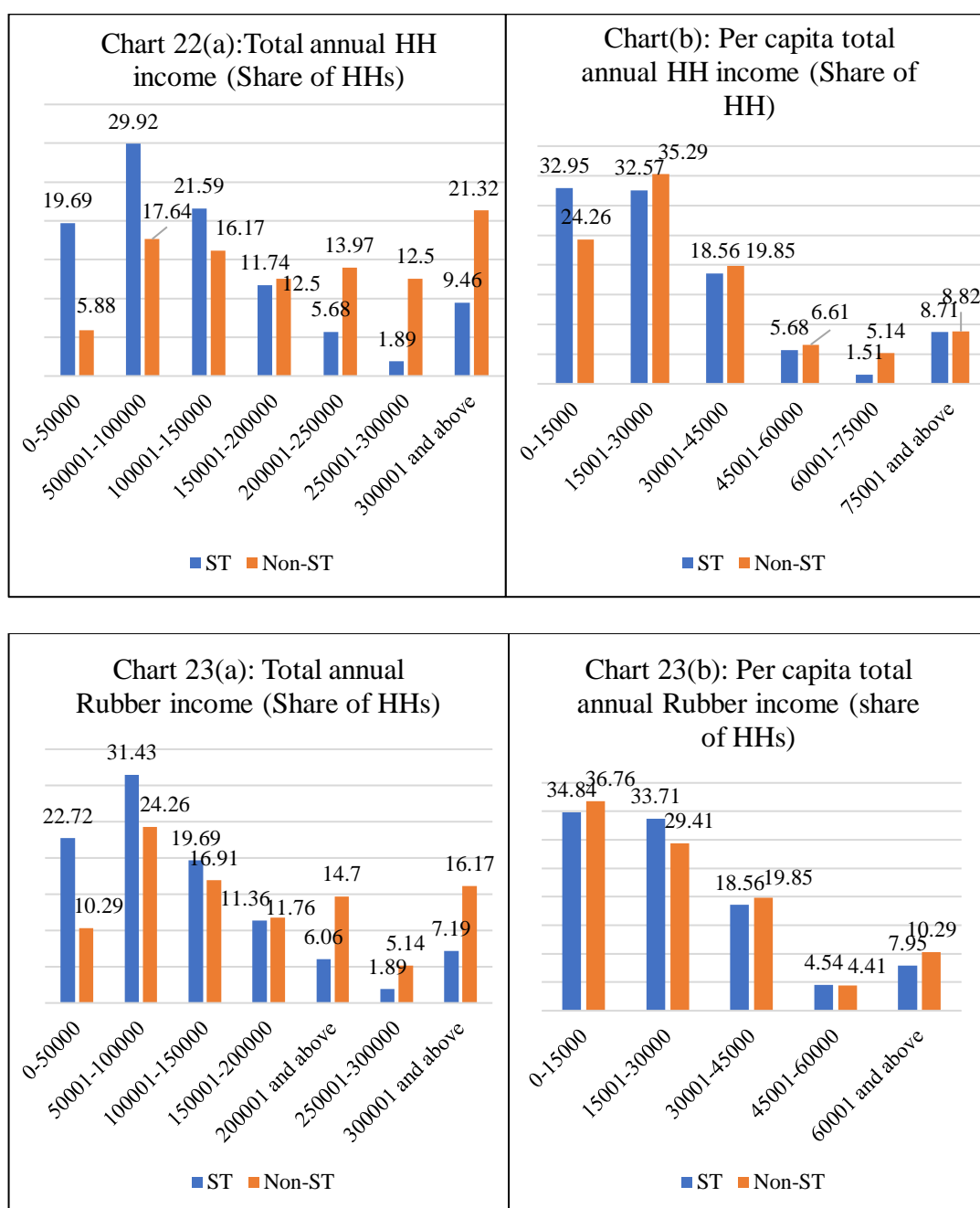
Two sample t test	Ho³: No difference between annual HH Rubber income of STs and non-STs. $t = 1.4240$ $\Pr (T > t) = 0.1552$ (Not significant)
	Ho⁴: No difference between total HH incomes of ST and non-ST Rubber growers. $t = 2.5565$ $\Pr (T > t) = 0.0109$ (Significant)
Source: Author's calculation based on field survey data	

On the other hand, the STs are faring better than the non-STs in terms of per capita total HH income as well as per capita annual Rubber income. The Tribal HHs' mean per capita annual Rubber income (Rs. 31,968) and per capita annual total HH income (Rs. 34,492.28) are higher than those of the non-Tribal HHs (per capita annual Rubber income= 25,112.08/- and per capita annual total income= 29,796.52/-). Per capita HH income can be considered as a better measure of poverty and inequality than total HH income, if not the best (*Datta and Meerman, 1980*), as it considers the effect of HH size. In the case of the current study, the STs have smaller HHs in size (4.80) whereas the non-ST HHs are almost double the size of that of the STs (8.02). In general, with higher per capita income a HH can better deal with external climatic shocks like famine (*Webb et al., 1994*) and at aggregate level, per capita income has strong positive influence on healthcare spending (*Moore et al., 1992*), etc among others.

Charts 22(a) reveals that most of the ST HHs (29.92%) earn total annual income in the range of Rs.50,000 to Rs.1,00,000, followed by in the range Rs.1,00,001 to Rs.1,50,000 (21.59%), unlike the non-STs, most of whose total annual incomes are more than Rs.3,00,000 (21.32%), followed by 17.64% of the non-STs earning between Rs.50,000 to Rs,1,00,000. The least proportion of ST HHs (1.89%) earn total annual income between Rs.2,50,001 and Rs.3,00,000. In terms of annual income from Rubber only, most ST HHs (31.43%) earn in the range Rs.50,000 to Rs.1,00,000, followed by earning less than Rs.50,000 (22.72%) (chart 23(a)).

In terms of per capita total annual income, as chart 22(b) reveals, around 32.95% ST HHs earn per capita total annual income of Rs.15,000 and less, followed by 32.57%

of the STs earning in the range of Rs.15,001 to Rs. 30,000. The least proportion of ST HHs (1.51%) earn per capita income in the range of Rs.60,001 to Rs.75,000. The non-STs mostly fall in the per capita annual income bracket of Rs.15,001 to Rs.30,000 (35.29%) and like the STs, the least proportion of the non-STs' per capita total annual income also falls in the range of Rs.60,001 to Rs.75,000 (5.14%). In case of per capita annual Rubber income, most ST HHs are found to be earning less than Rs.15,000 (34.84%), followed by being in the range of Rs.15,001 to Rs.30,000 (33.71%) and the least proportion of ST HHs are found in the range of Rs.45,001 to Rs.60,000 (chart 23(b)).



The additional income streams (apart from Rubber) and the share of HHs earning from these sources are displayed in table 4-e. The table, firstly reveals that there are not many HHs, including ST and non-ST, who have diversified sources of income. However, the share of HHs with diversified income sources is lower among STs than the non-STs (80.30% and 68.38% respectively earn from Rubber only). Interestingly, in addition to rubber, higher share of Tribal HHs (5.68%) have more than one sources of income than their counterparts (1.47%). Most of the ST Rubber growing HHs in the previous year, i.e., in 2020, have reported of earning additional incomes from plantations of betel nuts, betel leaves and bamboo (6.81%), followed by selling remaining paddy over and above family consumption (5.30%) while the non-STs mostly have earned additionally as tappers in other Rubber growers' gardens or involving in wage labour in such plantations (16.91%), followed by other self-owned plantations (mostly betel nuts) (6.61%). The table also shows that unlike the non-Tribal HHs, the share of Tribal HHs' engaging in non-farm earning sources like small businesses, private and public sector jobs are smaller. Most common non-farm income sources of these growers have been owning grocery store, pharmacy shop, tea stall, being employed in Indian army, driving others' cars, etc. None of the ST HHs have reported being employed in any private sector jobs unlike their counterparts (2.20%). Greater dependence for additional income on the part of the Tribal HHs on plantations of betel nuts, betel leaves, bamboo etc. apart from Rubber as well as on paddy grown in own lands rather than doing business or formal employment is explained by the Tribal way of communal living among themselves, yet maintaining isolation from the outside world. Most ST Rubber growers raise poultry and/or livestock. However, very few of them sell farm animals on the market (3.78%), mostly to pay for financially difficult times. Clearly, these HHs are either ill-informed of the monetary benefits of commercial livestock farming or lack the funds to commercialise the same. In either case, the government or local NGOs have failed to actively promote or assist commercial livestock production in the study region.

The lower Rubber incomes of the ST HHs can be attributed to lower Rubber landholding size (mean land under Rubber by STs is 0.91 hectare) and lesser tappable trees of these HHs (mean tappable Rubber trees under ST HH are 352.04) compared to those of the non-STs (1.58 hectare of mean Rubber land and 466.35 mean tappable trees respectively). On the other hand, significant lesser total annual HH income on

the part of the Tribal Rubber growers can be contributed to smaller Rubber landholdings and lower proportion of HHs having incomes from diversified sources compared to the non-STs.

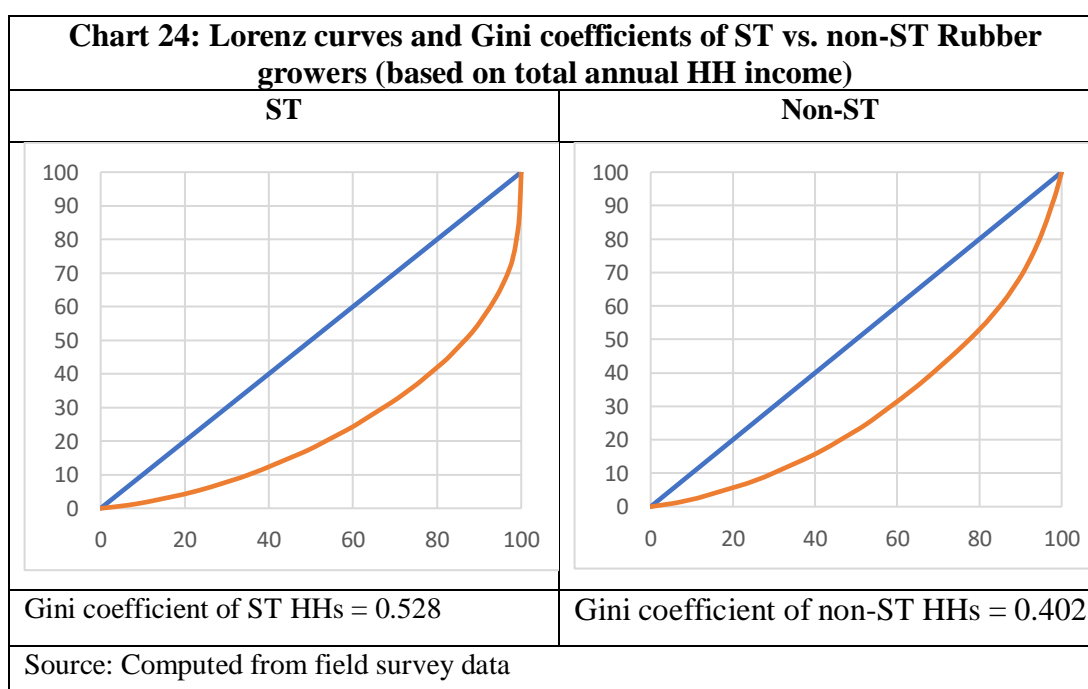
Table 4-e: ST and non-ST HHs with sources of income		
Income sources	Share of ST HHs (%)	Share of non-ST HHs (%)
Rubber only	80.30	68.38
Rubber + Poultry and/or livestock sale	3.78	-
Rubber + Small business or self employed	2.27	5.88
Rubber + Paddy sale	5.30	-
Rubber + Tapping in or working as wage labour in others' Rubber gardens	1.13	16.91
Rubber + Private job	-	2.20
Rubber + Government job	1.13	1.47
Rubber + Other plantations	6.81	6.61
Rubber + More than one additional sources of income	5.68	1.47
Source: field survey		

However, when compared with the income sources of average HHs of the survey districts as well as of Assam (refer table 4-f), considerably higher proportion of ST Rubber growing HHs earn from agriculture (Rubber only, Rubber + paddy sale and Rubber + other plantations) than the average HHs in Assam as well as districts of Goalpara, Kokrajhar and Karimganj. Low earning from livestock farming is consistently observed among Assam's HHs, though proportion of the ST Rubber growers are lower than the average HHs in Assam as well as the districts in consideration. However, striking differences are observed among the ST Rubber HHs and the average HHs of Assam and the selected districts in terms of earnings from self – employment, casual jobs and salaries. The share of Rubber growing HHs in these three categories are abysmally low when compared with the average HHs in the state which in turn reflect heavy agriculture-dependence of the former HHs.

District/State	Goalpara	Kokrajhar	Karimganj	Assam
Sector				
Agri & farming	9.0	25.5	10.2	11.1
Livestock	2.6	11.1	1.0	2.1
Self-employment	21.5	13.0	21.8	21.6
Casual jobs	39.5	25.0	38.3	24.9
Salaries	25.9	21.6	24.4	34.9
Transfer income	1.4	3.8	4.3	5.2

Source: Government of Assam, 2014

In the case of the current study, using the total annual HH income data, Lorenz curves and Gini coefficients are formulated separately for Tribal and non-Tribal Rubber growers. As observed from the chart 24, the Lorenz curve of ST growers seems farther from the line of equality than that of the non-ST growers. The Gini coefficient value of the STs (0.528) is found to be closer to 1 than that of the non-STs (0.402). Thus, both the Lorenz curve and Gini coefficient reflect that more income inequality is prevalent among the ST Rubber growing HHs than the non-ST HHs. The bottom 10% of Tribal HHs cumulatively hold only 1.6% of income, less than the bottom 10% of non-Tribal HHs (2.2%), whereas, the top 10% of the STs hold as high as 45% of income compared to 32% of income held by top 10% of non-ST HHs.



HH poverty levels

It is observed from table 4-g that using the difference between total annual HH incomes and minimum annual income thresholds of Rubber growing HHs as described in section 4.4, a total of 342 HHs are found to be poor out of the 400 surveyed Rubber growing HHs. Both the Tribal and non-Tribal Rubber growers are mostly poor, the former having a higher share of poor HHs (87.12%) than the later (82.35%). However, the difference in poverty status between the ST and non-ST growers are found to be insignificant despite the latter having significantly higher total annual HH incomes. This again can be explained by the contrasting HH sizes of the two communities (ST mean HH size is 4.80 and non-ST mean HH size is 8.02). Due to lower HH sizes, ST HHs' minimum annual HH income thresholds are also lower than their non-ST counterparts. Thus, although the share of ST HHs being poor is higher than that of non-ST HHs (87.12% of ST HHs and 82.35% of non-ST HHs are poor), the difference in the poverty status between the two communities' Rubber growers is insignificant.

Table 4-g: Community-wise HH poverty status	
Community	Poverty status
ST (No. of HHs)	Poor = 230
	Non-poor = 34
	Total = 264 (87.12% poor and 12.87% non-poor)
Non-ST (No. of HHs)	Poor = 112
	Non-poor = 24
	Total = 136 (82.35% poor and 17.64% non-poor)
Combined (No. of HHs)	Poor = 342
	Non-poor = 58
	Total = 400 (85.5% are poor and 14.5% are non-poor)
Two sample t test	Ho⁵: No difference between poverty status of ST and non-ST Rubber growers. t = 1.2825 Pr (T > t) = 0.2004 (Not significant)
Source: Author's calculation based on field survey data	

Livelihood assets and HH poverty

In the logistic regression model, which intends to study the influences of the 12 individually significant sub-components of the five livelihood assets and an interaction term on the HH poverty status, five sub-components are found to be significant, viz., ‘HHsize’ and labour type’ of human assets, ‘land under Rubber’ of natural assets, ‘savings’ of financial assets and ‘sellingpoint’ of social assets.

Table 4-h: Result of logistic regression model				
Asset	Sub-component		Odds ratio	Standard error
Physical	1.Poultry and livestock		0.6965438	0.3377826
	1.Housing condition		1.246821	0.5713291
Human	1.HHsize		6.706157 ***	3.263774
	1.Training		1.974461	1.304069
	1.Labour type		0.1213375 ***	0.0873651
	1.Training#1.Labour type		1.19349	1.036522
	Education	1	2.46261	3.653903
		2	1.069805	1.345264
	1.Distance to hospital		1.540667	0.7093621
Natural	1.Land under Rubber		6.670758 ***	3.664249
Financial	1.Savings		8.794738 ***	4.571643
	1.Subsidy		1.250768	0.5845766
Social	1.RGS membership		0.5470283	0.2472308
	1.Selling point		8.404199 **	7.389833
Constant			0.0158066***	0.0215582
*Significant at 0.10		**Significant at 0.05	***Significant at 0.01	
Source: Author’s calculation based on field survey data				

- **Physical assets**

Interestingly, neither ‘poultry and livestock’ nor ‘housing condition’ under physical assets is found to be significantly influencing the poverty status of Rubber growing HHs.

The fact that HHs with poultry and livestock is more likely to be poor (OR = 0.69) signifies that mere owning the asset does not necessarily generate economic benefit to

the HHs. Only 10 ST HHs have reported selling poultry and/or livestock in the year 2020, despite most HHs' involvement in livestock farming. The farm birds and animals mostly serve nutritional requirements of these HHs. Poultry and/or livestock are sold only to finance occasional economic distress faced by the HHs.

In terms of housing conditions of the Rubber growers, those owning semi-pucca or pucca houses are more likely to be non-poor than those having bamboo or mud houses (OR = 1.24). This is expected given that the housing condition is representative of a HH's economic status. Moreover, concrete is a costlier building material compared to mud and bamboo and hence can be afforded by economically well off HHs only. Also, mud and bamboo are available in abundance in the interior parts of the state and thus cheaper to by the poorer HHs.

- **Human assets**

Smaller HHs (≤ 4) are found more likely to be non-poor (OR= 6.70). Smaller HHs demand lesser minimum HH annual income threshold to escape or remain free from poverty.

Around 320 (228 ST HHs) out of the 400 surveyed Rubber growing HHs use family labour for Rubber tapping and processing. Interestingly, these HHs employing family labour in plantations are more likely to be poor (OR= 0.12), although these HHs can save on labour cost of 200/- to 250/- per labour per day of tapping given to hired labour or not let go off around 40% to 50% of daily Rubber sheets produced as hired labour cost. The reason for not benefiting economically by employing family labour by the Rubber growers is labour inefficiency due to lack of training. With training on tapping and Rubber processing, employing family labour can make HHs economically better-off (OR for being non-poor with trained family labour is 1.19). In fact, by employing trained labour, irrespective of the labour type, HHs are more likely to be (OR= 1.97).

Both primary education and secondary or higher level of education seem to positively influence HHs' economic wellbeing (OR= 2.46 for primary education and OR = 1.06 for secondary and above education). The observed positive relation between education and economic wellbeing of the HHs seems expected as education opens greater livelihood diversification opportunities for a HH as compared to no education.

Distance of local hospitals and/or health centres may impact a HH's expenditure towards health care. In this regard, odds of Rubber HHs being non-poor is found to be 1.54 times that of poor when distance between their houses and local hospitals or health centres is 5 Km or less. Having basic health care services at the neighbourhood of the HHs saves on their transport expenditure, which otherwise may increase the burden of healthcare expenses.

- **Natural assets**

HHs who have landholdings of more than 2 hectares under Rubber plantations are more likely to be non-poor (OR = 6.67) than those with smaller holdings. Larger Rubber holdings by a HH ensure owning a higher number of tappable Rubber trees, more Rubber produce, higher income generation and subsequent poverty alleviation.

- **Financial asset**

HHs who own active savings accounts are likely to be non-poor (OR = 8.79). Savings, along with providing monetary support in economic (crop damage) and/or non-economic distress (health emergency) to the HHs, also unfold invest opportunities in additional livelihood-generating sources and improve economic solvency of the HHs.

Receiving planting/replanting and plantation maintenance related subsidies from the Rubber Board encourage and support poorer HHs to take up and/or regrow Rubber plantations. In the initial seven years of plantations, when there is no latex production, financial as well as technical support from the Board let the grower HHs continue with the plantations and strengthen their financial status. Thus, receiving subsidies at early stages of plantation development ensures a stable financial support system for the growers. Thus, HHs' with subsidy are found more likely to be non-poor (OR = 1.25).

- **Social asset**

The RGSs not only deliver input materials, planting materials, training, etc., but also boost the social capital status of the member Rubber growers. These societies act as collectives which empower the member growers with better bargain over Rubber produce prices than those selling in local markets or to private dealers who collect from their homes. The supply of Rubber inputs and planting materials, organisation of training and workshops for increasing the member growers' efficiency in plantation management and any other related issues are taken care of by the Societies at a

collective level. In either case of non-existence or inactive existence of the RGSs, the HHs are deprived of the collective benefits these societies can bring in terms of cheaper supply of inputs, more efficient production, and profitable sale of outputs. The absence of any special contribution of RGSs in HHs' plantation related activities may explain the incidence of HHs with RGS membership being more likely to be poor than those with no membership (OR for membership = 0.54).

Closely related with the issue of efficient functioning of RGSs is the role of selling point, i.e., the marketplace where Rubber growing HHs sell their Rubber sheets. According to the current model, odds of HHs which sell Rubber sheets in RGSs to be non-poor is 8.40 times the odds of being poor.

4.6 Discussion

The study reveals most of the Rubber growing HHs to be poor. The Tribal growers, despite their overall better livelihood assets status compared to the non-Tribal growers, earn less than the latter and exhibit higher income inequality. Lower HH incomes of the Tribal Rubber growers are largely due to smaller Rubber holdings and thus fewer tappable Rubber trees, as well as a smaller number of HHs diversifying their sources of income. Nevertheless, the HH poverty situation does not differ significantly between the two communities. The bigger HH size of the non-STs offsets their higher income advantage due to heightened minimal HH annual income thresholds in comparison to the STs, resulting in inability to escape monetary poverty.

Chapter 3 previously has explored affirmative livelihood assets conditions of the Tribal Rubber growing HHs compared to the non-Tribals. The current chapter, on the other hand, has explored the relationship between these assets and HHs' poverty status. The highly significant intercept of the logistic regression (table 4-h) clearly demonstrates increased likelihood of Rubber growing HHs' poor economic status in the absence or unsatisfactory presence of the livelihood assets with the HHs (OR= 0.01). However, existence of high incidence of poverty among the Tribal Rubber growers, despite better livelihood assets conditions compared to their counterparts, indicates less than optimum access to or ownership of the select livelihoods assets to the STs.

Table 4-i: Tribal Rubber growing HHs' lack of ownership/access status of select livelihood asset sub-components	
Not owning poultry and/or livestock (%)	9.84
Not selling poultry and/or livestock (%)	96.21
Do not have semi-pucca or pucca housing (%)	36.36
HH size > 4 (%)	48.84
Did not received training on Rubber tapping and/or plantation management and/or processing (%)	40.15
Use untrained family labour in plantations (%)	34.84
No education (%)	-
Rubber landholding \leq 2 hectares (%)	93.93
HHs not having savings account (%)	47.72
HHs not received subsidy from Rubber Board (%)	33.33
HHs with no RGS membership (%)	46.96
HHs not selling Rubber sheets to RGSs (%)	95.07
Source: field survey	

Table 4-i reveals that the Tribal HHs are exorbitantly deprived in commercialisation of livestock farming, larger Rubber landholdings and RGSs' functionality as a marketplace for Rubber sheet selling. Lack of Governmental intervention in aiding and promoting commercial livestock farming is observed in the study area. Ignorance and lack of finances on the part of the Tribal Rubber HHs have resulted in non-adoption of commercial livestock farming, thereby hindering its positive contribute to HH economic solvency.

While smaller Rubber holdings are more prominent among the Tribes than their counterparts, land related woes are further aggravated by the fact that some of these HHs have developed the plantations in forest land and lack land ownership titles and documents. In the absence of land rights documents, the Rubber growers fail to receive financial assistance for plantation development and management from the Rubber Board, resulting in the financial burden of growing Rubber at their own expense and delayed realisation of economic benefits from the plantations.

ST growers' inability to sell Rubber produce through RGSs can, in a way, be the result of their non-membership in RGSs. The RGSs in the study area are either non-

operational or operating inefficiently, thereby forcing the HHs to sell Rubber sheets to local markets and private dealers through home collection. The RGSs help the HHs to get unified prices for their produce, which generally are at par or even higher than the market rate. Thus, the non-existence of RGSs or their inefficient functioning cause the HHs to face price volatility and income losses.

Other than the above three areas of deprivations, the Tribal growers also need more access to trainings and subsidy as well as enhanced savings habits. Field survey reveals that the share of ST HHs using untrained family labour in plantations is around 34.84%. Training ensures better labour productivity, longevity of the trees' productive phase and increased quality of the sheets produced. With better quality Rubber output, the HHs' capacity to earn higher increases. Also, subsidy assistance from the Board helps the HHs avoid initial financial crunch and develop early profit earning conditions from the plantations. Moreover, through encouraging the HHs to maintain savings accounts, which may enhance their capacity for investment and chances for livelihood diversification, their financial situation can be improve even more.

CHAPTER 5: CONCLUSION

5.1 Introduction

The current concluding chapter reiterates the major findings of the study in a nutshell, proposes some policy recommendations based on these findings and finishes off by identifying future scope of further study.

5.2 Summary of major findings

The present study has attempted to explore in detail the livelihood assets conditions of the ST Rubber growers in Assam. In other words, the answers to the following set of research questions are specifically sought in course of the present study;

Research question 1:

What are the current livelihood assets status of the Rubber growers belonging to various Tribal communities in Assam?

Research question 2:

Are there significant differences in livelihood assets conditions among different Tribal communities' growers?

Research question 3:

Are there significant differences between Tribal and non-Tribal growers in terms of livelihood assets status in Assam?

Research question 4:

How do these livelihood assets conditions of the Rubber growers impact their household (HH) poverty status?

The current section attempts to summarise the major findings of this study under the following headings;

Tribal Rubber growers' position vis-a-vis non-Tribal growers in terms of livelihood assets

In comparison to their non-tribal counterparts, the current study reveals that the Tribal Rubber growers have richer livelihood assets endowments in Assam. They have better access to human, physical and financial assets. Even in the case of natural and social assets, whose access or ownership is comparatively unfavourable to these Tribal

growers with respect to the other three assets, they still outperform their non-Tribal counterparts.

The rich human assets conditions of these Tribal groups are contributed by their small HH sizes, secondary and above level of educational attainment, use of family labour in plantations, thereby saving the cost of hired labour, receiving training on Rubber plantation development and management, accessibility to clean drinking water through HH-owned hand pumps and free primary health care services in the neighbourhood.

Access to or ownership of physical assets by the ST growers are highly sustainable due to higher proportion of HHs owning vehicle and gadgets (one and/or multiple vehicles), higher no. of HHs owning livestock and/or poultry, more HHs having better housing in terms of pucca or semi-pucca houses and lesser no. of HHs requiring to travel long distances (more than 5 Km) for accessing local markets compared to the non-ST growers. However, the HHs face transportation and communication difficulties due to lack of good road infrastructure in their neighbourhoods. Most roads in the study area are earthen and get flooded during the rainy season which is the most prominent weather condition in the state.

The financial assets of the Tribal HHs are also sustainable, but are less satisfactory when compared to the human and physical assets. While most ST HHs do not possess active loans, their savings habits need to improve. Also, compared to their non-ST counterparts, although a higher proportion of ST HHs have received subsidy from Rubber Board, some HHs are denied the financial assistance due to lack of legal land ownership documents.

Natural and social assets of these Tribal growers are weakest amongst the five livelihood assets. Both the ST and non-ST Rubber growers are found to be land resource deficient, but the deficiency is more acute among the Tribes. Closely related with Rubber land paucity is low tappable Rubber tree stock. The Tribal growers' average tappable Rubber tree stock is quite foreseeably less than their non-Tribal counterparts. However, the accessibility to water for Rubber processing is better among the STs due to private ownership of water sources in the form of hand pumps or at least having access to nearby dug wells.

The poor social assets conditions of these growers can be attributed to the non-functioning of RGSs and SHGs which result in non-existing group processing facilities, inaccessibility to loans/funds for additional livelihood generating activities

as well as absence of trainings for raising nurseries, piggeries, animal husbandry, etc. and finally, not being able to charge uniform, stable prices for sale of Rubber sheets.

Inter-Tribal community livelihood assets conditions

During the current study, three major Tribal communities were identified as Rubber growing communities in the districts of Goalpara and Kokrajhar - Rabha, Bodo and Garo. The Rabhas are found to be the richest in overall livelihood assets status, compared to the other two Tribal communities mostly due to better access to physical assets (resulting from more HH gadgets ownership, livestock and/or poultry farming and lesser distance to travel for accessing local markets) as well as social assets (due to more memberships in RGSs and SHGs). Among the other two communities, the Garos are better endowed in human assets (contributed by smaller HH sizes, better access to drinking water sources, more use of family labour and better educational attainments of HH members) and natural assets contributed by easier access to water for Rubber processing due to ownership of water sources (hand pumps mostly). On the contrary, the Bodos have better access to some of the sub-components of the five livelihood assets compared to the other two communities, but do not possess overall access advantage over all sub-components under any single asset indicator than the Rabhas and the Garos. For e.g., the Bodos have access to better roads (bituminous) and more vehicle ownership under physical assets, smaller HHs and more training coverage under human assets, better savings habits under financial assets and active RGSs as Rubber selling points comprising social assets compared to both the Rabhas and the Garos. On the contrary, they do poorly in the other assets and are only superior to the Garos in terms of owning livestock and the distance to the market under physical assets.

The three Tribal communities have different livelihood asset conditions from one another, albeit the differences are insignificant. This, on the other hand, bespeaks the Tribal Rubber growers overall similar level of access to livelihood assets irrespective of differences in community status. Nevertheless, the Tribal Rubber growers are found to have significantly better access to or ownership of all the livelihood assets than their non-Tribal counterparts, which reflects the successful implementation of the Central government's Rubber-based livelihood generation for the erstwhile nomadic Tribal communities of Assam as well as NER.

Poverty status of the Tribal Rubber growers

The Rubber growers of the study area are mostly poor. More ST Rubber HHs are found to be poor than the non-STs. However, the difference in poverty status of the two communities is insignificant. 'HHsize,' 'labour type,' 'land under Rubber,' 'savings' and 'selling point' sub-components are found to influence HH poverty levels of the Rubber growers significantly. In other words, smaller HHs (size ≤ 4), larger Rubber holdings (> 2 hectares), having savings account(s) and RGSs acting as the Rubber selling points are the factors that make a HH more likely to be non-poor, while using family labour in plantations may aggravate the Rubber HHs' poverty conditions. Moreover, the HHs with livestock farming and RGS membership are more likely to be poor while those with better housing (semi-pucca or pucca housing), training, and education (primary and above), a shorter travel distance to access health care services (5 Km or less), and subsidy assistance from the Board are more likely to be non-poor. The impact of these sub-components on HH poverty status, however, is statistically insignificant.

Even though the ST Rubber-growing HHs have better livelihood assets conditions than the non-ST HHs, it is far from being optimum for reducing HH poverty. More than 90% of Tribal HHs' involvement in non-commercial livestock farming, ownership of smaller Rubber holdings (≤ 2 hectares) and non-accessibility of RGSs as a marketplace for Rubber selling, followed by moderate proportion of the Tribal HHs using untrained family labour (34.84%), not having savings accounts (47.72%) and inaccessibility to subsidies (33.33%) are some of the major assets-scarcities contributing to the ST Rubber growers' inability to escape poverty.

5.3 Problem areas identified

Through permanent agriculture-based livelihood creation, Rubber plantations have been successful in improving the lives of the erstwhile nomadic Tribal people of Assam and North-East India in general. There is no denying that the Tribal Rubber growers have promising livelihood assets conditions in the state compared to their nomadic days. The exploration of the ownership of or access to five livelihood assets of the Tribal Rubber growing HHs of Assam in the present study and subsequent comparison of those with the non-Tribal Rubber growing HHs of the state reflect overall better assets status of the former. Nonetheless, salient areas of inadequate

achievements are discovered in course of the current study, which, if resolved, may enhance the state's Tribal Rubber growers' development experience.

First and foremost is the problem of practise of Rubber monoculture among most of the Tribal HHs in the study area. Rubber being the only source of income to many of these HHs, they are more susceptible to outside shocks like damage to plantations from seasonal cyclones, pests, severe rain and flooding, price fluctuations, etc. At the same time, they lose out on the opportunity of earning more incomes by not engaging in multiple livelihood generation activities.

In the context of developing diversified livelihood systems, these Rubber HHs have the ready option of commercial rearing of livestock. However, currently livestock only serves as emergency credit source and HH nutritional requirements to them. Ignorance on the parts of the Rubber growers on various existing central and state government schemes to support poultry and livestock-based entrepreneurship development like National Livestock Mission and Assam Milk, Meat and Egg Mission, etc. is one of the barriers for commercial livestock farming development in the region. Also, there is a lack of initiative on the part of the Rubber Board in popularising commercialisation of livestock farming given the fact that these Tribal Rubber growers are already engaged in livestock rearing.

In Assam's Rubber plantations, use of family labour is the norm. While this ensures saving on labour cost otherwise to be paid for hiring, it is to be noted that Rubber tapping and processing requires skilled labour. Though higher number of Rubber growers are found to be trained compared to the non-Tribes, a considerable chunk of the grower population remains untrained. With non-exposure to correct methods of tapping and processing of Rubber, it is highly probable that the growers can damage the tree productivity as well as Rubber sheet quality. Unskilled tapping also reduces the productive phase of Rubber trees due to unscientific cuts made to the bark of the trees as well as non-adherence to the minimum time gap required for resuming tapping from the same area of incision.

The current study has identified land ownership related issues among the growers, the Board and the Forest department which partially contributes to the poorer natural assets conditions as well as restricting financial assets development in terms of limited subsidy disbursement to the growers. Some of the Rubber growers have developed plantations on forest lands. Thus, they do not have legal ownership of these lands. Without valid land ownership documents, they have been declared ineligible from

receiving subsidy benefits for plantation development and management from the Rubber Board. The lack of financial assistance from the Board has hindered the ability of these Rubber-growing HHs to maintain their plantations and is also limiting the entry of new Rubber growers into the sector. Another lacuna identified in the present study regarding financial assets of the Rubber growers is their lacklustre savings habits. The growers often fails to maintain savings accounts with the banks, which are the primary point of connection between them and the Board in case of monetary transactions.

The study has also discovered poor social assets status of the Tribal growers of Assam contributed by the lack of strong connectedness and networks among the growers as well as among the Board, the Rubber dealers and the growers. Regrettably, the Board does not actively support and monitor the creation and operation of the RGSs in the study region. Internally, the RGS leadership is found to be afflicted with representation from wealthy Rubber garden owners, as well as a lack of rotation of leadership posts like the president within the prescribed duration. Moreover, very few RGSs are found to be actively engaged in providing training, processing and marketing support to the growers in the survey region. This has prevented the Rubber growers from easy, cost-effective group processing of Rubber as well as limited their ability to exercise bargaining power over Rubber prices, thereby forcing them to act as price takers in the market and face price fluctutations.

5.4 Policy recommendations

Based on the problem areas identified, some policy suggestions are listed below;

- **Diversification of livelihood sources**

To lessen the hazards associated with growing just one crop, Rubber plantations can be integrated into farm livelihood systems, agroforestry, and/or intercropping systems. Poultry and livestock farming, beekeeping, non-Rubber plantation development like bamboo, tea, Gamari, etc., production of vegetables and fruits such as, tuber crops, turmeric, pineapple, and bananas, are few examples of potential Rubber-friendly diversification alternatives. The Rubber Board, although arranges trainings for the Rubber growers to gain skills for carrying out some of these alternative livelihood

activities, should step up its promotions and support in this area to bring more Rubber growers under diverse livelihood generation practices.

- **Commercialisation of livestock farming**

As discussed earlier, most Tribal Rubber growers currently practice livestock farming to meet emergency credit needs and nutritional requirements. To encourage commercial livestock rearing, the Government with support of Rubber Board should educate these growers on the existing central and state government schemes to support poultry and livestock-based entrepreneurship development. Promoting the benefits offered by these schemes at a local level is expected to improve the Tribal Rubber HHs' interest and efforts in commercialisation of livestock farming.

- **Stepping up trainings on tapping, plantation management and processing of Rubber**

Many of these Rubber growers were motivated to start Rubber plantations by observing the profits it brought in for the fellow growers. However, they fail to recognise the role of skilled tapping and quality processing of Rubber for maintaining long term plant productivity and price advantages achievable with the production of higher grades of Rubber sheets. Given a considerable proportion of HHs with no training, the Rubber Board should amp up promoting the importance of trainings. Also, it should create more training centres in remote locations to cater to the local growers and increase the frequency of free of cost training programmes in the remote localities.

- **Correction of land ownership issue**

Given the experience of land ownership issue between the Board and the growers, the Board should be more prompt in scrutinising land rights documents of the potential entrants in the Rubber plantation sector in future. The potential growers should be made aware of the disadvantages of growing plantations illegally. Additionally, this will prevent conflicts between the Board and the State Forest department over land encroachment.

- **Regular disbursement of subsidy**

The Board often fails to grant subsidy to new growers due to lack of funds. In some cases, the pending subsidies are also not being disbursed to the existing growers for the same reason. The Central Government should be more prompt in regular allocation of funds to the Board to avoid such hiccups.

- **Increase RGS's presence and efficient functioning**

First and foremost, the Rubber Board should involve the Rubber growing communities in making the RGSs more active in assisting efficient input delivery, price moderation, output sales, etc. Smooth functioning of the RGSs will also provide these HHs to sell their Rubber sheets through these societies at unified price and at lower transportation cost, thereby improving their financial wellbeing. Similarly, the local authorities should encourage especially the women of the HHs to actively build and participate in SHGs to learn additional livelihood generation skills like piggery etc., to save small amounts of money to develop new livelihood sources and to use the saved funds during distresses, etc. The Board should also intervene in case of non-universal representativeness of the leadership positions.

- **Improvement of savings habit**

The local authorities as well as the Board should encourage and promote maintenance of regular savings in banks, post offices and other similar financial institutions to avoid financial emergencies and broaden the investment opportunities in the future.

- **Joint support of the Rubber Board and the State Government**

The state of Tripura has enjoyed tremendous success in Rubber-based livelihood generation among the Tribal growers and one of the attributing factors for this success is the active role of the State Government in promoting and devising various programmes, projects and schemes to benefit the Tribal people through plantations. Such active participation from the State Government of Assam is lacking till date. Prompt contribution and support from the State is required to make the issues of the local Rubber growers' count. The Rubber Board's financial woes in state's Rubber sector operations can also be curbed if the State Government comes out with financial assistance programmes specific to the sector.

5.4 Limitations and scope of further study

The present study mostly focuses on the Tribal communities of Goalpara and Kokrajhar districts of Assam. The livelihood assets status of these communities has been mostly similar across the three Tribal groups of Rabha, Garo and Bodo in the study region. However, the same outcome may not be generalised in case of other Tribal groups practicing Rubber plantation in other parts of the state. Due to fund constraints as well as limitation of time studying the assets status of more diverse Tribal groups of the state has remained outside the scope of the current study. Future studies may target districts like Karbi Anglong, Kamrup and Udulgiri for studying diversified livelihood development cases of different Tribal groups.

The scoring and weighing of the asset indicators may be possible using a multitude of methods like analytical hierarchy process (AHP), delphi method and principal component analysis (PCA), etc. among others. Hence, the present study's findings can be re-explored using these methods.

This study has mostly relied on the grower-side explanations, details and issues while understanding their asset conditions. Future studies may explore the institutional side of the story in a greater detail.

Covid-19 pandemic has changed the functioning of the existing economic systems in every corner of the globe. The Rubber sector of Assam should (or should not) be no exception. Based on the current study's findings, future studies may be developed to explore the post-pandemic accessibility conditions of livelihood assets of the Tribal growers of the state.

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ANNEXURES

1. Weight assignment of sub-component indices of the livelihood assets

(i) Physical assets

Sub-components	Categories	Weight
HH gadgets/appliances (TV, fan, hand pump and mobile phone)	Owning all four	1.00
	Owning any three	0.75
	Owning any two	0.50
	Owning any one	0.25
	Owning none	0
House ownership	Owned by self/family	1.00
	Otherwise	0
Ownership of poultry and livestock	Owning at least one of them	1.00
	Owning none	0
Housing condition	Pucca	1.00
	Semi-pucca	0.66
	Kachha	0.33
Distance to market	≤5 Km	1.00
	>5 Km	0
Road condition	Bituminous	1.00
	Brick	0.66
	Kankar	0
Ownership of vehicles (Car, motor bike and bi-cycle)	Owning all three	1.00
	Owning any two	0.75
	Owning any one	0.50
	Owning none	0.25

(ii) Human assets

Sub-components	Categories	Weight
HH size	≤mean of the selected community	1.00
	> mean of the selected community, but ≤1.5 times mean of the selected community	0.66
	> 1.5 times mean of the selected community	0.33
Training	Received training	1.00
	Untrained	0
Type of labour	Family	1.00
	Both family and hired	0.66
	Hired only	0.33
Education	Higher secondary and above	1.00
	Secondary	0.66
	Primary and less	0.33
Distance to nearest health center/hospital	≤5 Km	1.00
	>5 Km	0
Cost of healthcare	Free	1.00

	Paid	0.66
Source of drinking water	Hand pump	1.00
	Tap water supply by local authorities	0.75
	Dug wells	0.50
	Others	0.25

(iii) Natural assets

Sub-components	Categories	Weight
Land under Rubber	> 1.5 times mean of the selected community	1.00
	> mean of the selected community, but ≤ 1.5 times mean of the selected community	0.66
	\leq mean of the selected community	0.33
Tappable Rubber tree stock	> 1.5 times mean of the selected community	1.00
	> mean of the selected community, but ≤ 1.5 times mean of the selected community	0.66
	\leq mean of the selected community	0.33
Accessibility to water for Rubber processing	Very easy	1.00
	Easy	0.75
	Difficult	0.50
	Very difficult	0.25

(iv) Financial assets

Sub-components	Categories	Weight
Savings	Yes	1.00
	No	0
Loan burden	No	1.00
	Yes	0
Subsidy status	Received	1.00
	Not received	0

(v) Social assets

Sub-components	Categories	Weight
RGS membership	Yes	1.00
	No	0
SHG membership	Yes	1.00
	No	0
Selling point	RGS	1.00
	Home collection by private dealers	0.66
	Local market	0.33

2.

**AN EXPLORATION OF THE TRIBAL RUBBER GROWERS'
LIVELIHOOD ASSETS STATUS IN ASSAM, INDIA**

(Questionnaire for field survey of Rubber growers)

Sl no. Date

1. Respondent name

2. Contact no

3. (a) Gender (b) Age (c) Religion

4. (a) District (b) Village

5. Relationship with the HH head

6. HH size

7. Do you belong to any Scheduled Tribe community?

(a) If YES, mention the specific community name

(b) If NO, mention the Caste/Category

8. Mention highest educational qualification of HH members

.....

9. Primary occupation

10. Secondary occupation (if any)

11. How many Rubber trees do you have in stock?

12. How many Rubber trees were tapped in the last season?

13. (a) Do you practice intercropping with Rubber? Yes No

(b) If YES, mention the crop(s) names(s)

14. (a) Do you own poultry? Yes No

(b) If YES, mention the type(s) of poultry

(c) Do you own livestock? Yes No

(d) If YES, mention the type(s) of livestock

15. What purpose does poultry and/or livestock farming serve to the HH (if applicable)?

(a) Self consumption (b) Regular income generation

(c) Sale during emergency credit requirement

- (d) If combination(s) of the mentioned options apply, specify
16. How much land do you have under Rubber cultivation (in hectare)?
17. (a) Do you produce crops other than Rubber and its intercrops?
 Yes No
- (b) If YES, mention the crop(s) name(s)
- (c) How much land do you have under these crops (in hectares)?
- (d) What purpose do these crops serve to the HH?
 Self-consumption Sale Both
- (e) In what quantity and at what rate (Rs.) are the crops sold during the last season (if applicable)?
18. What is the source of labour used in your Rubber plantation(s)?
 (a) Family only (b) Hired only (c) Both
19. How many labourers are employed during tapping and processing of Rubber in a day?

20. What is the tapping frequency followed in your plantation in a month?

21. How do you pay the labourers (if applicable)? Specify

22. What quantity of Rubber sheets do you produce in a year (in Kg)?
23. From where do you purchase inputs required for Rubber tapping and processing?
 (a) RGS (b) Authorised private dealers (c) Local market
24. Where do you sell Rubber sheets?
 (a) RGS (b) Home collection by private dealers (c) Local market
25. (a) What is the source of water for Rubber processing?.....
 (b) How difficult is it to fetch water for Rubber processing?
 Very easy Easy Difficult Very difficult
26. (a) Did you receive training for Rubber plantation development and management?
 Yes No
- (b) If YES, mention the agency name from where training has been obtained
- (c) Is the training provided free of cost (if applicable)? Yes No
- (d) If NOT, how much did you pay for the training (in Rs.)?
- (e) What, according to you, are the benefits of being a trained Rubber grower?

27. (a) Did you receive a subsidy from the Rubber Board for Rubber plantation related operations?

Yes No

(b) What part of the plantation activity did you receive subsidy for?

(c) How many instalments of subsidy did you receive till the last tapping season?

28. (a) Do you or your family members have membership in RGS? Yes No

(b) What benefits do you/family member enjoy from this membership? Specify

.....

29. (a) Do you or your family members have membership in any SHG?

Yes No

(b) Mention the name of the SHG

(c) What activities does the SHG perform?

(d) How frequently do the SHG members meet in a month?

(e) Do you feel benefitted being a member of the SHG? Yes No

(f) If YES, why so?

(g) If NO, why so?

30. Do you or your immediate family own a house? Yes No

31. What type of house do you live in?

(a) Kutchra (b) Semi- pucca (c) Pucca

32. How much land do you have in your residence?

.....

33. Select the HH gadgets you/HH members own

(a) TV (b) Fan (c) Hand pump

(d) Mobile phone (e) None

34. Select the vehicles you/HH members own

(a) Bi-cycle (b) Motor bike (c) Car (d) None

35. What is the source of drinking water for your HH?

(a) Hand pump (b) Tap supply by local authority

(c) Dug wells (d) Other (specify)

36. (a) How far is a health centre or local hospital from your house?

Distance \leq 5 Km Distance $>$ 5 Km

(b) Do you receive free of cost health care in this health centre/hospital?

Yes No

37. How far is the local market from your house?

(a) Distance ≤ 5 Km (b) Distance > 5 Km

38. (a) Road condition in your house's neighbourhood

Bituminous Brick Kankar

(b) How difficult is the transportation through this road for you?

Very easy Easy Difficult Very difficult

(c) Why so?

39. (a) Do you/HH member(s) have savings account(s)? Yes No

(b) Name of the bank/financial institution where the account is created

.....

40. (a) Do you have outstanding loans till the last tapping season? Yes No

(b) For what purpose is the loan taken?

(c) Name of the lending agency (if applicable)