Study No .: 155

SOCIO-ECONOMIC TRANSFORMATION OF *REANG* PRIMITIVE TRIBAL GROUP THROUGH RUBBER PLANTATION IN TRIPURA

STUDY SPONSORED BY
Ministry of Agriculture and Farmers' Welfare
Government of India, New Delhi

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Jorhat-785013

2021

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2021

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PREFACE

The study entitled, "Socio-Economic Transformation of *Reang* Primitive Tribal Group through Rubber Plantation in Tripura" was undertaken by the AERC, for North -East India, Jorhat as an individual study of the centre approved by the CCOS.

As per accepted design, the study was conducted on the basis of primary and secondary level data. Tripura is the third smallest state of India and the smallest state of North- Eastern Region in terms its geographical area. As per land use statistics, the forest area covers more than 60 per cent and about 27 per cent of the total area is enumerated as agricultural land. A large part of the land is hilly *tilla* land. The total population of the state was about 36.74 lakh as per 2011 Census, characterized by social diversity with their own cultural identity and one third of the population belongs to Schedule Tribes (ST). There are 19 sub-tribes among the ST population. *Reang* tribe is the second largest population next to *Tripuri* tribe of the state. This tribe is also listed under the Primitive Tribal Group (PTG) of Tripura.

About 42 per cent of the population of the state depends on agriculture & allied activities. The *Reang* tribe mostly practiced *Jhum* cultivation at large. But number of *Jhum* cultivators has declined over the years. *Jhuming* being a subsistence agriculture there lies a little scope of applying modern technology for which their life and livelihood still under sub-standard condition. Reports are found in plenty on poor economy and harmful effects on ecology and environment for *Jhum* cultivation. As such continuous efforts are going on to find an alternative way of livelihood for this chunk of population in the state of Tripura. With this end in view, the Forest Department of Tripura in 1982, started rubber plantation for rehabilitation of this PTG practicing *Jhum* cultivation. Thus, a revolution set off through rubber plantation.

In order to see the socio-economic transformation of the *Reang* tribe, a comparative analysis was also undertaken among the farmers practicing *Jhum vis-a-vis* rubber cultivation. The report has seven chapters, each with relevant sub-section addressing important aspects and development of socio-economic condition of the tribe and policy suggestions to be adopted for improvement.

The Agro-Economic Research Centre, Visva Bharati, Shantiniketan, West Bengal is the designated peer Reviewer for the Agro-Economic Research Centre, Jorhat. The draft report was submitted to the AER centre, Shantiniketan for comments and a few changes have been made in the final report as suggested. I am thankful to Dr. B.C. Roy, for critically reviewing the report.

I am also grateful to the MoA & FW for their valuable comments on the final draft and as suggested, explanations have been incorporated in the final report.

I am thankful to our research staff at the centre without whose sincere cooperation; the work would not have been possible. I acknowledge gratefully the help and guidance rendered by Dr. A.K. Ray, Dean (Academics & Research, ICFAI University, Tripura) as consultant of the study. The names of the research staff associated with the study are mentioned elsewhere in the report.

I hope that the findings of the Report will be useful to the policy makers and researchers as well.

(Anup Kr. Das)
Honorary Director
November 12, 2021, Jorhat AERC, for N-E India, Jorhat, Assam

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ACRONYMS

ADC	Additional Deputy Collector
CAGR	Compound Annual Growth Rate
GOI	Government of India
ICAR	Indian Council of Agricultural Research
NR	Natural Rubber
NH	National Highway
NRP	National Rubber Policy
PTG	Primitive Tribal Groups
RPS	Rubber Producer Society
SR	Synthetic Rubber
TTWD	Tripura Tribal Welfare Department
TTAADC	Tripura Tribal Areas Autonomous District Council
TFDPC	Tripura Forest Development and Plantation Corporation Ltd.
TRPC	Tripura Rehabilitation in Plantation Corporation Ltd
USAID	United States Agency for International Development
UNDP	United Nations Development Prgramme

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Executive Summery

Shifting cultivation also known as *Jhum* cultivation is practiced by the most of the hill tribes of the North- Eastern region. These hill tribes live in small groups surrounded by vast tracts of forest. *Jhum* cultivation also compels them to live a nomadic life as they are to move from one place to another place in search of new plot of land for cultivation.

In the past, shifting cultivation had been the most rational and viable method of farming and consequently slashing and burning of forest was the normal way to access to land for cultivation. Besides *Jhuming*, they could supplement their food requirement by hunting and gathering of wild fruits & vegetables, bamboo shoots *etc*.

Initially *Jhum* cycle was ranging from 20 to 30 years, but as per the latest report, the *Jhum* cycle in most of the areas of Tripura has come down to 2-3 years due to ever rising population. As per TTADC Survey Report (2015), about 16,948 households were associated with *Jhum* cultivation in Tripura.

It has been observed that the output-input ratio in *Jhum* cultivation has come down over the years, for which the *Jhumias* of the state continue to lead a sub-standard life. Continuous decline in soil fertility on account of ever dwindling *Jhum* cycle resulting in low productivity of crops, high cost of land preparation, non-use of fertilizer and scanty or no rainfall at proper time are identified to be the major constraints of *Jhum* cultivation. Also the scientists at different points of time have reported that *Jhum* cultivation has multiple negative impacts on natural environment due to reckless deforestation of hilly areas. In this regard, a lot of experiments are still going on to replace the *Jhum* practices by settled cultivation. Efforts have been made to rehabilitate the PTG people through teak plantation at the initial stage and then through rubber plantation in lieu of shifting cultivation.

The first idea of rubber cultivation to replace *Jhum* cultivation in Tripura sprouted in 1976 and to that end, the State Government came forward to establish a new Department called Tripura Forest Development and Plantation Corporation Limited (TFDPC Ltd). The Department started rubber plantation on trial basis and got excellent results. Perhaps, this was the turning point of the success story of natural rubber industry in the State of Tripura. Later on, timely and good initiatives of the Government and establishment of the Regional Rubber Board Institute have given a

new scale of growth in rubber cultivation. It is also true that the agro-climatic conditions of the State are quite suitable for rubber plantation for which within a very short period of time, Tripura occupied the second position amongst the natural rubber producing States of the country.

At the same time, involvement of the *Jhumias*, particularly the *Reang* farmers in rubber cultivation has brought out a new ray of hope for up lift of the socio-economic conditions of the group. As per available census record, *Reang* tribe is the second largest ST community of Tripura next to *Tripuri* Tribe. They are the poorest and most backward ethnic group of the State living in remote hamlets and they are identified as the only Primitive Tribal Group of Tripura (PTG).They have a unique socio-cultural identity different from other tribes of the state. The dialect of *Reang* is called *Kok-borok.*

In this back drop, the present study was undertaken to evaluate the status of *Reang* tribe practicing *Jhum* and rubber cultivation in Tripura with a special focus on the socio-economic transition. The study was undertaken with the following objectives:

Objectives of the Study

1. To study the trends of area, production and productivity of rubber and *Jhum* in Tripura
2. To evaluate the impact of rubber plantation on income, employment, education, health, drinking water, sanitation, housing patterns of the *Reang* tribe of the State
3. To examine the relation between rubber plantations and local environment
4. To identify the constraints of rubber plantation and suggest ameliorative measures.

Methodology

The study was based on both primary and secondary level data. Primary data were collected with the help of a well-structured questionnaire from 300 *Reang* households, randomly selected from the 3 blocks of 3 districts of the State of Tripura, where rubber plantation programmes have been implemented at the behest of Tripura Tribal Welfare Department (TTWD) & Primitive Tribal Group (PTG). Secondary data were collected from the internet pages of various annual reports of the Tripura Rehabilitation and Plantation Corporation (TRPC) & Primitive Tribal Group (PTG) Department and Tripura Forest Development & Plantation Corporation (TFDPC),

various newspaper clips, journals, various published or unpublished reports and working papers available at different state and national level institutions.

Statistical Model Used

To analyze the primary data simple statistical tools like percentage, averages, cross tabulation analysis and other parametric and non-parametric tests have been tried. To study the trends of area, production and productivity of rubber and *Jhum*, the following model has been used:

The trend lines of different parameters of *Jhum* and rubber were calculated by choosing suitable trend equation giving best fit with the data.

To work out CGAR in area, production and productivity, the following equation was used

$$Y= a\ b^{t}\ e \ldots\ldots (1)$$

Where, Y= Dependent variable for which growth to be estimated

a= Intercept

b= regression coefficient

t= time variable

e= error –term

The compound growth was obtained by taking log of the equation (1)

$$\log Y=\log a+ t \log b +\log e \ldots\ldots (2)$$

The per cent of growth rate was derived by using the following relationship

$$CGAR= (\text{Anti log of } b-1) *100 \ldots\ldots (3)$$

To test the significance of CAGR (r), standard error was estimated with the formula given in equation (4) as-

$$S.E.(r) = \frac{100\ b}{\log_{10} e} \sqrt{\frac{\left[\sum(\log y)^2 - \frac{(\sum \log y)^2}{N}\right] - \left[\sum x^2 - \frac{(\sum x)^2}{n}\right](\log b)^2}{(n-2)\left[\sum x^2 - \frac{(\sum x)^2}{n}\right]}} \ldots\ldots (4)$$

Where,

$\log_{10}e = 0.43429$

And, the ‘t’ value was estimated as-

$$t = \frac{r}{S.E.(r)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Average rating of different environmental parameters as well as constraints of rubber production was worked out by applying the formula

$$\text{Average Rating,} \quad R = (\sum_{i=1}^{5} r_i\, p_i)/100$$

Here, r_i, indicates rating value, where, i=1,2,3,4,5 (r_1=1, r_2=2,………r_5=5) and p_i indicates the percentage of respondents in r_i

Sampling Design

Multi-stage stratified sampling technique was used for selection of the sample units. In the first stage, 3 large *Reang* inhabited districts *viz.,* North, Dhalai and Gomati were selected purposively. In the second stage, one block from each district, *i.e.* Dasda block of North district, Ambassa block of Dhalai district and Amarpur block of Gomati district were randomly selected. In the third stage, one village [a cluster of hamlets (*basti*/small settlements)] from each block *i.e.* having adequate number of samples was selected purposively. Then, a list of *Reang* cultivators growing rubber and *Jhum* crops were prepared separately for each sample cluster and finally, 50 *Jhum* cultivators and another 50 rubber cultivators were selected randomly from each sample block. In aggregate, 100 samples were selected from each district and with this design; altogether 300 sample farmers were selected from 3 sample districts of the State for the study.

Major findings of the study from secondary level data sources

Under *Jhum* practices, paddy occupied about 95 per cent of the area and the rest of the area was covered by maize, pulses, sesame, chilly, mixed vegetable, *etc.* The area under *Jhum* has increased from 15,667 hectares in 2006-07 to 16,843 hectares in 2016-17 with a CAGR of 1.75 per cent.

The production of *Jhum* crops had shown an increasing trend from 15,514 MT in 2006-07 to 18,190 MT in 2016-17 with a CAGR of 2.60 per cent. The per hectare yield of *Jhum* crop had shown a steady growth from 990 kg in 2006-07 to 1080 kg in 2016-17 with the CAGR of 0.85 per cent.

The area under Natural Rubber (NR) trees in Tripura has increased from 36,862 hectares in 2005-06 to 84,308 hectares in 2017-18 with the CAGR of 6.97 per cent and was found significant at 1 per cent level.

The production of Natural Rubber had increased from 25,793 tonnes in 2005-06 to 65,330 tonnes in 2017-18 with a CAGR of 6.79 per cent which was found significant at 1 per cent level.

Per hectare yield of NR had shown an increasing trend from 700 kg in 2005-06 to 780 kg in 2017-18. But due to decline in yield between the period 2006-07 and 2016-17, the CAGR indicated a negative growth of 0.13 per cent which however, was found insignificant. It was observed that per hectare yield of NR in Tripura was found to be much lower as compared to national level yield (1,450 kg/ha).

The annual estimated value of the products from NR plantation in Tripura during 2015-16 to 2017-18 was also worked out on the basis the available published data. The value of the products was found to increase from Rs. 587.88 crores in 2015-16 to Rs. 881.96 crores in 2017-18. The estimated value of the rubber products in terms of percentage to the GSDP of Tripura was recorded at 1.64 in 2015-16, 1.92 per cent in 2016-17 and 1.91 per cent in 2017-18. These figures clearly indicate the impact of rubber plantations in the State economy as well as on the livelihood of the rubber growers.

Economic status of *Jhum* and Rubber Farmers

The change in income was assessed by comparing gross return and net return from *Jhum vis-à-vis* rubber plantation in the study area.

The overall per hectare gross and net return per annum from rubber cultivation was found much higher than that of *Jhum* cultivation across the three sample blocks under three different districts.

The overall per hectare gross return from *Jhum* cultivation was recorded at Rs.18,647 in Dasda block in North District, Rs.19,923 in Ambassa block of Dhalai district and Rs.19,673 in Amarpur block of Gomati district while the per hectare gross return from rubber cultivation was recorded at Rs.111,100 in Dasda block in North District, Rs.101,221 in Ambassa block of Dhalai district and Rs.124,800 in Amarpur block of Gomati district.

The overall per hectare net return from *Jhum* cultivation was recorded at Rs.1,837 in Dasda block in North District, Rs.1,617 in Ambassa block of Dhalai district and Rs.2,145 in Amarpur block of Gomati district while the per hectare net return from rubber cultivation was recorded at Rs.77,200 in Dasda block in North District, Rs.69,020 in Ambassa block of Dhalai district and Rs.98,650 in Amarpur block of Gomati district.

The overall BCR of rubber cultivation was found to be three times more than that of *Jhum* cultivation across the sample blocks.

Employment Generation

The average per hectare annual employment in terms of man-days was found to be on higher side in rubber cultivation compared to shifting cultivation.

The average per hectare per year employment from *Jhum* was found at 124 man-days in Dasda block in North District, 126 man-days in Ambassa block of Dhalai district and 127man-days in Amarpur block of Gomati district while in rubber cultivation, it generated 153 man-days in Dasda block in North District, 146 man-days in Ambassa block of Dhalai district and 168 man-days in Amarpur block of Gomati district.

Education Status

Attendance pattern of the school going children was critically studied to see the awareness level and also to capture the spread of education among the *Reang* tribe in the study area. Field investigations amply demonstrate that economic conditions of the farm families played a vital role in taking the decision of sending their wards to the schools. And the awareness level was found to be much higher among the families adopting rubber plantations as compared to the *Jhumias*.

In case of *Jhum* cultivators, 6 to 20 per cent of the children were found to be regular in attending school and in case of rubber cultivators, it was found 60 to 76 per cent across the three sample blocks. The percentage of irregular students in attending of school was found at 32 to 64 per cent for *Jhum* cultivators and it was 20 to 30 per cent for rubber cultivators under three sample blocks. The children not attending school at all was found between 16 to 54 per cent in respect of *Jhum* cultivators while it was found between 4 to 10 per cent in case of rubber cultivators under the three sample blocks. By and large, the children's education in the study area can't be said to be satisfactory. But the children of the farm families growing rubber were in a better off position in terms of school education, may be because of accrual of higher income from rubber, and for that matter, they could afford to part with their additional income for children's education.

Type of Dwelling House

The type of dwelling house, the people live in, indicates the socio-economic condition of a community. Therefore, during the field investigation, the type of dwelling house was also taken into account while assessing the living standards of

both the sample groups, that is, the group of farmers involved in shifting cultivation and the group adopting rubber plantations. As per the survey records, about 92 to 96 per cent of the respondents practicing shifting cultivation still lived in Mud/*Kutcha* houses, 1 to 4 per cent of them lived in *Pucca* houses and 3 to 4 per cent lived in semi-*Pucca* house with tin roof while in case of rubber cultivators, 12 to 50 per cent of the respondents lived in Mud/*Kutcha* houses, 10 to 33 per cent of respondents lived in *Pucca* house and 36 to 55 per cent of the respondents lived in semi-*Pucca* house with tin roof. As such, the housing conditions of majority of the sample respondents were far from satisfactory level. But the farmers growing rubber crop were comparatively in a better off condition in terms of housing facilities, as compared to the *Jhumias*.

Drinking Water and Sanitation Facilities

A safe source of drinking water is a must for maintaining good health. As such, an effort was made to examine the status of safe drinking water in the study area, particularly with reference to the two groups of *Reang* farmers, *i.e.* the farmers practicing *Jhum vis-à-vis* the farmers adopting rubber cultivation. About 50 to 60 per cent of the cultivators practicing *Jhum* accessed water from well & natural stream, 28 to 32 per cent accessed water from tank and only 4 per cent of the sample farmers could access clean water from the Municipal Corporation. It is a big challenge before the Municipal Corporation/Boards of the State to cover those disadvantaged segments of the society living in the hilly terrain.

In case of rubber cultivators, the situation is little better in the sense that the road connectivity to the plantation area is good enough and there were some focused development programmes launched by the Government and the Regional Rubber Board of Tripura. May be for these reasons, 23 to 38 per cent of the sample rubber cultivator could access clean drinking water from the Municipal Corporation/Boards of Tripura. Nearly 27 to 35 per cent of the sample farmers accessed drinking water from tube wells and 20 to 36 per cent of the sample farmers continued accessing water from well & natural stream.

Going by the ground realities, it can very well be seen that the rubber cultivators are in an advantageous position, may be because of the support received under different Schemes and development programmes exclusively meant for promotion of rubber plantations launched by the Government of Tripura and Rubber Board.

Sanitation Status of the Sample Households

Together with clean drinking water, adequate sewage disposal systems constitute the edifice of a good sanitation programme. Maintaining personal hygiene is must for good health and also to prevent the spread of diseases. In this regard, the Government of India in partnership with UNICEF has made remarkable achievement in the country in reaching the Open Defecation Free target since 2014.

A simple analysis was carried out on the basis the information collected from the rubber growers to see the changes on the status of sanitation before and after the adoption of rubber cultivation as a means of livelihood option across the sample blocks.

Before adoption of rubber cultivation, only 4 to 12 per cent of the sample farmers used *Pucca* toilets, which increased to 50 to 80 per cent following adoption of rubber plantation. About 48 to 50 per cent of the sample farmers used *Kutcha* toilets and 40 to 47 per cent went for open defecation before the adoption of rubber cultivation. But the situation underwent major changes after the adoption of rubber cultivation by the farmers, which can be well reflected from the drastic reduction of *Kutcha* toilet users to 12 to 30 per cent and open defecation to 8 to 12 per cent.

Health & Hygiene

Health has been defined by the WHO as "A complete state of physical, mental and social well-being, not merely absence of disease or infirmity". And hygiene is the conditions or practices conducive to maintaining health and preventing disease, especially through cleanliness.

Reang, as a tribe, live in remote areas and it is not always possible for them to avail off the medical facilities provided by the State Medical Department on time. The field investigations clearly indicate that blood pressure related disease, diarrhoea, malaria, flue and headache were the common diseases found amongst both the group of farmers (farmers practicing *Jhum* and the farmers growing Rubber) of the *Reang* community of Tripura. And these diseases mostly occurred due to contaminated food or water or being exposed to organisms such as bacteria, viruses, fungi or parasites.

It was revealed that only 6 to 32 per cent of the cultivators practicing *Jhum* used to visit the PHC for treatment of their diseases, while the corresponding range of figures for rubber cultivators stood at 40 to 66 per cent. About 32 to 40 per cent of the *Jhum* farmers and 12 to 30 per cent of the rubber cultivators went to *Kabiraj* for treatment. As against this, nearly, 20 to 22 per cent of the *Jhum* farmers and 12 to 20

per cent of the rubber farmers used to take medicines as per the advice of the medical shop keeper (Pharmacy). Similarly, 10 to 12 per cent of the *Jhum* farmers and 0 to 10 per cent of the rubber cultivators used to consult with their friends for treatment of their ailments. Both the groups of farmers were not free from superstitious beliefs, which can very well be reflected from the fact that about 4 to 10 per cent of the *Jhum* farmers and 0 to 12 per cent of the rubber farmers went to the village *Tantrik* for treatment of their diseases.

The results clearly indicate that after adoption of scientific settled cultivation with rubber, the sample beneficiaries became more and more health conscious following vigorous campaign launched by the Governments with the aids of different media, both print and visual and health extension machineries, enlightening them about the risk of consulting with *Kabiraj*, village *Tantrik* or Medical Shop.

Rubber Plantation and its Effect on Local Environment

Eco-friendliness nature of rubber plantations has been reiterated by many of the researchers in earlier decades. It has been found very effective in harnessing the carbon dioxide and releasing oxygen in the atmosphere. The relation between rubber and environment can very well be manifested in terms of biomass generation, natural recycling, sustainability issues and soil conservation, as highlighted by many of the authors. Past experiences also indicate that besides giving a viable alternative to the landless tribal people of the State, rubber plantations had mitigated the ecological imbalance caused by the traditional shifting cultivation, thereby restoring the degraded forestlands. But some of the recent studies indicate startling findings, which have raised eyebrows of all concerned connected with the ecology of the State. The rubber plantation is mostly grown as monoculture and as such, it offers lower biodiversity. The scientists consider monocultures as 'biological deserts' because of the fact that unlike natural forests, they don't accommodate diverse plant and animal species and on that count, debilitating effect of monocultures was contemplated with rubber plantations, including that of disturbance of ground water reserve and soil quality.

The average ratings of perceptions at aggregate level clearly indicate that the rubber growers did not agree with the common notions that there were soil erosion (Score 2.00) or rise in temperature (Score 2.03) or occurrence of drought-like situation (2.35) or destruction of valuable trees (score 2.67) because of rubber

plantations. But a sizeable number of rubber growers with score 3.55 in a scale of 5.00 opined that there was a decline in the rainfall pattern over the years.

By and large, the respondent farmers were not sure of any negative effect of rubber plantation on local environment so far, rather there were marked improvement in maintaining the ecological balance in the study area through added biomass, prevention of soil erosion and development of watershed *etc*.

Constraints of Rubber Production

By constraint, we mean something that imposes a limit or restriction or that prevents something from occurring. It is also a fact that forest dwellers supplement their food requirement from natural edible forest products such as wild nuts & fruits, roots, vegetables, bamboo shoots, *etc.* These issues cannot be isolated ones, rather are being encountered globally in different rubber growing countries.

As the present study is an attempt to see the socio-economic transformation of a particular tribe (*Reang*) through rubber plantations in the State of Tripura, it will be imperative to identify the constraints, if any, faced by the rubber growers. As such, the sample respondents were asked to offer their feedback for the constraint analysis and accordingly the results are documented and presented in the report.

While perusing through the responses of the sample farmers, it was noted that basically they came across a set of seven major problems, namely, (a) shortage of good quality seedlings, (b) low price of rubber sheets, (c) non-availability of fertilizer and pesticide on time, (d) low rainfall, (e) environmental pollution from rubber sheet production, (f) extinction of edible forest produce due to rubber plantation and (g) limited biodiversity. In addition, there were the common problems of lack of awareness and support, dearth of skilled labour, high input cost and inferior quality of rubber sheets, as reported by a small section of respondent farmers.

Careful perusal of constraint analysis indicate that at aggregate level, low price of rubber sheets topped the list of constraints encountered by the sample respondents with a score of 4.80, followed by shortage of good quality seedlings with score 4.59 and non-availability of fertilizer and pesticides on time with a score of 4.51. In terms of intensity, four other constraints were rated lower, more specifically, extinction of edible forest products (2.84), decrease in productivity of latex (2.65), change of biodiversity (2.65) and pollution from rubber sheet production (2.61). District-wise responses also indicated a similar pattern so far as the constraints were concerned.

Rubber Plantation: A Future Perspective

The present study to see the socio-economic transition especially among the *Reang* tribe due to wide acceptance of rubber plantations has prompted the investigators to consider it to be an excellent success story from the State of Tripura. All the family members, as a unit were found to contribute towards growing of rubber plants with a common responsibility, as it was a question of livelihood. Supports from the Government and Rubber Board successfully provided them with all backward and forward linkage, with the establishment of rubber processing plants at community level.

Involvement of Self Help Group (SHGs) in rubber processing unit was yet another indication of women empowerment in the study area. The women members were found to take real interest in undertaking the diverse activities of the rubber processing units, thereby opening up a new vista for society at large. Adoption of a new venture like rubber plantations had given them the taste of income, employment and a status in the community.

Success of paradigm shift from *Jhum* to rubber cultivation by the *Reang* tribe had also sensitized and encouraged the other tribes of the State and poor Scheduled Caste people to go for it in a massive way even with owned funds or institutional borrowings. The industrialists from other States also got attracted to start rubber plantations in Tripura. Besides enhancing income and improving health, education and socio-political status of the *Reang* families, it has brought out a revolutionary change in the mental make-up of the participants. It has created a new lease of confidence, self-respect and a sense of equality amongst themselves. Under the changed situation, undoubtedly, it would be a great challenge before the Government to tap the opportunity of involving them in a new kind of livelihood patterns.

Besides economic development, rubber cultivation has settled *Reang* tribe in a particular area for which they can now reap the benefits education, health & hygiene and other social and political amenities of the modern societies of Tripura. Also due to settling in a particular area it creates an opportunity to live in nuclear family and can take all the prevailing advantages of nuclear family for their sons and daughters. Therefore, modern technology with institutional policy support is a need of the hour for rubber growers to address the challenges of poverty, employment and socio-economic status of the *Reang* tribe of the Tripura.

Suggestions for improvement

Looking into the problems encountered by the sample beneficiaries and the aged-old social inertia, the following suggestions are made for appraisal and intervention of various agencies for socio-economic transformation of different tribal groups including the *Reangs*, living in the State of Tripura through better livelihood options.

- The productivity of natural rubber in Tripura (Less than 800 kg/ha as against a national average of 1500 kg/ha) has remained stagnant since last 4 decades, which needs immediate attention of the associated R & D agencies and other support services.
- Quality planting materials need to be provided to the rubber growers to build up and retain confidence
- The gestation period for natural rubber production was found to be about 6 to 7 years. As such, technical feasibilities may be explored for raising other crop and livestock activities in combination, for supplementary income generation.
- Most of the rubber growers used to dry the rubber sheets in the open sunlight in the study area. Use of drying machine can reduce the cost of scarce labour as well as protect the farmers from post-harvest losses.
- The Government/Rubber Board may come forward with a kind of policy to fix the price of the rubber sheets well in advance, which is expected to cover the cost of production plus a minimum of fifty per cent margin.
- Establishing market linkage can be yet another important actionable strategy for the benefit of the *Reang* and other tribes of the State.
- Credit on easy terms may be made available for the needy growers at the initial stage.
- The input costs, mainly fertilizers and pesticides cost are to be regulated/subsidized and may be made available on time.
- The new growers need to be educated and trained on modern agro-techniques of rubber cultivation with method and result demonstration.
- Formation of rubber producing societies may be encouraged to leverage umpteen numbers of benefits.
- Private players may be encouraged to play effective role in the entire channel from production to consumption.

- There should be strict vigil on the part of the Government, particularly on environmental issues and precautionary approaches are to be adopted for addressing the problems of sustainability, soil conservation, biomass generation and biodiversity on acceptance of rubber in the cropping patterns of the localities.
- Aggressive campaign may be launched to sensitize and inspire the tribal communities, who are still practicing shifting cultivation for mass acceptance of rubber as a viable alternative.

Conclusion

The findings of the present study have amply demonstrated that there were significant changes in the lives and living of the *Reang* tribe of Tripura with the adoption of rubber plantations. The same model can very well be replicated in the areas with similar techno-economic conditions. Accordingly, the State Government in association with the Rubber Board may come forward with a robust policy support in the line suggested above, to encourage and inspire the people to go for it. With successful introduction of rubber in the cropping patterns, a comprehensive action plan may be developed for the State as a whole, which will protect the ever-degrading forest land in one hand and simultaneously address the economic, environmental and social security issues and women empowerment on the other. At the same time, urgent necessary actions are imperative to get rid of the problems relating to price realization, quality planting materials, input costs and skilled labour as identified by the respondent farmers, while keeping an eye on the findings of the scientific studies being conducted throughout the globe on effect of rubber on environment.

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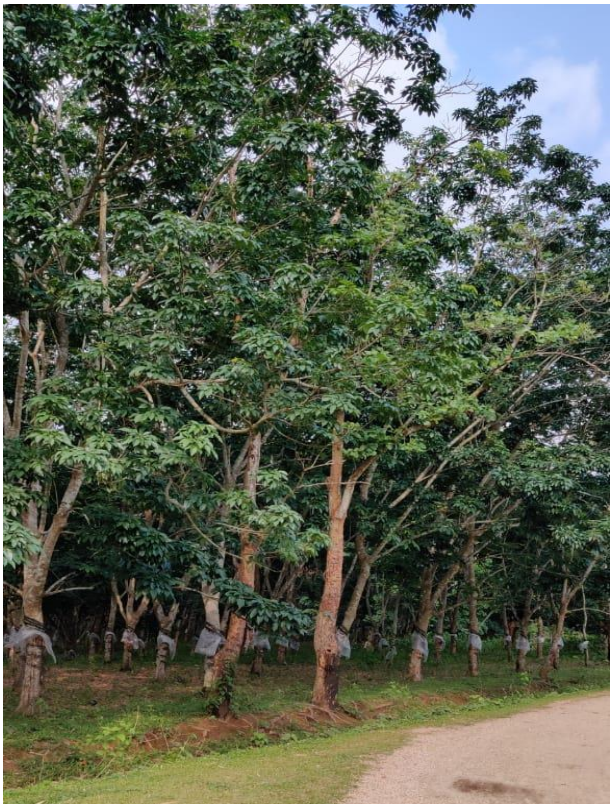


A View of Road Side Rubber Garden

A View of Protection of Latex from Rain

CHAPTER– I

INTRODUCTION

1.1 State of Tripura at a Glance

Tripura was merged with the *Indian* Union after independence as a Union Territory on October 15, 1949 and became a full-fledged State on January 21, 1972. It is the third smallest State in India with a total geographical area of 10,491.69 sq. km. located in the North-Eastern part of India. The total length of its border is 1,018 km. of which about 856 km. covers international border with Bangladesh, 53 km. with Assam and the rest 109 km. with Mizoram.

As per Census data (2011), the population of Tripura is characterized by social diversity. Of the total population of the State (36,73,917), the Scheduled Tribes (ST) comprise about one-third of the population(11,66,813) constituting 31.75 per cent of the total population of the State. Gender-wise, the total ST male was 5, 88,327 and total ST female was 5,78,486. The population density of Tripura in 2011 was 350 persons per sq. km. as against the all-India figure of 382.

There are 19-sub tribes among the ST population of the State with their own cultural identity, namely i) Tripuri, ii) *Reang*, iii) Jamatia, iv) Chakma, v) Lusai, vi) Mog, vii) Garo, viii) Kuki, ix) Chaimal, x) Uchai, xi) Halam, xii) Khasia, xiii) Bhutia, xiv) Munda, xv) Orang, xvi) Lepcha, xvii) Santal, xviii) Bhil and xix) Noatia.

The Schedule Caste (SC) population of the State as per 2011 Census was 6,54,918 *i.e.*17.80 per cent of the total population. The SC population was scattered in different regions of the State while ST population were usually confined to a particular region/pocket only.

Tripura's economy is basically agrarian in nature and 42 per cent of the population depends on agriculture & allied activities. However, due to hilly terrain and forest cover (6,29,426 ha), only 24.34 per cent (2,79,050 ha.) of the total geographical area is available for cultivation. Paddy is the principal crop followed by wheat, maize and pulses. Amongst the horticultural crops, jack fruit and pine apple are at the top of the list. Banana, areca nut and coconut are also grown profusely. In addition, other horticultural crops like vegetables, spices and potato are also grown in the State. Sugarcane, jute, mesta and cotton are the cash crops of the State. Rubber and tea are the most important plantation crops of the State occupying 3.04 per cent of

the total cropped area. Tripura ranks second in India, next to Kerala in production of natural rubber. Bamboo is also grown abundantly in Tripura.

Moreover, the State is also known for its handicraft product particularly hand-woven cotton product, wood-carvings and bamboo products.

1.2 *Jhum* Cultivation in Tripura

Historically, *Jhum* is an agricultural technique which involves slash-and-burn of forest and wood lands to create agricultural field for cultivation. Such type of agricultural practice is also found in several other countries of the world. Traditionally the tribal people in the Northeast, including those in Tripura practiced *Jhum* (shifting cultivation) in the hill slopes as an important means of livelihood. With relatively low density of population and long *Jhum* cycles, these communities could manage their livelihood reasonably well enough. However, the situation changed drastically over the years, largely due to increase in population (Karthik *etal*.2009 and Behera & Nayak, 2017) in the wake of substantial improvement in health infrastructure and declining mortality. This has made the traditional agricultural practices unsustainable and searching for alternative livelihood became inevitable (Roy *etal*.2015). In spite of a number of formidable constraints, *Jhum* cultivation in many parts of the State continues because of the fact that they do not have sufficient plain land for settled cultivation and secondly, it is ingrained as a tradition and culture in back of their minds. Initially, *Jhum* cycle was ranging from 20 to 30 years, but with the increase in size of population and rise in their demand for land, the *Jhum* cycle had reduced to 5-6 years (Chakma, *et al*.2008). But due to ever rising population, the *Jhum* cycle in most of the areas of Tripura has now come down to 2-3 years. Usually, multiple mixed cropping patterns are followed in *Jhum* cultivation and at least 3 to 4 crops are grown in the same plot of land. As such, the cost of land preparation is little less for the subsidiary crops and hence aggregate per hectare cost of production under *Jhum* cultivation as a whole, remains at reasonable level.

In Tripura, *Reang* primitive tribal group practiced *Jhum* cultivation since long together with *Deb Barma, Jamatiya* and *Chakma*. Traditionally, *Jhum* cultivation was the main source of livelihood for most of the tribal people of the State. However, the number of people dependent on *Jhum* has declined over the years. *Jhum* is a subsistence type of agriculture that typically uses little technology for which the *Jhumias* continue to live a sub-standard life. In Tripura, the crops grown by the people in the hills on their *Jhum* land include rice, cotton, chillies, vegetables, *etc.*. Although,

the number of *Jhumia* family has come down from 25,000 in 1968 to 16,948 in 2015, as reported by the Tripura Tribal Areas Autonomous District Council (TTAADC), a sizeable number of tribal families still continue to depend on shifting cultivation (Table-1.1).

Table – 1.1
Number of *Jhumia* Households and People Dependent on *Jhum* Cultivation during 1968 to 2015 in Tripura

Year	Source	No. of household	No. of dependent people
1968	J.B. Ganguly	25,000	-
1978	Benchmark Survey	46,847	2.59 lakh
1987	Benchmark Survey	55,049	2.88 lakh
1999	Tribal Welfare Dept.	51,265	-
2001	Agriculture Deptt. Survey	-	2.97 lakh
2007	Forest Department	27,278	1.36 lakh
2015	TTAADC Survey (only hardcore *Jhumia* considered)	16,948	-

Source: Tribal Welfare Dept. Govt. of Tripura. (2016) & Tripura HDR (2007)

In the recent past, a large number tribal people, owing to economic hardship, came forward to look for new economic venture as an alternative way of livelihood. And *Reang* is a glaring example of indigenous tribe of Tripura, who started rubber plantation as an alternative way of livelihood over and above other agricultural & allied activities. In this back drop, the present study is undertaken to see the effect of rubber plantation on the socio-economic status of the *Reang* tribe at large.

1.3 Rubber Cultivation and Tripura: A Genesis

The botanical name of rubber tree is *Hevea brasiliensis.* It is one of the most important products emerged from the rainforest. Though indigenous rainforest dwellers of South America have been using rubber for generations, it was not until 1839 when rubber had its first practical application in the industrial world. In that year, Charles Goodyear accidentally dropped rubber and sulphur on a hot stovetop, causing it to char like leather yet remain plastic and elastic. Vulcanization, a refined process of hardening of rubber, transforms the white sap from the bark of the *Hevea* tree into an essential product for industrial use (A brief history of rubber, Rainforest.mongabay.com/10/rubber.htm)

Scientifically, rubber plants require highly deep weathered soils which consist of laterite (both a soil and a rock type rich in iron and aluminium). They grow best in well drained porous soils with moderately acidic in nature. However, rubber plant also thrives well in red alluvial soils, if there is a good organic matter in the soil.

Natural rubber is extracted by a method called tapping, by making incisions into the bark and collecting the fluid into vessels attached to the rubber trees. The liquid is a sticky, milky sap called latex, and requires a couple of steps before it is sold as natural rubber.

Natural Rubber (NR) is grown in tropical humid climatic conditions. Thailand, Indonesia, Malaysia, Vietnam, China and India are the major NR producers in the world. The current world production of NR is around 12.40 million tonnes. The major NR consumers are China, India, USA, Japan, Thailand, Indonesia and Malaysia. Rubber is largely perceived as a strategic industrial raw material and accorded special status globally for defense, national security and industrial development. Major consuming countries keep strategic reserves of NR. Most of the rubber products including tyres require blends of NR and Synthetic Rubber (SR).

Globally and locally 91 per cent of the area under rubber is in the hands of small holders (below 10 hectare) and about 92 per cent production comes from small holders. There are around 1.3 million rubber growers and 0.6 million workers in rubber plantation sector in India. The average size of holding is about 0.57 hectare which is the lowest size among the major rubber producing countries. Most of the growers in non-traditional region of the countries are tribal and other poor communities (National Rubber Policy, 2019).

India is the second largest consumer of NR in the world with a consumption of around 1.1 million tonnes in the form of sheet rubber (47%), block rubber (43%) and latex (8%).

Rubber is an internationally traded commodity and price of rubber is influenced inter-alia by trends in economic growth, production in major producing countries and deemed in major consuming countries. Domestic NR prices generally follow the trends in the international market and are therefore, subjected to fluctuations in price (National Rubber Policy 2019).

The rubber park in Tripura, a joint venture of the Tripura Industrial Development Corporation (TIDC) and the Rubber Board is the second of its kind after the rubber park in Kerala's Irapuram.

Rubber plantation may be a game changer of the economy of down trodden tribal people of Tripura provided farmers get remunerative price for their produces.

Rubber planters of Tripura sell their produce either in the form of latex or rubber sheet. The farmers, who have machinery, can make sheet rubber at home and

the growers who do not have such facilities at their home, can produce rubber sheet through the Rubber Producer Society (RPS). The women SHG group plays an important role in the RPS. Usually, formic acid (85%) is used as a reagent to prepare the rubber sheet, as reported by the Secretary, RPS at Purana Senapati Para of Gomati District. They used to mark the quality of the sheet by using a separate machine and usually special tag is used for grading the quality from 1 to 5 to indicate the quality level. For grade 1, the price may go up to Rs. 140/kg of rubber sheet. The price of rubber sheet varies from Rs.115 to Rs. 120/ kg, depending upon the demand of the product in the market. The best season for harvesting latex is January to March and during the other months harvesting of latex is not that regular, rather sporadic. In the market, a rubber sapling is priced at Rs.20. However, rubber saplings are distributed free of cost with required inputs amongst the farmers under different development programmes under the aegis of the State Government and the Rubber Board. In most of the RPS, biogas plants are also seen in the vicinity for rational use of waste products generated from rubber processing plant.

In his research article entitled 'Rubber plantation: A new hope for rural tribal sin Tripura', Sarkar Sukanta (2011) quotes: Rubber sheet is the basic input of rubber industry. In rubber factory, various types of products are produced by using rubber. In those factories, large number of unemployed tribal people can be engaged and draw their living. Further, rubber wood has emerged as an alternative source of timber. Processed rubber wood can be used in furniture paneling, flooring and household articles. Rubber seed is a minor source of non-edible oil. The oil content ranges from14 to 16% of the total weight of the seeds. Rubber seed cake can be used up to 20% of the total weight of cattle feed. Also, rubber tree is a rich source of nectar. Extra-floral nectar glands are found at the end of the petiole where the leaflets join. About 10 kg of honey is obtained from one hive. It contains mainly glucose and fructose that are easily digestible. Common people can collect branches of the broken trees which they can use as fuel. In every year during March-April, all leaves of trees are generally fall and can be used as fuel in rural areas. This practice reduces the pressure on fire-woods collection in the forest. Bio-gas can be produced by using spoilt latex.

1.4 Rubber as an Alternative to *Jhum* Cultivation

From the economic point of view, it is an established fact that natural rubber is one of the most demanding products for different rubber industries, which in turn,

gives an opportunity to earn stable income by the rubber growers. As Tripura is situated in sub - tropical region, its climate and natural soil structure are suitable for rubber tree plantation. Rubber trees are grown in large area by the hill tribes of Tripura replacing *Jhum* cultivation as it fetches more profit as compared to *Jhum* cultivation. Gestation period for tapping of latex from a natural rubber plant is reported to be about 6 to 7 years. Further, as *Jhum* cycle has been reduced from 20 to 30 years to 2 to 3 years on account of increasing population, the economics of *Jhum* cultivation has also come down to an extreme marginal level. At the same time, *Jhum* cultivation has caused serious land degradation and ecological problems over the years. As reported by the Indian Council of Agricultural Research (ICAR) for North-Eastern Hill Region, about 14.66 lakh hectares has been affected by shifting cultivation in the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura.

Rubber is an important commercial crop of Tripura and the State is the second largest producer of natural rubber in the country after Kerala. Rubber plantation was introduced in the NER on trial basis by the State Forest Department. In 1982, Tripura Rehabilitation Plantation Corporation Ltd. (TRPC) and Primitive Tribal Group (PTG) were formed with the primary objective of rehabilitating the farmers practicing shifting cultivation and such other marginal tribal farmers through rubber plantation and thus, a revolution set off. In the recent past, Rubber Mission has been set up by the Government of Tripura for better co-ordination of all the agencies involved in taking up plantation and marketing of rubber. Rubber has now attained the status of the most important plantation crop in Tripura, not merely because of its commercial viability, but due to its innovative application for economic rehabilitation of the shifting cultivators, which was delivered with a great degree of success in a manner hitherto not experienced in any rehabilitation package on un-arable uplands (Zee News, August 31, 2012). The Tripura Government wanted to wean away the *Reang* primitive tribal group from *Jhum* practices and settle them in rubber plantation, as slashing and burning of forests are established to be destructive practices (Business Line, Nov. 22, 2005).

Rubber has already started influencing the socio-economic profile of rural Tripura. The State Government, right from the beginning is giving due importance to rubber plantation. The Rubber Board is also implementing a number of programmes in order to enhance the area under rubber in the State in collaboration with Tripura

Forest Development and Plantation Corporation Ltd. (TFDPC) and Tripura Rehabilitation Plantation Corporation Ltd (TRPC). The area coverage under rubber plantation has shown a rapid increasing trend from 574 hectares in 1976-77 to 3,590 hectares in 1981-82, and then increased to 10,085 hectares in 1986-87. It was further increased, from 17,860 hectares in 1991-92 to 61,082 hectares in 2011-12 and further to 84,308hectares in 2017-18 (Rubber Board, Tripura). The State Government agencies like TFDPC Ltd., TRPC Ltd and the Tripura Tribal Areas Autonomous District Council (TTAADC) *etc.* are also putting their own efforts for expansion of rubber cultivation in the State. The Rubber Board, Tripura Forest Development and Plantation Corporation Ltd., TRPC Ltd., PTG Department, the North Eastern Council and the State Government are now working together for rehabilitation and uplift of the livelihood status of all the tribal communities including the *Reang* in the State. The present study is an attempt to see the level of improvement in respect of the *Reang Jhumias* engaged in rubber cultivation in the State.

The important programmes and activities undertaken by the Rubber Board in collaboration with Tripura Tribal Development Department, TRPC Ltd. and PTG Department are enlisted herewith:

1. Rubber Plantation Development Scheme
2. Production and distribution of improved planting materials
3. Advisory and extension services to the rubber growers
4. Demonstration of scientific planting and production
5. Supplies of equipment and materials requiring popularisation
6. Identification of non-traditional areas suitable for rubber planning and undertaking activities for its promotion in such areas
7. Schemes for productivity enhancement in small holdings
8. Schemes for improvement of quality of small holder rubber
9. Schemes for extra income generation from rubber plantations and
10. Training of tappers

1.5 *Reang* Tribe of Tripura

Originally *Reang* was a nomadic tribe in nature and they shifted from one place to another in search of better source of livelihood and with the passage of time, they started settling permanently. The *Reang*s live in the remote hamlets of the State and they are identified as the only Primitive Tribal Group (PTG) in Tripura. Most of them are the inhabitants of Damcharra, Lalchari, Dasda, Pecharthal, Kumarghat,

Manu, Chawmanu, Ambassa, Ganga Nagar, Dumbur Nagar, Durga Chowmuhani, Mungiakami, Ampi, Amarpur, Karbook, Matabari, Bokafaand adjoining areas (Government of Tripura, TW (TRPC& PTG) Department, 2020).

Presently, *Reang* tribe is the second largest tribal community out of 21 Schedule Tribes of Tripura. Their population is distributed all over the State and they are recognized as one of the 75 primitive tribes in India. However, they are also found in Mizoram and Assam. In Mizoram they are kwon as *Aka Bru. Reangs* are said to have come first from Shan State of upper Burma (now Myanmar) in different waves to the Chittagang Hill Tracts and then to the Southern part of Tripura. Similarly, another group entered Tripura *via* Assam and Mizoram during 18th Century. *Reangs* belong to Indo-Mongoloid racial stock. Ethnically, *Reang*s are divided into 2(two) major clans, *e.g.* (i) *Meska* and (ii) *Molsoi*.

The *Reangs* living in the remote hamlets are the poorest and most backward ethnic group of Tripura. Hence, Tripura Government created the Tribal Rehabilitation in Plantation Corporation Ltd. (TRPC) & Primitive Tribal Group (PTG) Department exclusively for the *Reangs* in 1986. The Department together with TRPC Ltd. is now implementing a number of welfare schemes for socio-economic and edu-cultural development of the *Reang* people of the state.Efforts of the Department were to rehabilitate the PTG people through teak plantation at the initial stage and subsequently, in rubber plantation practice. Rubber plantation provided them with a new base of life and livelihood.

Initially, skill development training was imparted to the PTG people in agriculture & allied activities. Basic needs like health care facilities were provided through mobile medical units headed by departmental medical officers. Massive education awareness campaign was launched in the inhabitants of remote PTG hamlets. Creation of basic infrastructure like link road, dwelling house, community hall for socio-cultural activities and market stall for unemployed youth *etc.*, had led to improvement in common living standard of the PTG rubber cultivators.

The State Government has been trying to bring this chunk of indigenous *Reang* tribal population out of the morass of backwardness by enthusing them to go for settled cultivation instead of sticking to their century old *Jhum* cultivation (Ray *et al.* 2012).

1.6 Language of *Reang* Tribe

The North-Eastern Region is a habitat of different linguistic tribes. Each tribe has its own dialect. But most of the dialects are on the verge of extinction, as they do not have their own scripts. A policy initiative for preservation of those dialects has become imperative now.

It is estimated that as many as 7000 languages in the world are going to extinct by the end of this Century. It also estimated that one language dies out every 14 days. When a language dies, we lose the culture and civilization of that particular group of people. There can be three main reasons of extinction *e.g.* dominance of rich language or deceleration in demographic structure for various causes or not having own scripts.

The *Reang* PTG from Tripura speaks a dialect called *Kok-Borok,* which is of Tibeto-Burmese origin and is locally referred to as *Kau Bru*. However, the spoken language of *Reang* does not have its own scripts.

A lot of tussle is still continuing between PTG and the ruling party on the matter of script. But most of them prefer to adopt Roman script for writing their language. Presently both Bengali and Roman scripts are used in their cultural functions and educational institutes. Their language, *i.e. Kok-borok* is not being taught in most of the schools as a subject and as such, the *Reang* students have to go for schooling in English medium. The literacy rate amongst the *Reangs* was found to be very low (39.8 %) as compared to the State average.

1.7 Religion of *Reang* Tribe

*Reang*s basically follow Hinduism. They believe in different form of Gods and Goddesses.The majority of the *Reang* belongs to the *Vaishnav* School of Hinduism and claims for *Kshatriya* status. Most of their deities are akin to Gods and Goddesses of Hindu faith. *Reang*s have faith on different deities like *Buraha, Bonirao, Songrame, Jampira, Mangisir* and *Lampraetc.* There are also some female deities like *Metaikotorma, Tuibuma, Mailoma* and *Ganga, etc.* They have belief in spirits and existence of soul.

1.8 Culture of *Reang* Tribe

Dance is an integral part of *Reang* life. *Buisu*, not *Bihu* is the most popular festival of *Reang* tribe. *Reang*s' folk life & culture is very rich. *Hozagiri* dance with melodious tune of flute is most admired throughout the country and abroad. Over the years, considerable changes could be seen in the life & living conditions of the tribe in terms of livelihood pattern, education, health and socio-economic status.

They cremate their dead beside a river or *char* after observing series of rites & rituals and funeral procession.

1.9 Marriage System of *Reang* Tribe

Reangs traditionally are endogamous and do not marry outside their community. The Village Council Chief known as "RAI" permits Divorce and Widow Marriage. There is no dowry system in their society and the marriage is similar to that of other tribes of Tripura.

1.10 *Reang* Population

As per Census data, the population of *Reang* tribe was 8,471 in 1951 comprising 3.57 per cent of the total tribal population and 1.31 per cent of the total population of the State. In 1961, its population showed a marked increase at 56,597. It might be due to migration of population from the neighbouring States or may be the delay in fixation of political boundary of the State or may be something wrong in under taking Census operation. In 1971, the *Reang* became the second largest of the scheduled tribes in Tripura. A high decadal growth was observed since 1971 to 2001.In 2011 Census, the *Reang* population increased to 1, 88,220 with a decadal growth of 14.00 per cent. The growth of population of *Reang* tribe with percentage share to ST population and the total population of the State are presented in Table-1.2 and Fig.-1.1.

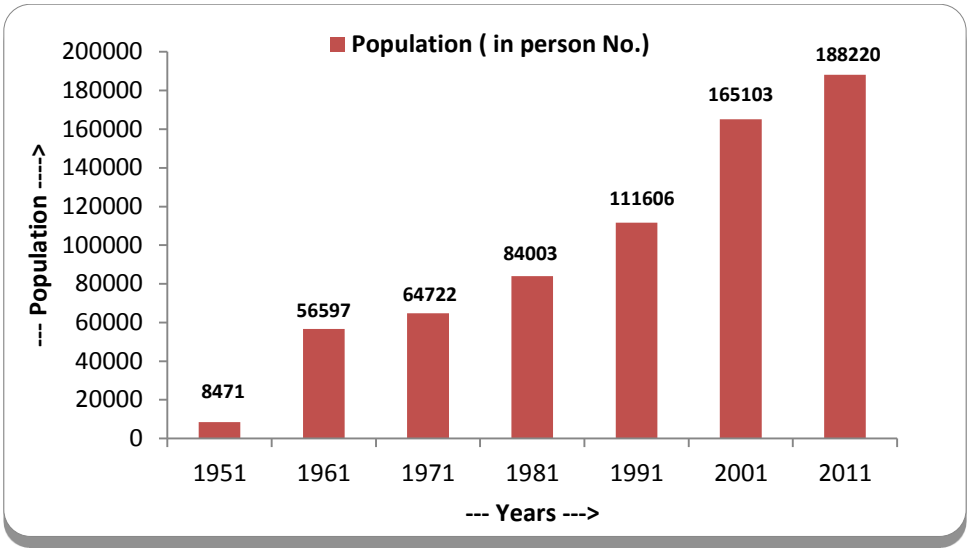
Table-1.2
Trend of Growth of *Reang* Population in Tripura during Different Census Period

Census Year	Population particulars (in number)					
	Reang Tribe				Total tribal population	Total population of Tripura
	Population	Decadal Growth	% to total tribal population	% to total population		
1951	8,471	-	3.57	1.31	237593	645707
1961	56,597	-	15.72	4.96	360070	1142205
1971	64,722	14.36	14.37	4.16	450544	1556342
1981	84003	29.79	14.39	4.09	583920	2053058
1991	111606	32.86	13.08	4.05	853345	2757205
2001	165103	47.93	16.62	5.16	993426	3199203
2011	188220	14.00	16.13	5.12	11,66,813	3673917

Source: Various census reports

In 1997, due to ethnic clashes between Mizo and Bru community (also referred to as *Reang* community), about 34,000 Bru people entered into Tripura and they stayed back in the relief camps as refugees. Recently, the Government of India through an agreement with the Tripura Government agreed to settle them down

Fig. - 1.1
Trend of Population Growth of *Reang* Tribe as per Census



permanently in different places of the State with a rehabilitation package of Rs.600 crores. Undoubtedly, in near future, it is going to bring in marked changes in the demography of *Reang* or Bru population of the State.

1.11 Need and Scope of the Study

Although the North-Eastern Region lies far outside the traditional rubber growing zone, the agro-climatic conditions of the region is conducive enough for rubber crops for its tropical nature of climate. The people of Tripura were mainly dependent on agriculture for their livelihood and the aborigines of the Princely State were primarily dependents on the shifting cultivation. It is a very primitive, uneconomic and exhaustive form of cultivation. Plough cultivation was unknown to the tribal living in the interior parts of the State (Ribario *et.al*: 2013).

Tripura is the home land of different tribes. Altogether there are 19 (nineteen) tribes in the State. They could be divided into 2 (two) major groups *viz.*, (i) aboriginal and (ii) immigrants. *Jhum* cultivation was the primary source of livelihood for the primitive tribes like *Reang*, but the situation has gradually changed because of the restrictions imposed by the Government as well as for economic reasons. Under the situation, the *Reang Jhumias* started growing rubber plantation as an alternative to aged old *Jhum* cultivation. Over time, it has become a popular plantation in the *tilla* land (low hill slope) of the rural areas of Tripura, providing employment opportunities for lot many people.

The first phase of TRPC (Tripura Rehabilitation Plantation Corporation Ltd) project for creation of 1,200 hectares of rubber plantation for 800 shifting cultivators was supported by bank loan under NABARD refinance scheme channeled through a consortium of three banks *viz*., State Bank of India, United Bank of India and Tripura *Gramin* Bank. In 2007-08, the TRPC received a loan amounting of Rs. 173.82 lakh under the World Bank Aided Rubber Project (WBRAP) for raising 1,000 hectare of rubber plantation for tribal small farmers owning un-arable uplands.The TRPC promoted formation of Rubber Producers Societies (RPS) with beneficiary families as its members, one for each plantation center. The TRPC and PTG (Primitive Tribal Group) also organized training programmes on rubber cultivation and its management including tapping and processing for its beneficiaries (Economic Review of Tripura, 2008-09), thereby playing a crucial role in weaning the *Reang* tribe from shifting cultivation and making them involved in rubber plantations.

Prior to that, during 2002-03, the Tripura Tribal Areas Autonomous District Council (TTAADC) under the Central aided *Jhumia* Resettlement Scheme (JRS) motivated the hill people to go for settled cultivation. The council provided each family one hectare of land and paid wages at the rate of Rs 87 per day for developing the rubber garden which continued for seven year. Also, the Tripura Forest Development and Plantation Corporation Ltd. (TFDPC) rehabilitated 5,000 tribal families, who are now earning monthly net income of Rs.10,000/- to Rs.15,000/- per hectare of rubber plantation. Similarly, the Tripura Rehabilitation Plantation Corporation Ltd (TRPC) raised 5,094 hectares of rubber plantations, rehabilitating an additional 3,977 tribal families permanently in the successive years. Moreover, hundreds of small rubber wood based factories are mushrooming throughout the State. Natural rubber based activities have already been declared as the thrust sector because of its special significance for the State. Added benefits under the Tripura Incentive Scheme (TIS) are also being provided for setting up of natural rubber based industries.

So far, not too many studies have been conducted on the impact of rubber plantation in economic development of *Reang Jhumias* of the State. The Rubber Board and other agencies have conducted sporadic surveys on coverage and effect of plantation on socio-economic life of rubber growers and tappers. But dedicated studies on rubber plantation as a means of rehabilitation of *Reang Jhumias* are scanty. In this backdrop, the present study was designed to see the changes that have taken

place over the years, with the adoption of rubber cultivation as a means of livelihood by the *Reang* tribe of Tripura.

1.12 Objectives of the Study

This study is focused to see the changes in living standard, brought in by rubber plantation in the life of *Reang Jhumias* in Tripura. The specific objectives of this study are as follows:

1. To study the trends of area, production and productivity of rubber and *Jhum* in Tripura
2. To evaluate the impact of rubber plantation on income, employment, education, health, drinking water, sanitation, housing patterns of the *Reang* tribe of the State
3. To examine the relation between rubber plantations and local environment
4. To identify the constraints of rubber plantation and suggest ameliorative measures.

1.13 Methodology

The present study is an empirical work, based on both primary and secondary level data. Primary data have been collected with the help of a well-structured questionnaire from 300 *Reang* tribal households, randomly selected from the 3 blocks from 3 different districts of the State where rubber plantation programmes are being implemented. Secondary data were collected from the internet pages of various annual reports of the Tripura Rehabilitation and Plantation Corporation Ltd, Primitive Tribal Group Department and Tripura Forest Development & Plantation Corporation Ltd., various newspaper clippings, journals, various published and unpublished reports and working papers available at different state and national level institutions.

1.14 Statistical Model Used

To analyze the primary data, simple statistical tools like percentage, trend analysis, cross tabulation analysis and other parametric and non-parametric tests have been conducted. To study the trends of area, production and productivity of rubber and *Jhum* in Tripura, the following model was used:

The trend lines of different parameters of *Jhum* and rubber were calculated by choosing the suitable trend equation giving the best fit with the data.

To work out the CGAR of area, production and productivity, the following equation was used

$$Y = a\, b^{t}\, e \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, Y= Dependent variable for which growth to be estimated

a= Intercept

b= Regression coefficient

t= Time variable

e= Error–term

The compound growth was obtained by taking log of the equation (1)

$$\log Y = \log a + t \log b + \log e \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

The per cent of growth rate was derived by using the relationship

$$CGAR = (\text{Anti log of } b-1) * 100 \quad \ldots\ldots\ldots\ldots . (3)$$

To test the significance of CAGR (r), standard error was estimated with the formula given in equation (4)

$$S.E.(r) = \frac{100\, b}{\text{Log}_{10} e} \sqrt{\frac{\left[\sum(\log y)^2 - \frac{(\sum \log y)^2}{n}\right] - \left[\sum x^2 - \frac{(\sum x)^2}{n}\right] (\log b)^2}{(n-2)\left[\sum x^2 - \frac{(\sum x)^2}{n}\right]}} \quad \ldots\ldots\ldots\ldots (4)$$

Where,

$\text{Log}_{10} e = 0.43429$

And, the‘t’ value is estimated as-

$$t = \frac{r}{S.E.(r)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Following formula was applied to arrive at the average rating against different environmental parameters and constraints of rubber production, as perceived by the sample farmers.

Average Rating, $R = (\sum_{i=1}^{5} r_i\, p_i)/100$

Here, r_i, indicates rating value, where, i=1,2,3,4,5 (r_1=1, r_2=2,……r_5=5)

and p_i indicates the percentage of respondents in r_i

1.15 Data Collection

Tripura is a small hilly State in the North-East India and about seventy per cent of its land area is covered by the hills and forests. Tribal people are the main inhabitants of those hilly areas of the State.

The Rubber Plantation Schemes for Development of Primitive Vulnerable Tribal Groups (PVTGs), started functioning from April 1, 2008 onwards. The Scheme seeks to adopt a holistic approach to the socio-economic development of PVTGs and gives State Governments flexibility in planning initiatives that are geared towards the specific socio-cultural imperatives of the specific groups at hand. The present study was an attempt to examine the impact of rubber plantation on income, education, health, drinking water, sanitation and housing patterns and behavior of the PVTG, *i.e.* the *Reang* tribe of the State. Accordingly, the data were collected against each of the specific parameters selected for the study.

1.16 Sampling Design

The study districts and blocks there-under were selected based on the records available with the Government agencies, particularly the sites largely inhabited by the *Reang* tribe opting for rubber plantation in place of *Jhum* under various development programmes.

Multi-stage stratified sampling technique was adopted to collect the samples. In the first stage, 3 large *Reang* inhabited districts *viz.*, North, Dhalai and Gomati were selected purposively. In the second stage, one block from each district, *i.e.* Dasda block of North district, Ambassa block of Dhalai district and Amarpur block of Gomati district were randomly selected.

Table-1.3
Sample Distribution of the Field Study

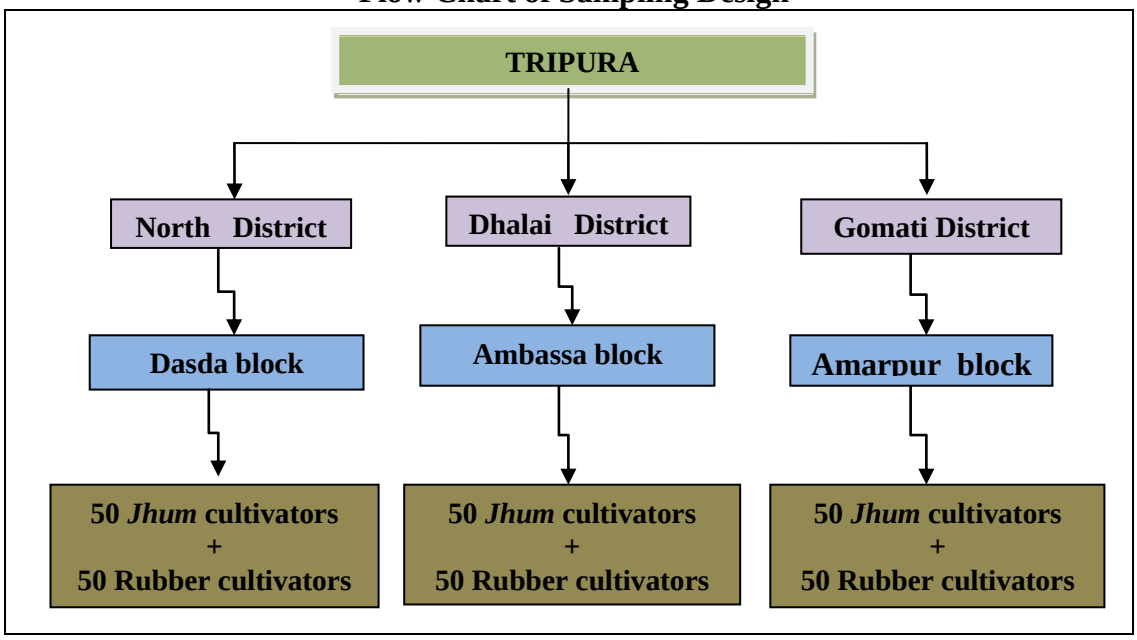
(in no.)

District	Block	No. of *Jhum* cultivators	No. of rubber cultivators	Total
North	Dasda	50	50	100
Dhalai	Ambassa	50	50	100
Gomati	Amarpur	50	50	100
Total		150	150	300

Source: Field Survey

In the third stage, one village [a cluster of hamlets (*basti*/small settlements)] from each block *i.e.* having adequate number of samples was selected purposively. Then, a list of *Reang* cultivators growing rubber and *Jhum* crops were prepared separately for each sample cluster and finally, 50 *Jhum* cultivators and another 50 rubber cultivators were selected randomly from each sample block. In aggregate, 100 samples were selected from each district and, altogether 300 sample farmers were selected from 3 sample districts of the State (Table-1.3 and Fig-1.2).

Fig -1.2
Flow Chart of Sampling Design



1.17 Questionnaire Design

A well-structured schedule which included both open ended and close ended questions was prepared to collect primary data from the sample households. Data were collected directly from the head of the sample household by personal interview method. The sample respondents were requested to give free and fair responses. Full care was taken to include women respondents in all courses of discussions and interviews. Together with the field study, investigator's own observation, personal interviews with a group of tappers, village level political leaders and other officials and non-official agencies were taken into account to understand the living standards of the *Reang* tribal people.

1.18 Limitation of the Study

The limitations of the study are as follows:

1. The study depicts the present scenario relating to *Reang Jhumias* of Tripura and hence, the findings emerged may not be applicable to other category of people.
2. The study is limited to a sample of 300 households only.
3. Restriction of movement of the investigators to the remote part of the State
4. Language limitation, in the sense that the information was collected by the investigators with the help of interpreters only.

1.19 Organization of the Study

In consideration of the stated objectives, the study is divided into seven major chapters. Each chapter has been further sub-divided into some sub sections. As a whole, the organization of the study was framed as follows:

Chapter-I Introduction.

It includes the Background, Need and Scope of the Study, Objectives, Methodology and Limitations of the Study followed by some Review of Literatures

Chapter-II Socio-economic Profile of the Sample Areas under Study.

Chapter-III Area, Production and Productivity of Rubber and *Jhum* in Tripura along with Trend Analysis

Chapter-IV Impact of Rubber Plantation on Income, Employment, Education, Health, Drinking Water, Sanitation and Housing Patterns were evaluated in this chapter.

Chapter-V Rubber Cultivation and Local Environment

Chapter-VI Constraints of Rubber Production

Chapter-VII Suggestions and Conclusion

1.20 Review of Literatures

A brief review of the relevant studies undertaken in different parts of the country and abroad are presented in this section.

Cameron (1970), in his paper entitled, "Destruction of the indigenous forests for Maori agriculture during the nineteenth century" observed that the introduction of potato to New Zealand at the end of the eighteenth century caused considerable changes in Maori tribal agriculture. There was a great expansion in shifting/*Jhum* cultivation over the forestland and there were records of Maori fires having destroyed very large areas of forest. It was suggested that European settlement in New Zealand did not check the rate of forest destruction but allowed to continue it on the same scale.

Kox (1990) observed that leaf coverage and the root system of rubber trees regulate the micro climate allowing a range of secondary plants to flourish and the trees also offer a habitat for a great variety of fauna.

Ninan (1992), in his paper on "Economics of shifting cultivation in India" analyzed the economics of shifting cultivation *vis-a-vis* settled (terrace) cultivation in

North-East India with the help of micro-level data and information available in the studies conducted by some Agro-Economic Research Centres (AERCs). His study indicated that settled (terrace) cultivation was not as remunerative as shifting cultivation.

Sethuraj (1996) observed that being a surface feeder, rubber tree afforded good soil binding and reduced erosion of soil considerably.

Anonymous (2003), observed that as most of the traditional measures failed to curb shifting cultivation in the forest lands, the Government took different approach as towards resettling, mainly through four plantation schemes, *viz*., Horticulture, Rubber, Tea and Coffee.

Tripathi and Barik (2003), observed that *Jhum* was a subsistence level farming system having very low output input ratio and its yields barely enough to survive.

Jyotishi (2004), in his project on "Ecological, Economic and Institutional Aspects of Shifting Agriculture: A study in Orissa", found that the colonial forest policies were intended for commercial exploitation of forest. There was a decline in the forest area over last three decades, which was about 11,000 square kilometers.

Anonymous (2007), while analysing the revealing cenario of the period from 1986-87 to 2004-05, showed that rubber had been established as an important means of rehabilitation in Tripura..

Mithani (2005) observed that in the Southeast Asian uplands including Tripura, a North Eastern State of India, agricultural transition was underway from subsistence production of shifting cultivation to commercial plantation of rubber (*Hevea brasiliensis*). There were reports of positive impacts of this transition both on the socio-economic and health conditions of the concerned people and on the ecology of the concerned area.

Mishra (2005), in his paper entitled, "Growing Discontent of *Adivasis* in Assam "examined the problems of tribal people in Assam and found that certain local factors were responsible for pushing the tribal of Assam into abject poverty. Alcoholism was a major drain on income, which restrained the mobility of women and children outside the village, resulting in high dropout rate among the school-going children. The community had poor access to anti-poverty, social security and scholarship schemes and was derived of agriculture extension services. Instances were plenty in rural Assam where the tribal were affected more severely by natural disasters.

Kerkhoff (2006), in his paper on "Debating Shifting Cultivation in the Eastern Himalayas: Farmers Innovations as Lessons for Policy", evaluated the farmer's traditional practices and more recent indigenous innovations that contributed to the existing farming system and found that it yielded benefits both to the practitioners and other stakeholders. Shifting cultivation and the farmers' innovations in particular were found to contribute to forest cover and biodiversity conservation, while at the same time maintaining agricultural and forest productivity.

Kumar *et al.*(2006), in their paper on "Spatial patterns and processes for shifting cultivation landscape in Garo hills-India" discussed a few spatial patterns and processes of shifting cultivation landscape in the Garo Hills of Meghalaya State wherein 85 per cent of the land belonged to native communities and it showed a bit better yield.

Bahuguna, V. K.(2006), stated that rubber plantation was not only valued for its capacity for giving soil cover in soil conservation and afforestation programme but also its economic aspects too played a key role.

Bhowmik (2006), remarked that Tripura became the second largest producer of natural rubber in the country, which was of superior quality. In N-E States, particularly in the State of Tripura, initially rubber plantation was introduced on trial basis by the Forest Department. In 1982, considering the success of rubber plantation, the Tripura Rehabilitation Plantation Corporation Ltd. (TRPC) and Primitive Tribal Group (PTG) were formed with the main objectives of developing the *Reang* group, both in economic and sociological terms, which revolutionised the life pattern of the concerned tribal population.

Talukdar (2007), in his paper on "Tripura Taps the Rubber Economy" evaluated the growth of rubber plantation in Tripura and found that Rubber Board and the Department of Tribal Welfare had taken a lot of initiatives for expanding the rubber plantation in the State.

Murtem *et al.* (2008), conducted a study on "*Jhumia*s view in Arunachal Pradesh" to know the problems of *Jhumias* involved in *Jhum* cultivation. In their survey, an attempt was been made to highlight the views of the *Jhumias*, particularly on policy and legal framework of shifting cultivation, together with solution to those problems of shifting cultivation in Arunachal Pradesh.

Chakma *et al.*(2008), reported that initially the *Jhum* cycle was ranging from 20 to 30 years, but with the increase in the size of population and rise in their demand for land, the *Jhum* cycle had reduced to 5-6 years.

Tangjang (2009), in his paper on "Traditional Slash and Burn Agriculture as a Historic Land Use Practice: A Case Study from the Ethnic Noctes in Arunachal Pradesh, India" discussed the practice of traditional slash-and-burn agriculture by the ethnic Noctes in Tirap district of Arunachal Pradesh and found it not economically viable.

Karthik *et al.* (2009), in their paper on "Forest Recovery Following Shifting Cultivation: an Overview" concluded that shifting cultivation was a predominant practice in majority of the tropical hilly tracts. Only a few studies had examined the forest recovery following shifting cultivation. Most studies reported that, although the fresh tree species recover relatively faster, the recovery of woody biomass of mature forest trees takes several decades after the suspension of cultivation.

Rajasnan (2010), in his project report on "Livelihood and employment of workers in rubber and spices plantations" examined the employment opportunity in rubber plantation and observed that the institutional role played by the Government was very significant during the early years. The settlement of workers also resulted in participation of women in large numbers. The report discussed the livelihood assets of plantation workers according to the components identified by USAID (United States Agency for International Development) and UNDP (United Nations Development Programme) for sustainable livelihood and poverty alleviation.

Sarkar (2010), in his paper on "Revolution of *Jhumias* through rubber plantation" concluded that rubber plantation had changed the life style of *Jhumia* people of Tripura. Both economic and social conditions of tribal people were better off, after adopting rubber plantation and they maintained a good standard of living.

Vikas (2012), in his paper on 'Sustainable livelihood enhancement of remote tribal people in India" found that majority of the indigenous tribal people were landless and daily labourers. Among the daily labourers, more than 80 percent were below the poverty line and 98 per cent of them belonged to *Adivasi* communities. The *Adivasi* communities started undertaking shifting cultivation and were responsible for reduction of forest coverage, which resulted in global warming like situation.

Sinha (2012), in his paper on "Rubber Plantation in Northeast India: hopes vs. concerns" examined the status of rubber plantation in North-east India and reported

that the entire amount of rubber latex in the Northeast was processed into sheets for sale. A large majority of the plantations were of smallholdings. While most of the rubber planters were found to be happy with the handsome returns from their plantations in Tripura, but their women folks often expressed their desperation in missing the bamboo shoots, delicious wild vegetables, tuber crops and medicinal herbs delivered by the erstwhile natural vegetation.

Sinha A. K. (2012), observed that initially, the idea of rubber plantation in Tripura came in the year 1976, with the establishment of Tripura Forest Development and Plantation Corporation Limited (TFDPC Ltd.), which took up the issue for improvement of degraded forestlands as a principal strategy and simultaneously, to wean away a cluster of tribals of Warangbari from shifting cultivation providing wage employment through rubber plantation.

Roy *et al*. (2015), observed that by and large *Jhum* was perceived as primitive, backward, wasteful, unproductive, exploitive and the cause of wide spread environmental degradation. Given the negative perception, the underlying premise of all Government policies were to replace the practice with permanent, settled agriculture or other settled land-based activities. Among the resettlement schemes, the rubber cultivation occupied a most important place.

According to Behera *et al.* (2016), human population growth in the developing world drives land-use changes, impacting food security and health. In India, the dramatic change in demographic dynamics over the past century had reduced traditional agricultural land use through increasing commercialization. The magnitude and implications for the farming system were analysed by the introduction of cash cropping, replacing the traditional slash and burn rotations (*Jhum*), of the tribal people in the Meghalaya Plateau, North-East India, by means of agricultural Census data and primary surveys conducted in seven villages. Land-use changes had brought major alterations in hill agricultural practices, enhanced cash-cropping, promoted mono-cropping, changed food consumption patterns and underpinned the emergence of a new food system and exposed the farmers and consumers to the precariousness of the market, all of which have both long and short-term food security implications. Dietary diversity was found to be higher under *Jhum* compared to any of the cash-crop systems, and higher under traditional cash cropping than under modern cash cropping.

Lembisana *et al.* (2016), in their study on "Farming System Approach for Sustainability, Food and Nutritional Security Under Agro Ecological Condition of

Tripura", observed that integrating agri-horticultural and allied research for food and nutritional security in the 'Era of Global Climate Disruption' may improve food and nutritional security under the agro-ecological conditions of Tripura.

Elebute *et al*. (2016), observed that if the youth are trained adequately, they would become more productive; a source of skilled manpower and not a burden on the society. They can perform their duty with diligence, effectiveness and best professionalism, and they can as well contribute positively to national development of their country. From the economic and social standpoint, livelihood sustenance and economic development require a sound vocational and technical education that is intended to meet a wide range of human needs.

Makdoh *et al.* (2016) observed that *Jhum* cultivation in Arunachal Pradesh was accompanied by low crop yield and land degradation, loss of forest wealth and soil fertility.

According to Pattanaik *et al.* (2016), the shifting cultivation in Arunachal Pradesh was dynamic in nature and was known as *Jhum*'. Upland rice was the main crop grown in mixture with maize, foxtail, finger millet, beans, cassava, yam, banana, sweet potato, ginger, chillies, vegetables, *etc.* in such system. The single crop of rice was preferred in the second year and this continued for 2-3 years and then it was left follow for fertility build up through regeneration of vegetation. They cultivated citrus, bamboo and *tache* (wallichia) trees in these fallow lands, which not only prevent the land from soil erosion, but also give income even from a short fallow period. This was a little shift from the traditional practice towards a sustainable practice adopted by the *Jhumia.*

Rao (2016), observed that Tripura was endowed with agro-climatic conditions suitable for rubber cultivation and Tripura was considered second rubber capital of India. All kinds of rubber plantations should be given a push by the State as well as by the Central Government to help the BPL(Below Poverty Line) *Jhumia* families to come up to APL(Above Poverty Line). This would also significantly improve housing, health, educational and socio-political status of different tribal communities of Tripura.

Behera & Nayak (2016), in their paper, out lined the regional population growth and its linkage with changes in agricultural landscape and its implications for food security in Meghalaya. Traditionally, the tribal people in the Northeast including those in Meghalaya practiced *Jhum* (shifting cultivation) in the hill slopes as an

important means of livelihood. With relatively low density of population and long *Jhum* cycles, these communities could manage their livelihood. However, the situation changed drastically over the years, largely due to increase in population in the wake of substantial improvement in health infrastructure and declining mortality conditions. This had made the traditional agricultural practices unsustainable and the search for alternative livelihood became inevitable.

Ray, A.K. *et al.* (2017), stated that almost all the *Jhumias* in Tripura were living below the poverty line before adoption block (rubber) plantation scheme. Besides enhancing income, health, education and socio-political status of the participants, rubber plantation brought about a revolutionary change in the mental makeup of the members. It created confidence, self-respect and sense of equality.

Milton (2019) observed that adoption of modern crop, horticulture and rubber plantation might increase the settled tribal farmer's income, by about 18-20 times.

Thus, it is clear from the review of the studies cited above that most of the *Jhum* cultivators are living below the poverty line. The practice of *Jhum* cultivation is also causing more harm to the environment through deforestation and degradation of land. As against this, settled cultivation can improve ecological, economic and health conditions of the tribal people of Tripura.

With this background, an attempt was made to see the impact of transition from shifting cultivation to rubber cultivation, particularly in the life and livelihood of the *Reang* PTG in Tripura with the stated objectives.

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A View of Deposition of Latex
(Raw form of Rubber)

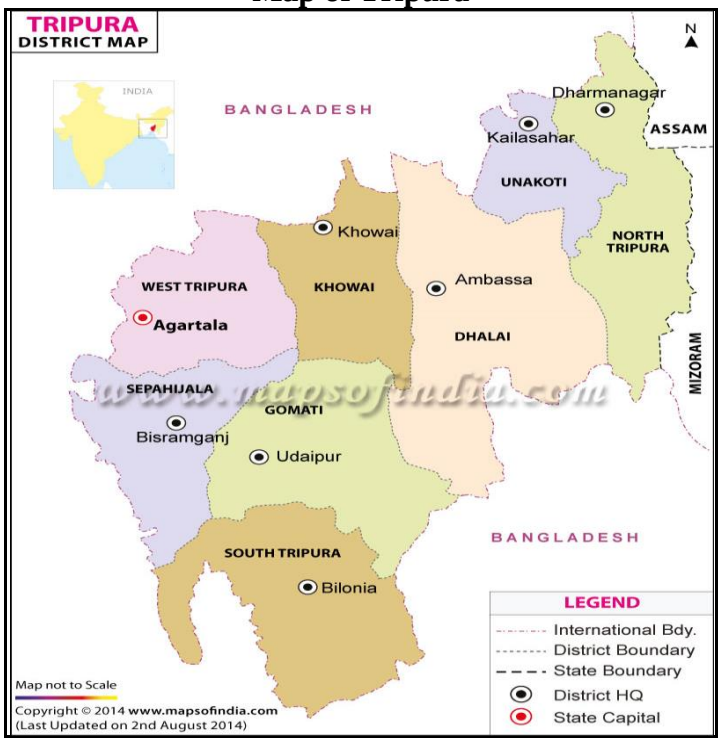
CHAPTER– II

PROFILE OF THE SAMPLE DISTRICTS AND BLOCKS

2.1 Administrative set up Tripura

For administrative purposes, the State of Tripura has been divided into 8 districts, 23 subdivisions and 58 development blocks with effect from 21 January 2012, together with newly created districts, sub-divisions and development blocks. The four new districts are Khowai, Unakoti, Sipahijala and Gomati; the six new sub-divisions are Jirania, Mohanpur, Kumarghat, Panisagar, Jampuijala and Karbook and the five new development blocks include Yuvaraj nagar, Durga Chawmuhani, Jolaibari, Silachari and Lefunga. The administrative map of Tripura is presented in Fig 2.1.

Fig – 2.1
Map of Tripura



2.2 Profile of Sample District: North Tripura

The North Tripura district started functioning after its recognition as a separate district *w. e. f.* 26-12-2011. The district was officially inaugurated on 13-01-2012. The geographical area of the district is 1444.5 sq. km. The North Tripura District is mostly hilly and shares boundary with Assam (53 km.) and Mizoram (109 km.) and

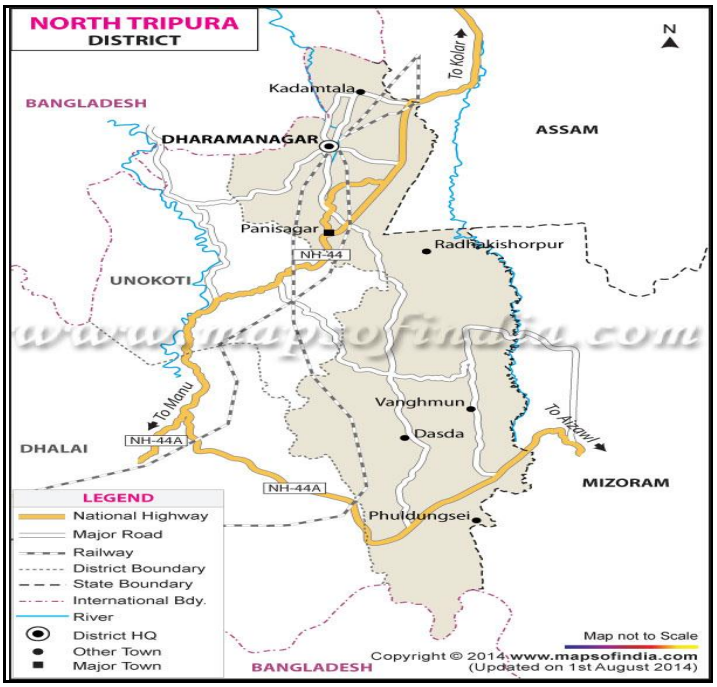
international boundary with Bangladesh (96 km.) of which Dharma nagar sub-division shares 44 km, and Kanchanpur shares 52 km. The important rivers like Longai, Juri and Kakari are flowing through this district. This district is the corridor and lifeline of the State. It is connected with railway line and the National Highway (NH-44) enters the district at Churaibari, which is on the border with Assam. This district is administratively set up with three sub-divisions, *viz,* Dharmanagar, Panisagar, Kanchanpur and eight Rural Development Blocks (Table-2.1 and Fig.2.1).

Table-2.1
Administrative set up of North Tripura District

Sample District	Headquarter	Sub-divisions (3 Nos.)	Development Bocks (8 Nos.)	Municipals (1 No.)	Population 2011Census (No.)
North Tripura	Dharmanagar	Dharmanagar, Kailashahar, Kamalpur	Damchera Dasda Laljuri Jampuihill Jubarajnagar Kadamtala Kalcharra Panisagar	Dharmanagar Municipal Council	417,441

Source: Directorate of Economics and Statistics (DES) - Tripura based on Census-2011

Fig-2.2
Map of North Tripura District



There are altogether 121*GaonPanchayat* of which 69 fall within non-ADC area and 52 with ADC area. The district consists of 10 Police Stations.

North Tripura district had a population of 6.93 lakh (tentative distribution) as per Census-2011 which included3.53 lakh males and 3.41 lakh females. The density of population was 341 per sq. km. and the sex ratio was 967. The average literacy of this district combining male and female was 87.50 per cent. Of the total population of the State, the percentage of ST and SC population were 25.86 per cent and 16.57 per cent, respectively (Table-2.2).

Topographically, the North Tripura district is mostly hilly with the boundary with Assam and Mizoram in the Northeast and is bounded by Unokoti district in the West and the international border with Bangladesh in the North-west and the Southern part of the district. The important rivers like Longai, Juri, and Kakari are flowing through this district.

Table-2.2
Particulars of North Tripura District as per 2011 Census

Sl. No.	Particulars	State	North Tripura District
1	Area (in sq. km.)	10,486	2,036
2	Total Population	36,73,917	6,93,947
	Male	18,74,376	3,52,860
	Female	17,99,541	3,41,087
3	Sex Ratio (Number of females per 1000 males)	960	967
4	Density of Population (Persons per sq. km.)	350	341
5	Overall literacy	28,04,783 (87.22)	5,20,402 (87.50)
	Male	15,01,369(91.53)	2,75,646(91.13)
	Female	13,03,414(82.73)	2,44,756(83.75)
6	Total Scheduled Tribe Population	11,66,813(31.76)	1,79,426(25.86)
	Male	5,88,327(31.39)	91,116(25.82)
	Female	5,78,486(32.15)	88,310(25.89)
7	Total Scheduled Caste Population	6,54,918(17.83)	1,14,968(16.57)
	Male	3,34,370(17.84)	58,375(16.54)
	Female	3,20,548(17.81)	56,593(16.59)

Source: Directorate of Economics and Statistics (DES), Government of Tripura
Note: Figures in parentheses indicate the percentages to total

2.2.1 Profile of Dasda Block under North Tripura District

Dasda is a development block in North Tripura District. Dasda town is its block Headquarters. It is located 49 km towards the South from the District Headquarters, Kailasahar and 110 km from the State capital, Agartala towards West. Dasda block is bounded by Jampui Hills block towards the East, Pecharthal block towards North, Manu block towards the West and Damcherra block towards the North.

Dasda block is at an elevation of 60 m mean sea level. Bengali is the local language and people can also speak *Kok-Borok* and English. There is no railway station near to the block, at least, not in the vicinity of 10 km. The PIN code of Dasda is 799264 and postal head office is Kumarghat. Most of the population of this block belong to *Reang* community and they depend on *Jhum* cultivation. But rubber plantation has also become very popular in recent time in this block. A large number of farmers of this district are also cultivating HYV paddy, chillies and different vegetables under settled farming.

2.3 Profile of Sample District: Dhalai

The detailed administrative setup of the district is presented in Table-2.3 and the map is given in Figure 2.2. As per 2011Census, it is the least populous district of the State with a population of 3.78 lakh. But area-wise, it is the largest district of Tripura with an area of 2,400 sq km. The population density was recorded at 158 person per sq. km. It is mainly located between two hills: *Atharamura* Range and *Sakhan* Range.

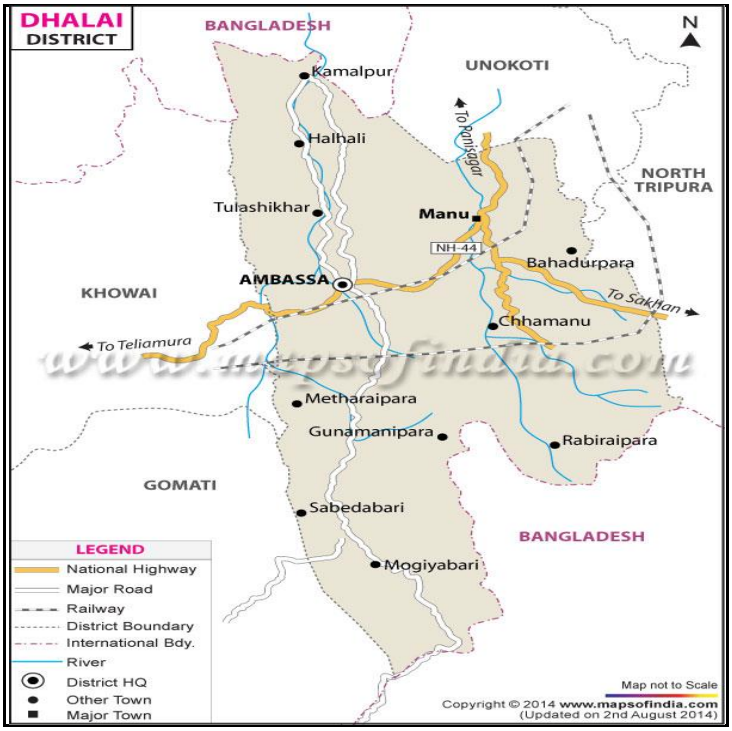
Table-2.3
Administrative set up of Dhalai District

District	Headquarter	Sub-divisions	Development Bocks	Municipals	Population 2011Census (No.)
Dhalai	Ambassa	Kamalpur Ambassa Longtarai Valley Gandachera	Salema DurgaChawmuhani, Ambassa, Manu Chawmanu Dumburnagar Raishyabari	Kamalpur Nagar Panchayet Ambassa Municipal Council	377,988

Source: https://en.wikipedia.org/wiki/List_of_districts_of_Tripura

More than 70 per cent of the district area is hilly and forest covered. The terrain is mostly undulating with small water streams (*chharas*), rivers and fertile valleys intervening. Major rivers passing through Dhalai are Dhalai, Khowai, Gomati and Manu. Major hills are Atharamura, Longtharai, Kalajhari and part of Sakhan. The district headquarter at Ambassa is about 85 km. from the State capital, Agartala. The district is bordered by Bangladesh on the Northern and Southern sides. The overall literacy combining male and female was 85.72 per cent in 2011 Census. The sex ratio was 944. The Schedule tribe population was about 55.68 per cent and the overall Schedule caste population was 16.31 per cent of the total population of the district as per 2011 Census.

Fig-2.3
Map of Dhalai District Tripura



The district is characterised by tropical climate with hot and humid summers, prolonged rainy season and warm winters. Frequent rainfall occurs in March and April. Maximum temperatures in summers and winters are 36 degrees and 28 degrees Celsius, respectively.

Table-2.4
Particulars of Dhalai District of Tripura as per 2011 census

Sl. No.	Particulars	State	Dhalai District
1	Area (in sq. km.)	10,486	2,400
2	Total Population	36,73,917	3,78,230
	Male	18,74,376	1,94,544
	Female	17,99,541	1,83,686
3	Sex Ratio (Number of females per 1000 males)	960	944
4	Density of Population (Persons per sq. km.)	350	158
5	Overall literacy	28,04,783 (87.22)	2,76,217(85.72)
	Male	15,01,369(91.53)	1,51,643(91.31)
	Female	13,03,414(82.73)	1,24,574(79.79)
6	Total Scheduled Tribe Population	11,66,813(31.76)	2,10,608(55.68)
	Male	5,88,327(31.39)	1,06,759(54.88)
	Female	5,78,486(32.15)	1,03,849(56.54)
7	Total Scheduled Caste Population	6,54,918(17.83)	61,688(16.31)
	Male	3,34,370(17.84)	31,461(16.17)
	Female	3,20,548(17.81)	30,227(16.46)

Source: Dhalai District Census Hand Book of Tripura

The minimum temperature in summers and winters are 17 degrees and 5.3 degree Celsius, respectively. The district has a demarcated Zone of Tripura Tribal Areas Autonomous District Council, headed by a Zonal Development Officer. Detail particulars of Dhalai district is presented in Table-2.3 as per 2011 Census.

2.3.1 Profile of Ambassa Block under Dhalai District

Ambassa Rural Development block has an area of 183.03 sq. km, out of which 70 percent area is hilly and covered with dense forest. The people of this block mainly depend on agriculture and *Jhum* cultivation. Paddy is the main crop of this block. Ambassa block of Dhalai district has a total population of 54,618 as per the Census 2011. 100 per cent of the population live in the rural areas. Schedule Tribe population was 72.5 per cent of the total population in Ambassa block. Population of children (0-6 years) is about 8,561. In Ambassa block, out of the total population, 4,661 were cultivators (owner or co-owner) while 3,013 were agricultural labourer.

2.4 Profile of Sample District: Gomati

This district was created in January 2012 along with three other new districts, raising the number of districts from 4 to 8 in the State. Udaipur is its headquarters. The area of the district is 1393.11 sq.km. The detailed administrative set up of the sample district is given in Table 2.4and the map of Gomati district is presented in Fig2.4.

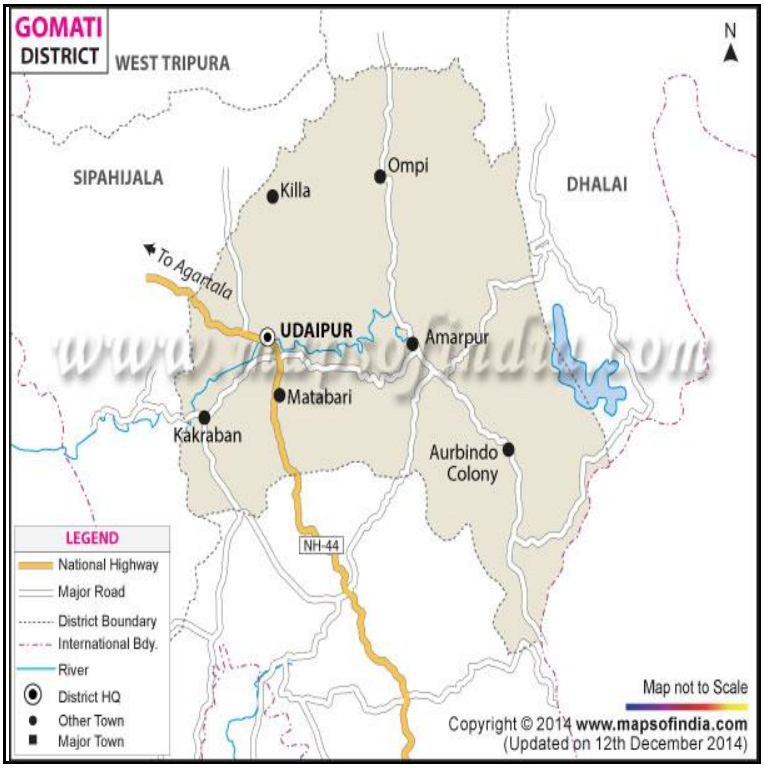
Table-2.5
Administrative set up of Gomati District

District	Headquarter	Sub-divisions	Development Bocks	Municipals	Population2011Census (No.)
Gomati	Udaipur	Udaipur Amarpur Karbook	Matabari, Kakraban Killa Amarpur Ompi Karbook Silachari	Udaipur Municipal Council Amarpur Nagar Panchayet	4,36,868

Source: https://en.wikipedia.org/wiki/List_of_districts_of_Tripura

The district figures prominently in Tripura's indigenous folklore, culture, religious rites and ritual so much so that tribal people perform posthumous rites dedicated to their departed near and dear ones on the bank of the river Gomati in the conviction that ablution with the consecrated water of the sacred river will pave the way for ascendance to heaven of their departed dear ones.

Fig-2.4
Map of Gomati District of Tripura



As part of the administrative reorganization effected in October2012, the Gomati district was demarcated comprising Udaipur, Amarpur and newly created Karbook sub-division as a truncated version of the erstwhile South Tripura district. Topographically, the Gomati district is marked by lush green and fertile Gomati valleys and the towering *Debtamura* hill range, which straddles Udaipur and Amarpur subdivisions of the district with its exquisite sculptural works, carved on panels of the hills.

Paddy, vegetables like snake gourd, pumpkin, okra, corn, cucumber, beans, potato, carrot, radish, bamboo shoot are grown in different parts of the district. Major spices include chillies and black pepper.

As per Census 2011, the total population of the district was 4.42 lakh comprising 51.06 per cent male and48.94 per cent female population. Of the total population, Scheduled Caste (SC) population was 16.85 per cent, Scheduled Tribe (ST) was 42.70 per cent, and the rest belonged to other communities. The population density of the district was 286 persons per sq.km, while the sex ratio was 957 females against 1000 males. Overall literacy rate was 84.53per cent (Table-2.6).

Table-2.6
Particulars of Gomati District of Tripura as per 2011 Census

Sl. No.	Particulars	State	Gomati District
1	Area (in sq. km.)	10,486	1,393
2	Total Population	36,73,917	4,41,538
	Male	18,74,376	2,25,428(51.06)
	Female	17,99,541	2,16,110(48.94)
3	Sex Ratio (Number of females per 1000 males)	960	957
4	Density of Population (Persons per sq. km.)	350	286
5	Overall literacy	28,04,783 (87.22)	3,73,232 (84.53)
	Male	15,01,369(91.53)	2,02,750 (89.94)
	Female	13,03,414(82.73)	1,70,511(78.90)
6	Total Scheduled Tribe Population	11,66,813(31.76)	1,88,554(42.70)
	Male	5,88,327(31.39)	-
	Female	5,78,486(32.15)	-
7	Total Scheduled Caste Population	6,54,918(17.83)	74,430(16.58)
	Male	3,34,370(17.84)	-
	Female	3,20,548(17.81)	-

Source: Directorate of Economics and Statistics, Govt of Tripura

2.4.1 Profile of Amarpur Block under Gomati District

Amarpur block under Gomati district has an elevation of 24m mean sea level and its total population was 10,863 during 2011.Its official languages are Bengali, Kok-borok and English. Amarpur town is the Headquarter of Amarpur sub-division.

Amarpur is a picnic spot, on the banks of *Amarsagar*, the 16th century artificial lake. The town stands on the ruins of a palace. On the southern bank lies, a temple dedicated to the eight headed goddess, *Mangalchandi*. A fair is held during the *Basant Panchami* (February) every year.There are two famous lakes, *i.e. Amarsagar* and *Fatiksagar* in the block. The tribal population of this block are mostly engaged in either *Jhum* or rubber cultivation. Some of them are engaged also in settled *Aman* paddy, vegetables and fruit cultivation. A sizable number of *Reang* tribe, *i.e.* about 22 per cent of the total district population are found in the block.

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CHAPTER–III

AREA, PRODUCTION AND PRODUCTIVITY OF *JHUM* AND NATURAL RUBBER IN TRIPURA

3.1 Trends of Growth of Area, Production and Productivity of *Jhum*

Trend analysis is important to know the changing pattern in the business and farm sectors during a range of time period. By observing the time series data over a period of time, one can easily understand the type of changes that took place in the past and can predict the future behaviour. Therefore, trend analysis is of great significance in assessing of economic health of a country or a State. It helps in planning for future operations and helps us to cope with uncertainty in the future. Therefore, it is necessary to analyse the past performance trends so that future planning can be framed by incorporating the strength and eliminating the weaknesses.

Jhum is a mixed cropping method of cultivation wherein paddy is the main crop covering about 95 per cent of the crop field in the State of Tripura. Mixed vegetables such as brinjal, chilly, lady's finger are also grown in *Jhum* areas. The details of the cropping pattern could not be found precisely, as the area under other crops was very insignificant. However, it has been observed from various studies that *Jhum* cultivation is not a profitable venture but still in practice because of two specific reasons. Firstly, *Jhumias* do not have plain lands to cultivate and secondly they consider it as their tradition. As the cycle of *Jhum* cultivation is dwindling over the years, the area under *Jhum* cultivation as shown a marginal increase.

The trend of growth of area, production and productivity of *Jhum* crops from 2006-07 to 2016-17 is presented in Table 3.1. The area under *Jhum* was increased from 15,667 hectares in 2006-07 to 16,843 hectares in 2016-17 with a CAGR of 1.75 per cent, which was found significant at 10 per cent level of probability. In between, the area under *Jhum* increased up to 19, 5340 hectares in 2014-15but it started showing declining trend in the succeeding years.

The production of *Jhum* crops has shown an increasing trend from 15,514 MT in 2006-07 to 18,190 MT in 2016-17 with a CAGR of 2.60 per cent and was found significant at 5 per cent probability level. The highest production was recorded in 2014-15with20,517 MT due to increase of area in the reference year, which declined in the succeeding year with fluctuation from year to year.

The per hectare yield of *Jhum* crop has shown a steady growth from 990 kg.in 2006-07 to 1,080 kg in 2016-17 with the CAGR of 0.85 per cent and it was found significant at 1 per cent probability level.

Table - 3.1
Area, Production and Yield of *Jhum* crops in Tripura

Years	*Jhum* Area (in ha)	*Jhum* Production (in MT)	*Jhum* Yield (in kg/ha)
2006-07	15667	15514	990
2007-08	14956	14956	1000
2008-09	16390	16472	1005
2009-10	14452	14423	991
2010-11	19540	20517	1050
2011-12	17859	19038	1066
2012-13	16511	17705	1072
2013-14	18351	18993	1035
2014-15	19540	20517	1050
2015-16	17859	19038	1066
2016-17(P)	16843	18190	1080
CAGR	1.75***	2.60**	0.85*

Source: Agriculture Department, Govt. of Tripura
Note:* indicates significant at 1 % level,** indicates significant at5 % level and*** indicates significant at 10%level

The graphical representation of area, production and per hectare yield of *Jhum* crops with trend lines is presented in Fig-3.1, Fig-3.2 and Fig-3.3, respectively.

Fig-3.1
Trend of Growth of *Jhum* Area in Tripura

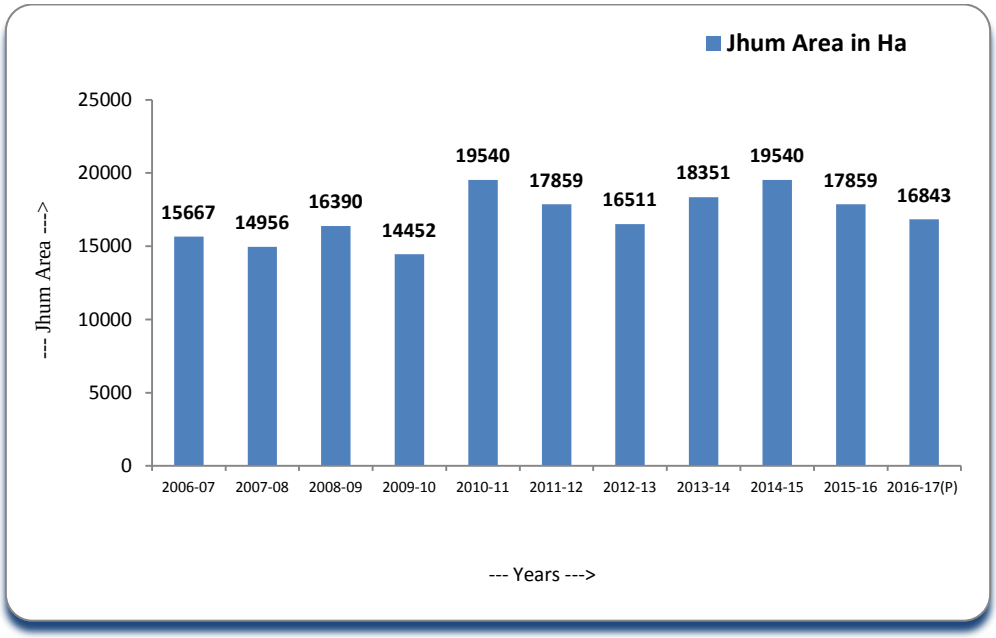


Fig-3.2
Trend of Growth of *Jhum* Production in Tripura

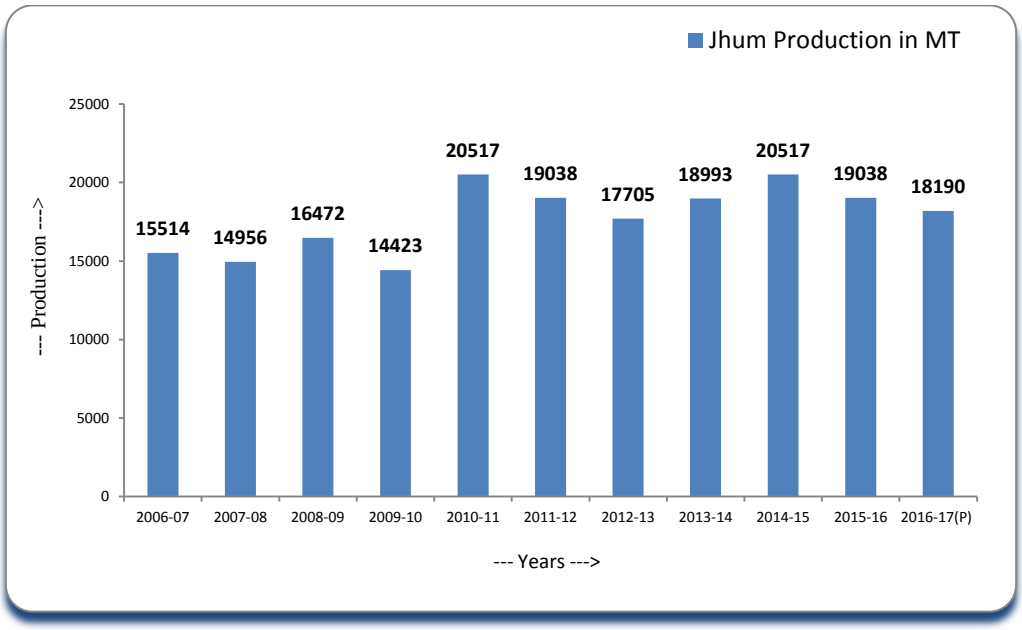
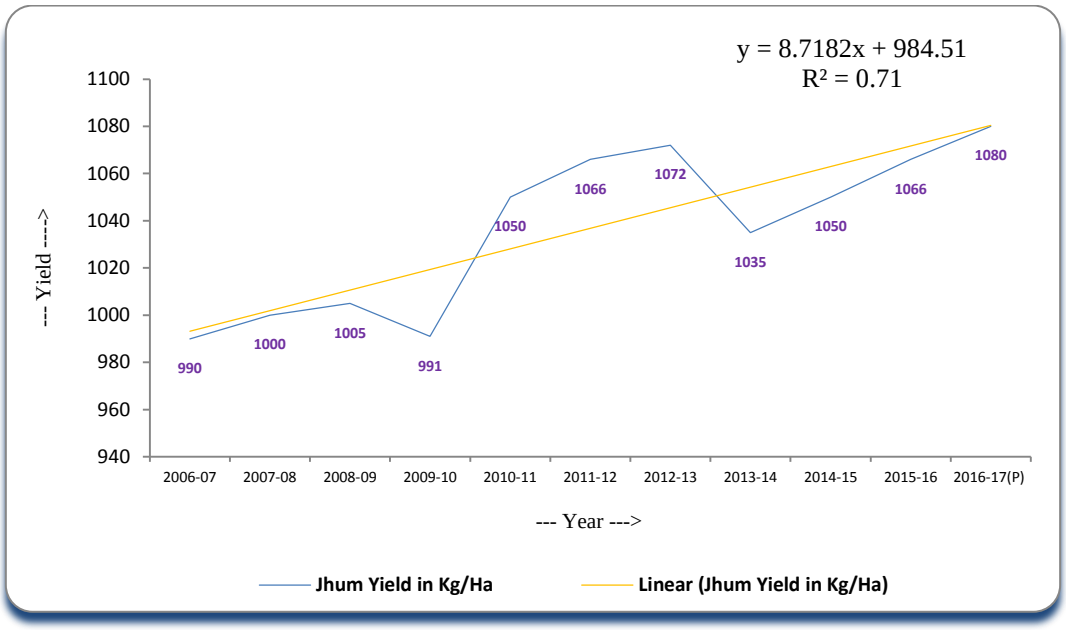


Fig-3.3
Trend of *Jhum* Yield in kg/ha in Tripura



3.2 Production of Natural Rubber (NR) across the States in India

State-wise production of natural rubber during 2015-16 to 2018-19 is presented in Table-3.2. It has been observed that Kerala and Tamil Nadu ranked 1st and 2nd position while Tripura ranked 3rd position amongst the States in production of NR during the reference period under study. Kerala, Meghalaya, Karnataka,

Maharashtra and the rest of the States had shown a rising trend of production. However, in totality, a sharp decline in production (6.63%) was observed in 2018-19 with 6,48,000 tonnes from 6,94,000 tonnes in 2017-18. There were many reasons for such decline in production of NR rubber, as identified by the concerned department, which included high labour cost, high input cost, cheap imports, ageing plants and low productivity per hectare *etc.*

Table-3.2
State-wise Production of Natural Rubber in India

(in tonnes)

State	2015-16	2016-17	2017-18(P)	2018-19 (P)
Kerala	438630	540400	540775	490460
Tamil Nadu	19495	21140	21110	21500
Traditional Total	**458125**	**561540**	**561885**	**511960**
Tripura	**44245**	**50985**	**50500**	**53050**
Assam	14560	19970	23300	24300
Meghalaya	7360	8950	9050	9100
Nagaland	3020	4320	4820	4930
Manipur	1660	2090	1790	1850
Mizoram	595	742	742	750
Arunachal Pradesh	360	478	428	450
North East Total	**71800**	**87535**	**90630**	**94430**
Karnataka	29400	38800	38300	38200
A&N Islands	240	240	240	275
Goa	640	645	575	625
Maharashtra	925	1185	1185	1250
Odisha	315	400	450	480
West Bengal	325	335	335	380
Andhra Pradesh	230	320	400	400
Others Total	32075	41925	41485	41610
Non-Traditional Total	**103875**	**129460**	**132115**	**136040**
Grand Total	562000	691000	694000	648000

Source: Rubber Board (This information was given by the Minister of Commerce & Industry, Piyush Goyal in a written reply in the Lok-Sabha)

3.3 Area, Production, Average Yield, Import and Export Scenario of NR Rubber in India

The area under NR in India has increased from 5.98lakh hectares in 2005-06 to 8.22 lakh hectares in 2018-19 with the CAGR of 1.33 per cent and found significant at 1 per cent probability level. Taping area of rubber has also increased with a CAGR of 1.36 per cent during the reference period and found significant at 1 per cent probability level.

The production of NR has shown a declining trend from 8.03 lakh tonnes in 2005-06 to 6.51 lakh tonnes in 2018-19 registering a negative CAGR of 1.22 per cent and was found insignificant at different probability. It may be attributed to sharp decline in average yield during the reference period. However, the highest production with 9.14 lakh tonnes was recorded in 2012-13.

Table-3.3
Trends in Area, Tap-able Area, Production, Average Yield, Import and Export of Natural Rubber in India

Year (April to March)	Rubber Area (in ha)	Tap-able Rubber Area (in ha)	Production (in tonne)	Average Yield (in kg/ha)	Import (in tonne)	Export (in tonne)	Total Trade (in tonne)
2005-06	5,97,610	4,47,015	8,02,625	1,796	45,285 (38.02)	73,830 (61.98)	1,19,115 (100.00)
2006-07	6,15,200	4,54,020	8,52,895	1,879	89,799 (61.36)	56,545 (38.64)	1,46,344 (100.00)
2007-08	6,35,400	4,58,830	8,25,345	1,799	86,394 (61.36)	60,353 (41.13)	1,46,747 (100.00)
2008-09	6,61,980	4,63,130	8,64,500	1,867	77,762 (62.37)	46,926 (37.63)	1,24,688 (100.00)
2009-10	6,86,515	4,68,480	8,31,400	1,775	1,77,130 (87.59)	25,090 (12.41)	2,02,220 (100.00)
2010-11	7,11,560	4,77,230	8,61,950	1,806	1,90,692 (86.46)	29,851 (13.54)	2,20,543 (100.00)
2011-12	7,34,780	4,90,970	9,03,700	1,841	2,14,433 (88.76)	27,145 (11.24)	2,41,578 (100.00)
2012-13	7,57,520	5,04,040	9,13,700	1,813	2,62,753 (89.57)	30,594 (10.43)	2,93,347 (100.00)
2013-14	7,78,400	5,18,100	7,74,000	1,629	3,60,263 (98.52)	5,398 (1.48)	3,65,661 (100.00)
2014-15	7,95,135	5,33,675	6,45,000	1,443	4,42,130 (99.77)	1,002 (0.23)	4,43,132 (100.00)
2015-16	8,10,800	5,58,900	5,62,000	1,437	4,58,374 (99.81)	865 (0.19)	4,59,239 (100.00)
2016-17	8,18,000	5,84,600	6,91,000	1,553	4,26,188 (95.32)	20,920 (4.68)	4,47,108 (100.00)
2017-18	8,20,900	6,12,000	6,94,000	1,458	4,69,760 (98.93)	5,072 (1.07)	4,74,832 (100.00)
2018-19 (p)	8,22,000	6,40,000	6,51,000	1,453	5,82,351 (99.22)	4,551 (0.78)	5,86,902 (100.00)
CAGR	**1.33**	**1.36**	**-1.22**	**-1.1**	**9.78**	**-12.48**	**6.64**
Test of Significance→	**Significant at 1% level of significance**	**Significant at 1 % level of significance**	**Insignificant**	**Insignificant**	**Significant at 1 % level of significance**	**Insignificant**	**Significant at 1 % level of significance**

Source: Rubber Board of India.

The average yield per hectare was recorded between 1,775 kg and 1,813 kg per hectare during 2005-06 to 2012-13 respectively, with a little bit variation in the

intervening period. In the succeeding years, the productivity came down drastically to 1,453 kg per hectare in 2018-19, with a negative CAGR of 1.10 per cent, which was also found insignificant at different probability level.

Fig-3.4
Trends of Area, Tap-able Area and Production of NR in India

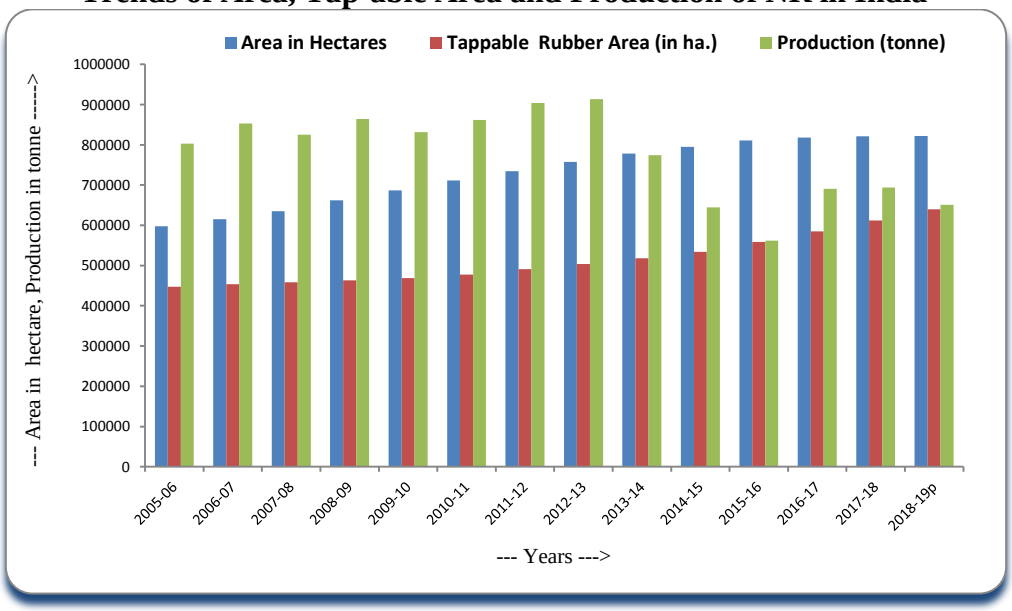
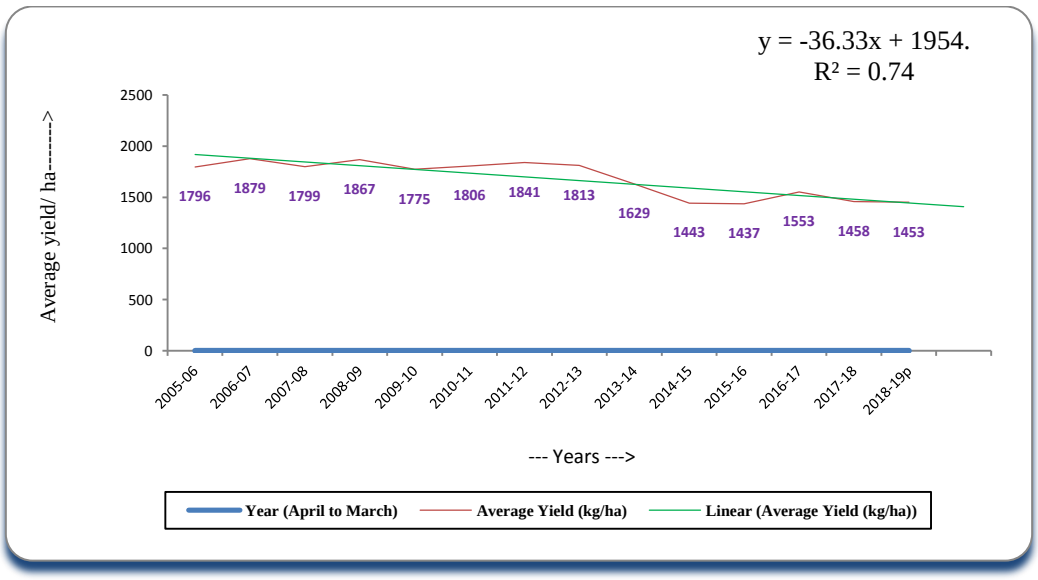


Fig-3.5
Trend of Yield of Rubber in India



It has been observed from the Table-3.3 that the demand for NR has been increasing over the years. The country's own production is not sufficient to meet the demand of NR rubber. As such, import has been increasing year after year. The import of rubber has increased from 0.45 lakh tonne in 2005-06 to 5.82 tonnes in 2018-19 with the CAGR of 9.78 per cent and was found significant at 1 per cent

probability level. Although the country is deficit in production, yet it has to maintain the export and import policy of the country. The country was not successful in maintaining the balance of trade. It is interesting to note is that the quantum of export in 2005-06 was significantly higher than that of import.

Because of increasing demand within the country, the export figure for NR indicated a sharp decline from 73.83 thousand tonnes in 2005-06 to 4.55 thousand tonne in 2018-19. The rate of decline in terms of the CAGR was recorded at (-) 12.48 per cent but found insignificant at all probability level under observation. In total trade of rubber, the percentage of import to total trade has rapidly increased from 38.02 per cent in 2005-06 to 99.22 per cent in 2018-19, indicating an increasing trend of deficit in production over the years. Trend of growth of area, production and the average yield are presented in Fig3.4 and Fig3.5.The CAGR of total rubber trade in the country during 2005-06 to 2018-19 was found at 6.64 per cent that was found significant at 1 per cent probability level.

3.4 Trend of Area, Production and Yield of NR in Tripura

The Regional Branch Office of the Rubber Board in Tripura, an autonomous body under the Ministry of Commerce and Industry, Government of India looks after all-round development of rubber plantation sector of Tripura. The State has emerged as the largest natural rubber growing State of the country, next to Kerala with 84.31 thousand hectares of rubber plantation. Rubber has occupied an important place for improvement of socio-economic status of a large chunk of people of the State.

As per Economic Review of Tripura, the National Bureau of Soil Survey and Land Use Planning (NBSS & LUP) has estimated that approximately one lakh hectare is available for rubber cultivation in the State, out of which 84.31 thousand hectares has already been brought under cultivation. The report also highlighted some steps requiring immediate intervention such as re-plantation with high yielding variety by uprooting the old plants and high amount of capital investment. Low productivity, quality up-gradation, scarcity of estate inputs & fertilizers, empowerment of growers, skill development, minimum support price, high transportation cost and absence of insurance coverage to meet the heavy loss of the plants due natural calamities especially hailstorm/cyclone during April to May, were the major constraints for rubber growers. In addition, it is factually true that an industry is sustainable only when the growers receive a remunerative price for its product. As per report, majority of the growers were marginal and socially backward (Tribal Community). Therefore,

a need-based external support with special package for the growers is a must for the rubber economy of the State.

The time series data on area, production and yield of Natural Rubber are presented in Table 3.4.

Table-3.4
Trends of Area, Production and Yield of Natural Rubber in Tripura

Years	Area (in ha)	Production (in tonne)	Yield (in kg/ha)
2005-06	36862	25793	700
2006-07	41620	30563	730
2007-08	46984	32280	690
2008-09	54439	33774	620
2009-10	59542	35408	600
2010-11	63423	37046	580
2011-12	67537	38096	560
2012-13	70765	39737	560
2013-14	74709	42491	570
2014-15	78498	46815	600
2015-16	80980	52025	640
2016-17	83280	56380	680
2017-18	84308	65330	780
CAGR	6.97	6.79	-0.13
Test of Significance	**Significant at 1% probability level**	**Significant at 1% probability level**	**Insignificant**

Source: Rubber Board, Tripura

The area under NR trees in Tripura has increased from 36,862 hectares in 2005-06 to 84,308 hectares in 2017-18 with a CAGR of 6.97 per cent and was found significant at 1 per cent probability level.

The production NR has increased from 25,793 tonnes in 2005-06 to 65,330 tonnes in 2017-18 with the CAGR of 6.79 per cent, which was found significant at 1 per cent probability level.

Per hectare yield of NR has shown an increasing trend from 700 kg in 2005-06 to 780 kg in 2017-18. But due to decline in yield between the period 2006-07 and 2016-17, the CAGR recorded a negative growth of 0.13 per cent which was found insignificant.

The graphical representations of area, production and yield of natural rubber with trend lines are presented in Fig-3.6 and Fig-3.7, respectively. A comparative trend of *Jhum* and rubber area in Tripura is presented in Fig.3.8, which depicts a significant growth of area under rubber as compared to that of *Jhum*.

Fig-3.6
Trend of Area and Production of Natural Rubber in Tripura

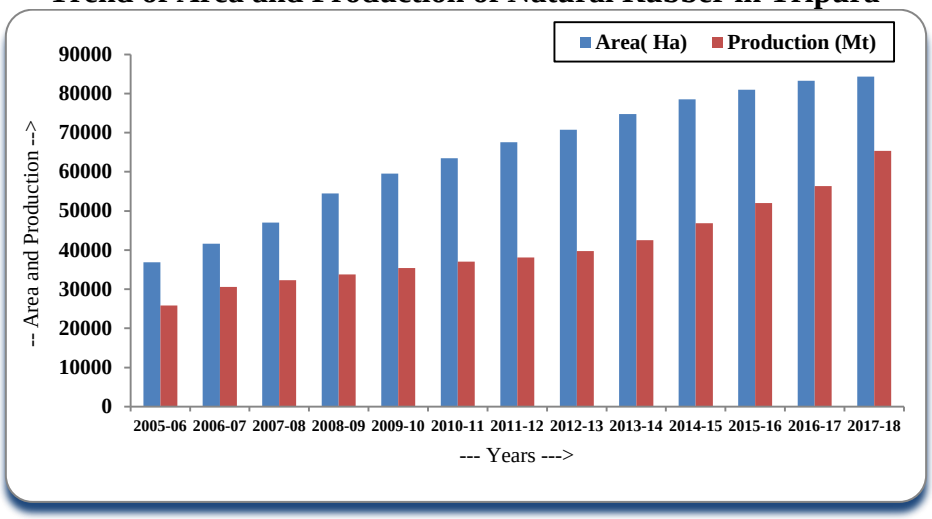


Fig- 3.7
Trend of Yield Rate of Natural Rubber in Tripura

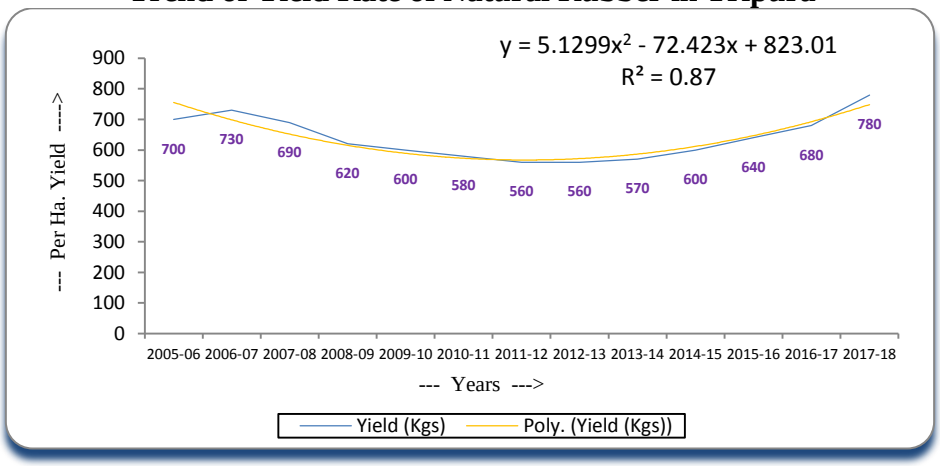
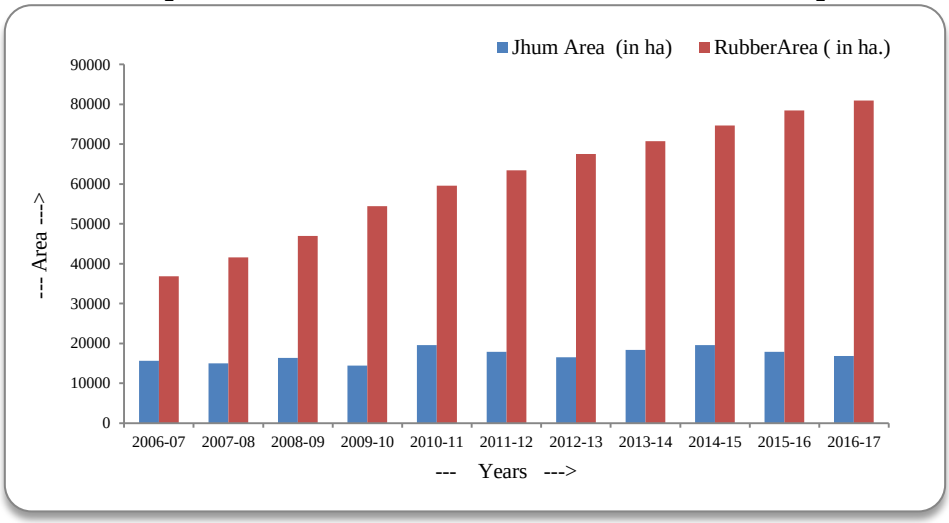


Fig -3.8
A Comparative trend of *Jhum* and Rubber Area in Tripura



3.5 Comparative Analysis of Productivity of NR in Tripura

The productivity of NR in Tripura is found to be significantly lower as compared to all India level. Thirteen years' time series data (Table-3.5) clearly indicated a widening gap in productivity of NR in Tripura *vis-a-vis* India (Table-3.5).

Table-3.5
Productivity of NR in Tripura *vis-à-vis* India

Year	Productivity in All India (kg/ha)	Productivity of Tripura (kg/ha)	Yield gap compared to all India (kg/ha)	Percentage of Yield Gap (%)
2005-06	1796	700	1096	38.98
2006-07	1879	730	1149	38.85
2007-08	1799	690	1109	38.35
2008-09	1867	620	1247	33.21
2009-10	1775	600	1175	33.80
2010-11	1806	580	1226	32.12
2011-12	1841	560	1281	30.42
2012-13	1813	560	1253	30.89
2013-14	1629	570	1059	34.99
2014-15	1443	600	843	41.58
2015-16	1437	640	797	44.54
2016-17	1553	680	873	43.79
2017-18	1458	780	678	53.50
CAGR	(-)4.19**	(-)0.13*	(-)3.74***	

Source: Rubber Board Zonal Office, Tripura
*Indicates not significant
** Indicates significant at 5% probability level
*** Indicates significant at 1% probability level

3.6 Estimated Return from NR and its Contribution to GSDP in Tripura

Sustainability of any crop cultivation depends on level of productivity, quality of product and the price received by the growers at retail point. All the factors are linked with the cost borne by the farmers at different stages of activities. These issues are to be well taken care of by the concerned Departments associated with the rubber planning & development. Adequate price support to the rubber growers can provide a big boost to the rubber industry in Tripura.

Table-3.6
Estimated Contribution of NR to GSDP of Tripura

Year	Area (in ha)	Production (in tonnes)	Estimated average price per kg (based on all India data published by Rubber Board of India)	Estimated Value of the Product (in croreRs)	GSDP with base year 2011-12 (in croreRs)	Estimated Value of the Product to GSDP (in %)
2015-16	80,980	52,025	113	587.88	35,937.73	1.64
2016-17	83,280	56,380	135	761.13	39,612.05	1.92
2017-18	84,308	65,330	135	881.96	46,132.88 (p)	1.91

Source: Rubber Board, Tripura

The annual estimated value of the products from NR plantation in Tripura from 2015-16 to 2017-18 were worked out on the basis the available published data and are presented in Table-3.6. The value of the products was found to the tune of Rs.587.88 crores in 2015-16, which increased to Rs. 881.96 crores in 2017-18. The contribution of the rubber product to the GSDP of Tripura was estimated at 1.64 per cent in 2015-16, 1.92 per cent in 2016-17 and 1.91 per cent in 2017-18. This amply indicates the growing importance of rubber in the economy of Tripura.

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A View of Drying of Rubber Sheet in the Sunlight

CHAPTER - IV

INCOME FROM SHIFTING AND RUBBER CULTIVATION

4.1 Returns from *Jhum* and Natural Rubber Cultivation across the Sample Blocks

Geographical location and prevailing agro-economic conditions determine the way of life of the people. The essence of community living is ingrained in the life style of *Reang* tribe. Community agriculture continues to be the main source of livelihood of the tribal people. In such societies, the natural resources like land, forest and water belonged to community as a whole and not to the individuals. This is a unique feature, which values them different from the rest. It has been observed that the tribal communities are deprived of some benefits offered by the Government at individual level. For instance, existing credit policy against crop is not applicable to them. However, the State Government has adopted some other policy initiatives to ensure the benefits under different schemes. Rubber growers are getting different benefits and facilities under different schemes of the Regional Rubber Board of Tripura.

Here an attempt has been made to highlight the economics of *Jhum vis-à-vis* rubber cultivation with the help of cost-benefit analysis (CBA) based on primary level data. The CBA is a mathematical technique used to work out the benefit ratio between gross income and total cost incurred in monetary terms in any economic activities. The technique has been applied in this study to determine the per hectare profitability in shifting *vis-a-vis* rubber plantation across the sample blocks under study. It is hoped that the final results of the analysis would help the farmers in deciding the better option, while appreciating the fact that the shifting cultivation continued to be a great catalytic force in the community life of tribal people.

In case of shifting cultivation, the major cost components included labour cost in land preparation and the cost involved in buying seeds and manure. Since, shifting cultivators normally do not buy any of these inputs from outside, the cost of labour, seeds and manures *etc.*, were estimated on the basis of the information provided by the farmers during field investigation.

The cost of cultivation of rubber plantation involved different cost components *viz.*, cleaning/weeding cost, owned and hired labour costs, fertilisers& manure, seed costs and plant protection cost (Rubber Board, Tripura, 2017) .

Table-4.1 shows per hectare costs and returns with benefit-cost ratio (BCR) of shifting cultivation across the sample blocks, namely, Dasda block of North District, Ambassa block of Dhalai district and Amarpur block of Gomati district.

Table –4.1
Costs and Returns with Benefit-Cost Ratio of Shifting Cultivation Across the Sample Blocks under the Selected Districts of Tripura

(Rupees/ha/annum)

Dasda Block of North District						
Activities	Paddy	Pulses	Till (sesame)	Chilly	Mixed vegetables	Overall
Land Preparation (slashing/burning/ cleaning)	10,000	0	0	0	0	2,000
Labour cost	37,400	4,000	2,000	6,250	4,000	10,730
Fertilizers	0	0	0	0	0	0
Seed/sowing/weeding *etc.*	16,100	1,000	1,000	1,500	800	4,080
Total Cost	63,500	5,000	3,000	7,750	4,800	16,810
Gross Return	64,135	5,500	6,000	8,000	9,600	18,647
Net Return	635	500	3,000	250	4,800	1,837
BCR	**1.01**	**1.10**	**2.00**	**1.03**	**2.00**	**1.11**
Ambassa Block of Dhalai District						
Activities	Paddy	Pulses	Maize		Mixed vegetables	Overall
Land Preparation (slashing/burning/ cleaning)	10,000	0	0		0	2,500
Labour cost(tilling of land)	37,709	3,343	3,900		3,621	12,143
Fertilizers	0	0	0		67	17
Seed /sowing/weeding *etc.*	13,603	308	280		392	3,646
Total Cost	61,312	3,651	4,180		4,080	18,306
Gross Return	63,248	5,060	5,692		5,692	19,923
Net Return	1,936	1,409	1,512		1,612	1,617
BCR	**1.03**	**1.39**	**1.36**		**1.40**	**1.09**
Amarpur Block of Gomati District						
Activities	Paddy	Pulses	Maize		Mixed vegetables	Overall
Land Preparation (slashing/burning/ cleaning)	10,000	0	0		0	2,500
Labour cost (tilling of land)	41,913	3,061	3,524		3,316	12,954
Fertilizers	0	0	0		96	24
Seed/sowing/weeding *etc.*	7,990	439	400		559	2,347
Total Cost	59,903	3,500	3,924		3,971	17,825
Gross Return	64,696	4,603	4,827		5,753	19,970
Net Return	4,793	1,103	903		1,782	2,145
BCR	**1.08**	**1.32**	**1.23**		**1.45**	**1.12**

Source: Primary data

Note: Rate of inputs during field survey

Labour wage Rs.200-300/day, Urea =Rs 5.76/kg,MOP=Rs.10.78/kg, SSP =Rs.10.95/kg, FYM= Rs.01/kg, Paddy seed = Rs.30-50/kg, *Jhum*Paddy Seed Price=Rs.30-40/kg.

As *Jhum* cultivation follows multiple cropping patterns in the same plot of land, the land preparation cost for subsequent crops were found/considered to be very minimal. The net return from *Jhum* paddy was found to be highest with Rs.4,793 per hectare in Amarpur Block but the corresponding figures were very low in Ambassa (Rs1936/ha.) and Dasda (Rs.635/ha.) block. It is clear from the table that the per hectare return from paddy under shifting cultivation were found at marginal level. However, the highest per hectare profitability in *Jhum* paddy with the BCR 1.08:1 was recorded in Amarpur block followed by the BCR 1.03: 1 in Ambassa block and 1.01:1 in Dasda block.

Til (sesame) and chilly were found to be cultivated in Dasda block only. The BCR for *til* (sesame) crop stood at 2.00:1 with the net return of Rs. 3000/ha and for chilly crop, the BCR was recorded at 1.03:1 with the net return of Rs.250/ha only.

In case of mixed vegetables, the highest profit was recorded in Dasda block (BCR 2.00:1) with a net return of Rs.4,800/ha while the BCR of mixed vegetables in Amarpur block stood at1.45:1with a net return at Rs.1,782,/ha in Amarpur block, closely followed by Ambassa block (BCR 1.40:1) with a net return of Rs.1,612.

For overall *Jhum* cultivation, the BCR was worked out at 1.11:1 with a net return of Rs. 1,837 against Dasda block. In Ambassa block, the BCR stood at 1.09:1 with a net return of Rs.1,617/ha and the corresponding figure for Amarpur block was recorded at Rs.2,145/ha with a BCR of 1.12:1.

Table-4.2 presents per hectare cost of cultivation together with gross and net return from rubber plantation across the selected blocks of North district, Dhalai district and Gomati district. The analysis is based on latex yielding rubber trees owned by the sample households. It is to be noted here that the extraction of latex from rubber plant goes throughout the year, with some seasonal variation. The per hectare labour cost for cleaning & weeding was found at Rs.6,650 each in Dasda block and Ambassa block while it was found at Rs.7,350 in Amarpur block.

The per hectare input cost of fertilizer & farm yard manure stood at Rs. 2,500 in Dasda,Rs. 2,000 in Ambassa and Rs.1,500 in Amarpur block. And per hectare costs incurred on account of plant protection were recorded at Rs.1,950 in Dasda block, Rs.1,050 in Ambassa block and Rs.2,000 in Amarpur block.

Per hectare processing & other costs included barking of rubber tree, fixing vessel for depositing latex, collection of latex and carrying it to the place where processing is done to make final rubber sheet for sale. In performing all these

activities, the total per hectare cost was recorded at Rs.22,800 in Dasda block, Rs.22,500 in Ambassa block and Rs.25,300 in Amarpur block.

Adding all costs, the per hectare total cost was found at Rs.33,900 in Dasda block, Rs. 32,200in Ambassa block and Rs.36,150 in Amarpur block.

Per hectare gross return was calculated based on the price received by the rubber growers from the sale of final product (rubber sheet). Available data indicates that the price of rubber sheet in retail point lies between Rs. 100 and Rs. 120 per kg. Accordingly, the per hectare per annum gross return stood atRs.1,11,100 in Dasda block, Rs.1,01,220 in Ambassa block and Rs.1,34,800 in Amarpur block. Also, the per hectare per annum net return was worked out at Rs.77.200 for Dasda block, Rs.69,020 for Ambassa block and Rs.98,650 for Amarpur block.

Table - 4.2
Costs and Returns with Benefit-Cost Ratio of Rubber Cultivation Across the Sample Blocks under the Selected Districts of Tripura

(Rupees/ha/annum)

Activities	Dasda Block of North District	Ambassa Block of Dhalai District	Amarpur Block of Gomati District
Labour cost (Cleaning & Weeding)	6,650	6,650	7,350
Fertilizer & Farm Yard Manure (FYM)	2,500	2,000	1,500
Plant Protection	1,950	1,050	2,000
Processing & Others	22,800	22,500	25,300
Total Cost	33,900	32,200	36,150
Gross Return	111,100	101,220	134,800
Net Return	77,200	69,020	98,650
BCR	**3.28**	**3.14**	**3.73**

Source :Field Survey
Note: Price received by the growers
Rubber sheet: Rs.100-120/kg,Rubber Scrap: Rs.60-70/kg
Labour Cost per Day Rs200-300,
Planting Material =33000-45000 /ha.

The highest net return of Rs.98,650/ha per annum was recorded in Amarpur block with a BCR of 3.73:1followed by Dasda block with the BCR of 3.28:1 and net return of Rs.77,200/ha and Ambassa block with a BCR of 3.14:1 yielding a net return of Rs. 69,020/ha/ per annum.

The annual per hectare gross and net return from *Jhum* and rubber cultivation across the sample blocks are presented in Fig.4.1 and Fig. 4.2

Fig. 4.1
Overall Gross Return from *Jhum* and Rubber Cultivation across the Sample Blocks

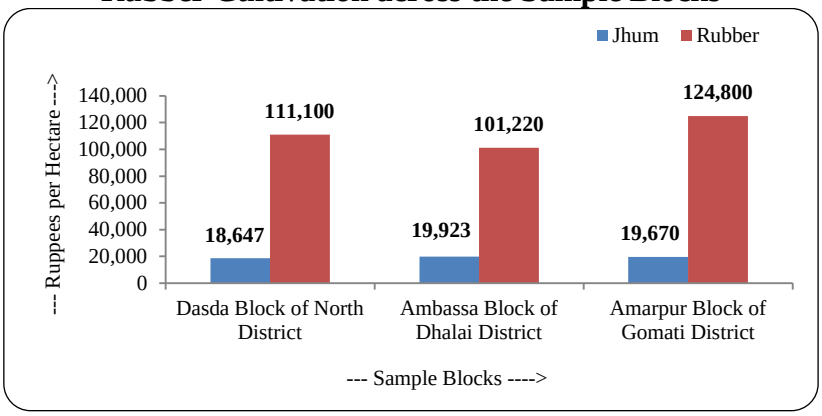
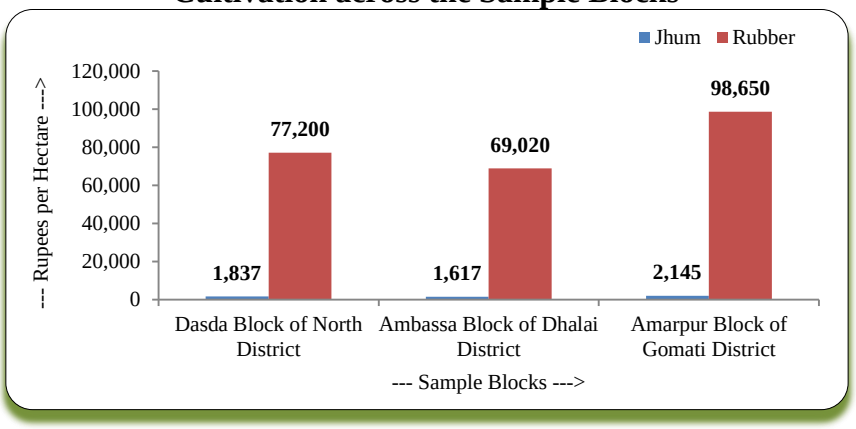
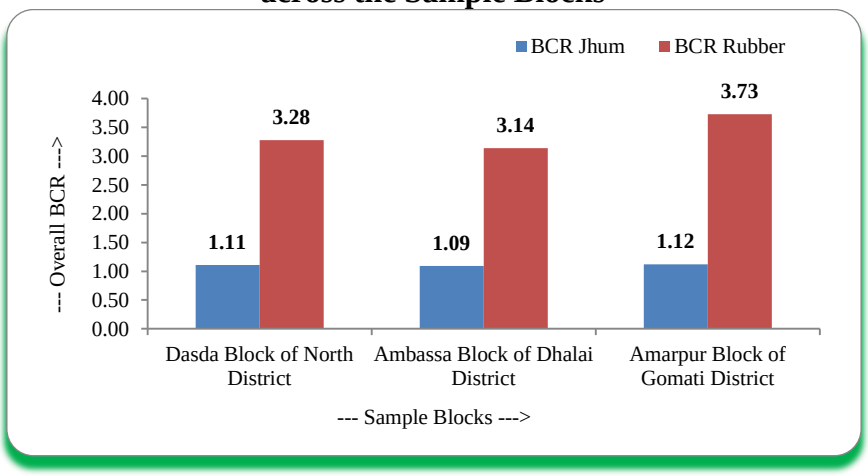


Fig. 4.2
Overall Net Return from *Jhum* and Rubber Cultivation across the Sample Blocks



Thus, it can very well be seen that overall BCRs of *Jhum* cultivation were significantly lower as compared to that of rubber cultivation. The benefit from rubber cultivation was found to be three times more than the *Jhum* cultivation (Fig 4.3).

Fig – 4.3
Overall BCR of *Jhum* and Rubber cultivation across the Sample Blocks



Apparently, constant efforts should be made to educate the *Jhum* farmers to go for settled cultivation for better livelihood option(s), like rubber.

4.2 Block-wise Annual Employment Generation from Shifting and Rubber Cultivation

Unchecked migration of labour from rural to urban areas in search of livelihood is a common phenomenon in the country, persistently causing great concern to the policy makers.

In this regard, rubber plantation is a ray of hope to the *Reang* tribe as it has the potential of providing gainful employment to a sizeable number of people. In this section, an effort has been made to present a comparative scenario of employment under *Jhum* and rubber cultivation in the study area.

Table - 4.3
Average Employment Generation from Shifting and Rubber Cultivation in the three Sample Districts of Tripura

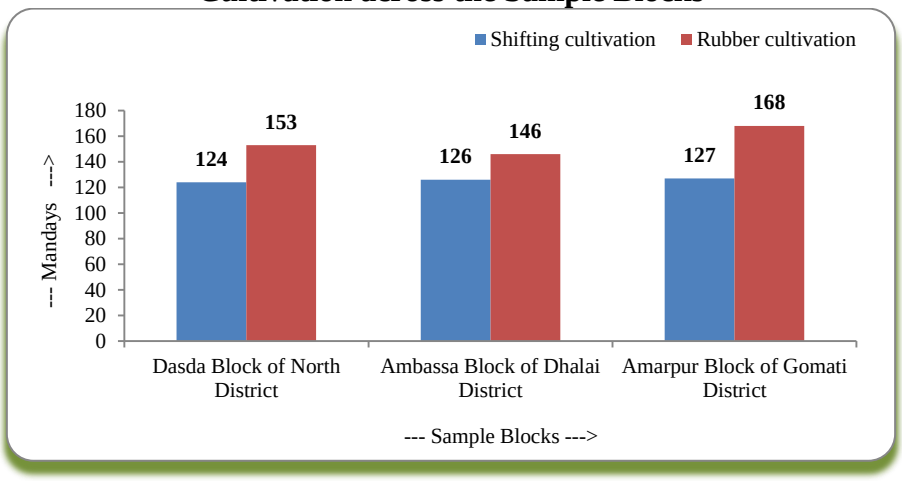
(Mandays/ha/year)

Dasda Block of North District		
Activities	**Shifting Cultivation**	**Rubber Cultivation**
Land preparation, Cleaning, Sowing *etc.*	24	0
Inter-culture	35	18
Fertilizer, FYM & Plant Protection	0	16
Harvesting (Cutting, threshing, winnowing, carrying / tapping and processing*etc*.	32	75
Border protection & Weeding	33	44
Total	**124**	**153**
Ambassa Block of Dhalai District		
Land preparation, Cleaning, Sowing *etc.*	18	0
Inter-culture	36	18
Fertilizer, FYM & Plant Protection	0	14
Harvesting (Cutting, threshing, winnowing, carrying / tapping and processing*etc*.	38	75
Border protection &Weeding	34	39
Total	**126**	**146**
Amarpur Block of Gomati District		
Land preparation, Cleaning, Sowing *etc.*	18	0
Inter-culture	36	18
Fertilizer, FYM & Plant Protection	0	16
Harvesting (Cutting, threshing, winnowing, carrying / tapping and processing*etc*.	38	90
Border protection & Weeding	35	44
Total	**127**	**168**

Source: Field Survey

Table4.3and Fig. 4.4 present activity-wise employment scenario across the sample blocks in terms of man-days per hectare per year under *Jhum* and rubber cultivation. It is revealed that the employment under *Jhum* cultivation per annum was very low as compared to the settled cultivation (rubber) in all the sample districts of Tripura.

Fig.- 4.4
Average Annual Employment Generation under Shifting and Rubber Cultivation across the Sample Blocks



Per hectare employment from *Jhum* was highest in Amarpur block of Gomati district (127 days/ha/year),whereas it was lowest in Dasda block of North district(124 days/ha/year). The labour employment per hectare per annum, in case of rubber cultivation was found to be significantly higher than that of shifting cultivation in all the selected blocks of sample districts. It was highest (168 days/ha/year) in Amarpur block of Gomati district while it was lowest (146 days/ha/year) in Ambassa block of Dhalai district. This may be because of the adoption of scientific agro-practices followed by the rubber growers, which were intensive in nature.

4.3 Block-wise Attendance Pattern of School Goers in the Families Involved in Shifting and Rubber Cultivation

The attendance pattern of the school goers of both groups of farmers was ascertained to see the educational awareness amongst the selected farm families. In this regard, besides many other factors, the economic conditions of the farm families played an important role in providing education to their children, as evident from the sample survey. Thus, the pecuniary condition of the sample cultivators was an important consideration while assessing the prevailing status of children education amongst the *Reang* tribe practicing *Jhum* and rubber cultivation. However, the level

of awareness of children's education was found to be significantly higher in case of rubber cultivators as compared to the *Jhumias.*

Table-4.4, Fig.4.5, 4.6 and 4.7 reveal the percentage of children with regular and irregular school attendance in the school along with the children not attending school at all in the sample blocks for both groups of farmers.

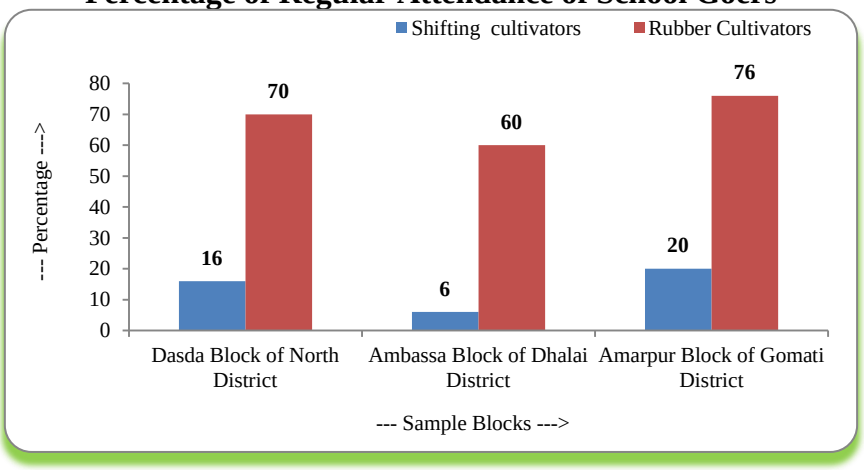
Table - 4.4
Patterns of School Attendance in Sample Districts

(Per cent)

Districts	Blocks	School attendance (Per cent)					
		Shifting cultivators			Rubber cultivators		
		Regular	Irregular	Not at all attending	Regular	Irregular	Not at all attending
North	Dasda	16	32	52	70	24	6
Dhalai	Ambassa	6	40	54	60	30	10
Gomati	Amarpur	20	64	16	76	20	4

Source : Field Survey.

Fig.-4.5
Percentage of Regular Attendance of School Goers



In case of *Jhum* cultivators, 16 per cent of the children were found to be regular in attending the school under Dasda block. It was recorded at 6 per cent for Ambassa block and at 20 per cent for Amarpur block. The children were irregular in attending the school to the extent of 32 per cent in Dasda block, 40 per cent in Ambassa block and 60 per cent in Amarpur block. The highest number of children (54 per cent) who did not attend the school at all was recorded in Ambassa block, closely followed by Dasda block (52 per cent) and Amarpur block (16 per cent). Not attending to the school in large proportion, particularly in the North and Dhalai district of Tripura may perhaps be attributed to abject poverty rampant among the tribe practicing *Jhum* cultivation and lack of awareness on the part of the family head about the importance of education.

Fig.4.6
Percentage of Irregular Attendance of School Goers

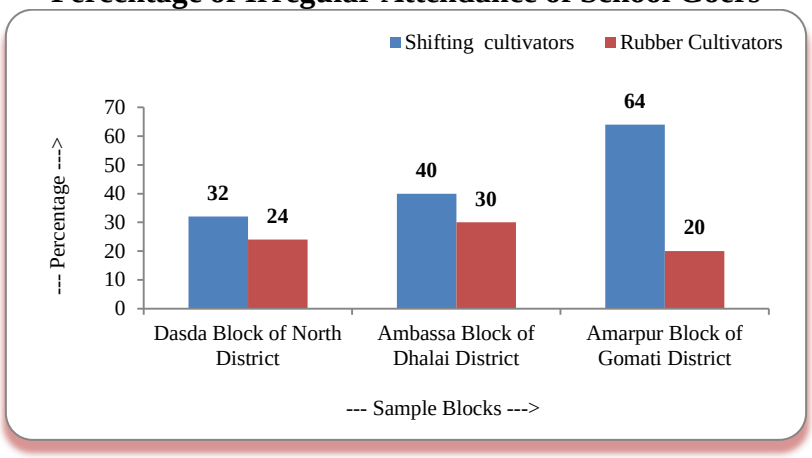
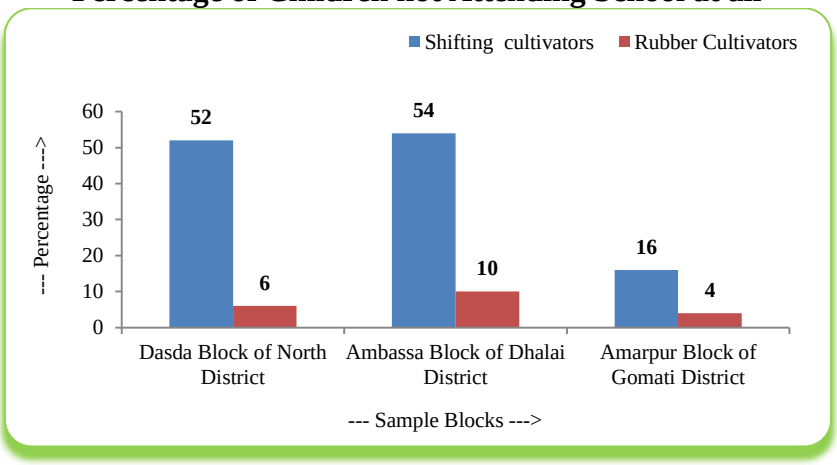


Fig.4.7
Percentage of Children not Attending School at all



A significant change was observed in respect of children's education amongst the rubber growers. It might be due to marked increase in income of the rubber growers and they might be in a better off position to afford the expenditure for their children's education. About 60 to 76 per cent of the children were found to attend their school regularly; 20 to 30 per cent children were irregular in attending the school and only 4 to 10 per cent of children were not going to the school at all in the sample blocks. Thus, it can be said that the overall status of children's education among both the group farmers was not good enough. Special efforts are to be made for spread of education among the *Reang* tribe and their children. Successful implementation of the on-going tribal development programmes backed by genuine political will can very well contribute to improve the education level, leading to amelioration of income and livelihood status.

4.4 Type of Dwelling Houses of the Farmers Involved in Shifting and Rubber Cultivation

The type and condition of dwelling houses also indicate the prevailing socio-economic status of a community. During the field investigation, the type and condition of the dwelling house of both the sample groups were visually assessed and it was emerged that most of the shifting cultivators, before adoption of rubber cultivation, were living in Government *patta*/leased land, in all the sample districts understudy. Housing patterns of the sample respondents for both categories of farmers are depicted in Table-4.5 (Fig 4.8, 4.9 and 4.10). As per records, about 92 to 96 per cent of the respondents under shifting cultivator category still lived in Mud/ *Kutcha* houses, 1 to 4 per cent of them lived in semi-*Pucca* houses and 3 to 4 per cent lived in *Pucca* houses with tin covered roof, while in case of rubber cultivators, 12 to 50 per cent of the respondents lived in Mud/*Kutcha* houses, 10 to 33 per cent of the respondents lived in semi-*Pucca* houses and nearly 36 to 55 per cent of the respondents lived in *Pucca* houses with tin

Table - 4.5
Pattern of Dwelling Houses in the Sample Districts

(percent)

Districts	Blocks	Housing Pattern					
		Shifting cultivators(percentage)			Rubber cultivators(percentage)		
		Mud/ Kutcha	Semi-Pucca	Pucca (Tin)	Mud/ Kutcha	Semi-Pucca	Pucca (Tin)
North	Dasda	92	4	4	12	33	55
Dhalai	Ambassa	93	3	4	34	30	36
Gomati	Amarpur	96	1	3	50	10	40

Source: Field Survey

Fig. 4.8
Percentage of Sample Households living in Mud/*Kutcha* Houses

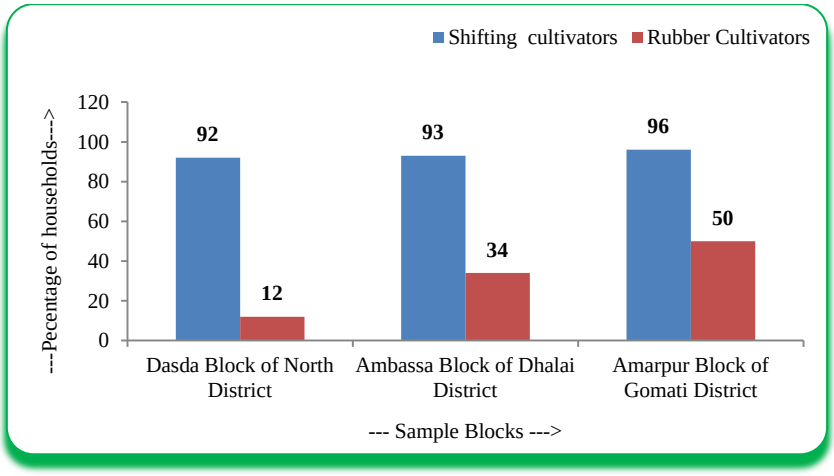


Fig. 4.9
Percentage of Sample Households living in Semi-*Pucca* Houses

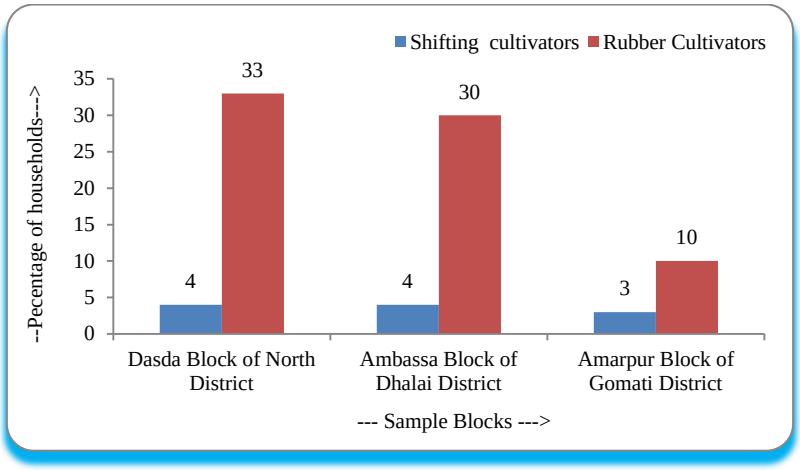
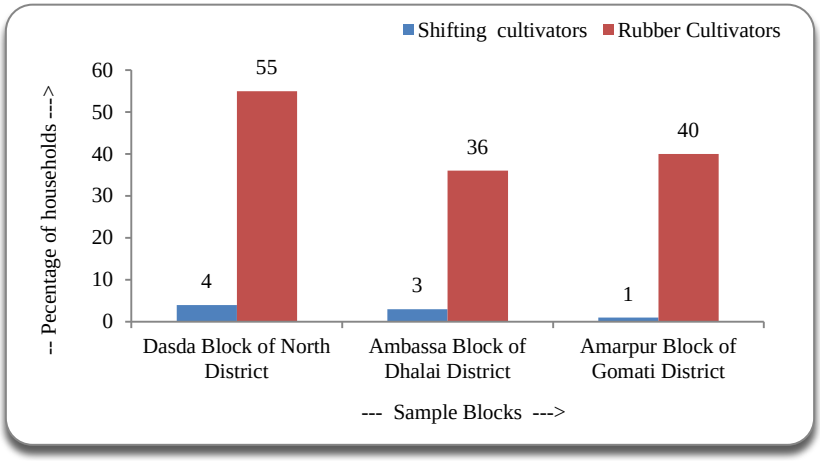


Fig. 4.10
Percentage of Sample Households living in *Pucca* Houses with Tin Roof



covered roof. Evidently, housing conditions of majority of the sample respondents were far from satisfactory level. However, housing problems were more pronounced among the *Jhum* cultivators as compared to the rubber cultivators. Improvement of housing condition in respect of rubber growers was possible, may be because of the increased level of income through adoption of modern package of practices. Because of saved-up capital, many of the rubber growers were even eligible for house building loan from the banks, as reported. Some of the respondents growing rubber trees also reported that they had already cleared their loan in full. But in case of *Jhumias*, it was not seen at all and thus, there is an urgent need to encourage and inspire the *Reang Jhumias* to get involved in settled cultivation, may be through rubber plantation, to earn added income to solve their housing problems.

4.5 Source-wise Drinking Water Availability in Sample Districts

Water is the essence of life. Hence, any denial of pure drinking water would imply a denial of right to life (Ayer, 2015). The right to water is not enshrined in the Indian Constitution as an explicit Fundamental Right but the Indian Judiciary, both at the State as well as at the centre, has in several judgments interpreted Article 21 of the Constitution to include a right to clean and sufficient water to each human and for healthy environment which would certainly imply a right to water to all the members of the society, be it is a human or animal.

The Supreme Court has recently reiterated again that 'the right to access to clean drinking water is fundamental need to life and there is a duty on the State under Article 21 to provide clean drinking water to its citizens'. The State of Tripura is also duty bound not only to provide adequate drinking water but also to protect water sources from pollution and encroachment. Any act of the State that allows pollution of water body 'must be treated as arbitrary and contrary to public interest and in violation of the right to clean water.'

As such, close observations were made to identify various sources of drinking water in the study area, particularly in respect of both categories of farmers, *viz. Jhumias* and the rubber growers. About 50 to 60 per cent of the shifting cultivators accessed water from well & natural stream, 28 to 32 per cent accessed water from tank, 10 to 18 per cent accessed water from tube well and only 4 per cent of the sample farmers that too, from Gomati district only accessed clean water from the Municipal Board. Tripura Govt. has to do a lot to reach out the ground realities of *Jhum* farmers living in the hilly terrain (Table-4.6).

The situation in case of rubber cultivators was found to be significantly better off. With adoption of settled cultivation through rubber plantation, most of the farmers were covered under various development schemes of the Government and Rubber Board. And under their patronage, headways were made for creating necessary infrastructure for supplying of clean water to the farmers. For these reasons, 23 to 38 per cent of the rubber cultivators accessed clean and safe water from the Municipal Boards, 27 to 35 per cent of the sample farmers could access water from tube wells, 4 to 20 per cent used water from tanks and 20 to 36 per cent of the sample farmers still had to access water from well & natural streams (Table-4.6).

Table - 4.6
Drinking Water Availability and use in Different Sample Districts

Districts	Blocks	Drinking water availability &use pattern							
		Shifting cultivators(percentage)				Rubber cultivators(percentage)			
		Municipal Board	Tube well	Tank water	Well& Natural stream	Municipal Board	Tube well	Tank	Well& Natural stream
North	Dasda	0	14	32	54	30	35	15	20
Dhalai	Ambassa	0	10	30	60	23	27	20	30
Gomati	Amarpur	4	18	28	50	38	32	4	26

Source: Field Survey

For a resourced-constrained State like Tripura, it is not that easy to provide clean water in hilly terrains. Once the tribal communities settle down in the plains under different rehabilitation programmes, it would become manageable to develop necessary facilities for water supply. That is why probably, the rubber growers could reap the benefits of relatively cleaner water provided by the local Government (Municipality Board).

4.6 Awareness and Current Status of Sanitation in Sample Districts

Sanitation implies "the condition and practices that help to maintain good health and prevent the spread of diseases". In this regard, the Government of India in partnership of UNICEF has made remarkable achievement in the country in reaching the Open Defecation Free target since 2014. A comparative analysis has been made here on the basis the information collected from both categories of sample farmers and presented in Table-4.7 and Figures 4.11,4.12 & 4.13. The table indicates that with the adoption of rubber cultivation, there was the up lift of economic condition of the farmers leading to remarkable changes in community sanitation among the sample farmers.

Table - 4.7
Status of Sanitation in the Sample Districts

(Per cent)

District	**Blocks**	**Sanitation(in percent)**					
		Shifting cultivators			**Rubber cultivators**		
		Pucca	***Kutcha***	**Open Place**	***Pucca***	***Kutcha***	**Open Place**
North	Dasda	4	52	44	73	15	12
Dhalai	Ambassa	3	50	47	50	30	20
Gomati	Amarpur	12	48	40	80	12	8

Source: Field Survey.

Wherein shifting cultivation was in practice, only 3 to 12 per cent of the sample farmers used *Pucca* toilets, 48 to 52 per cent of the sample farmers used

Kutcha toilets and 40 to 47 per cent of the farmers went for open defecation in the study area. However, marked changes were observed in the status of sanitation amongst the rubber growers. The use of *Pucca* toilets had increased to 50 to 80 per cent and *Kutcha* toilets had come down to 12 to 30 per cent in the study area. But ironically, 8 to 20 per cent sample farmers were still using open places for defecation.

Fig. 4.11
Percentage of Sample Households having *Pucca* Sanitation

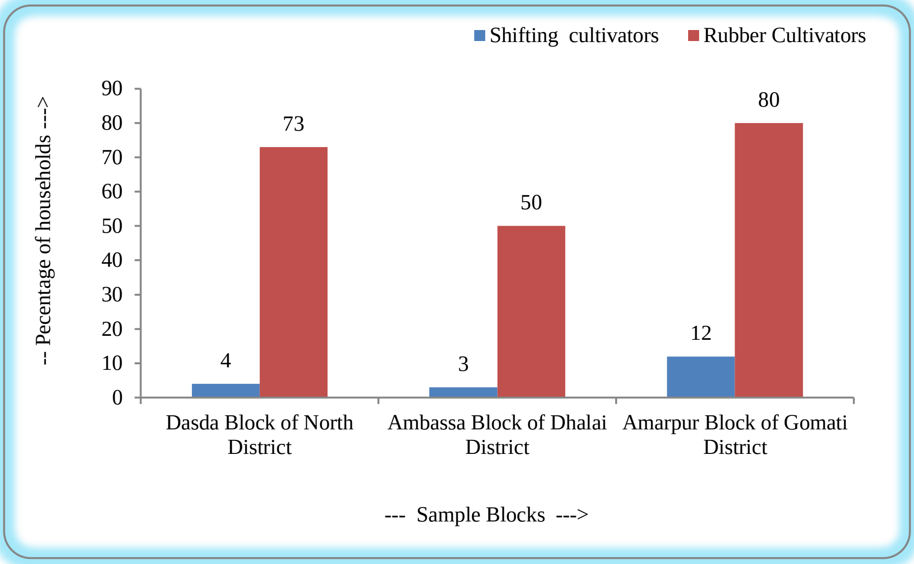


Fig. 4.12
Percentage of Sample Households having *Kutcha* Sanitation

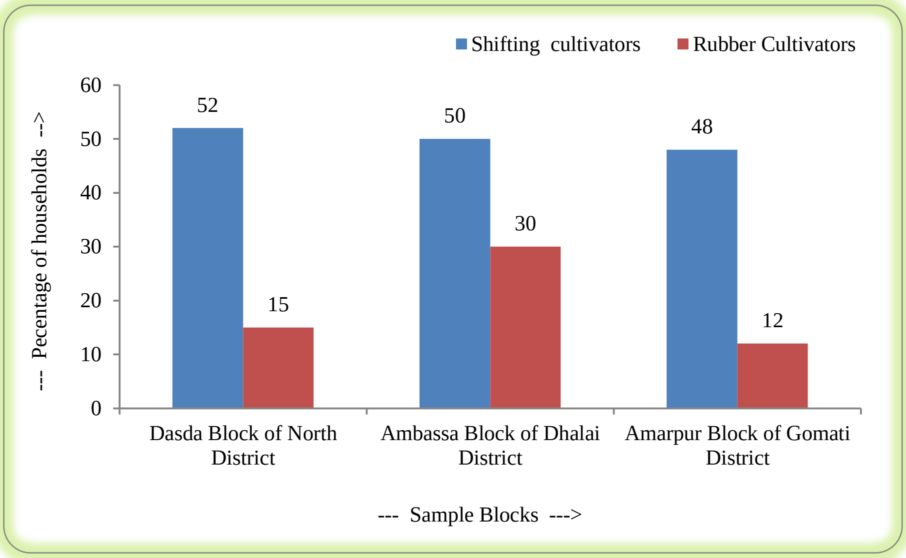
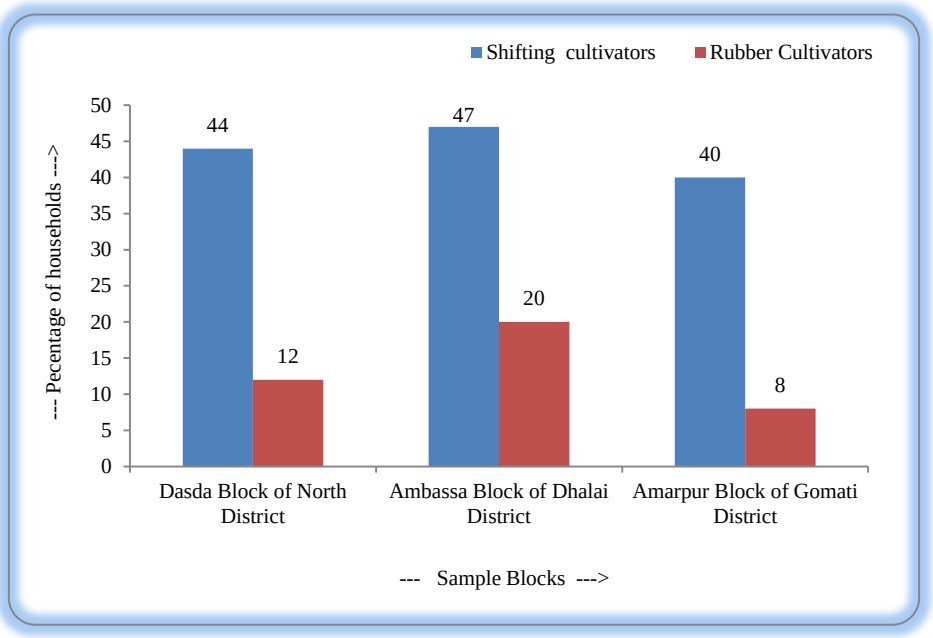


Fig. 4.13
Percentage of Sample Households using Open Place for Defecation



The above observations clearly indicate that vigorous campaign is needed to educate the farmers about personal and community hygiene. Sanitation is one of the most important aspects of community well-being because it protects human health and extend life span. The State has a major role to play to make all the tribal areas free from open defecation.

4.7 Status of Health & Hygiene in Sample Districts

The word "Health" has been defined by WHO as "A complete state of physical, mental and social wellbeing, not merely absence of disease or infirmity". In simple word, hygiene means series of practices to maintain one's health and to prevent disease especially. The most of the common diseases usually occur due to contaminated food or water or for being exposed to organisms such as bacteria, viruses, fungi or parasites. An effective health management system can prevent the occurrence many diseases through quality care and by adhering to the guidelines prescribed by the medical practitioners. Also, in the study area, most of the respondents had to suffer a lot due to prohibitive cost of treatment. It was not possible for them to access medical facilities provided by the State Health Department on time because of remoteness of their habitation.

As per the field data, blood pressure related diseases, diarrhoea, malaria, tuberculosis, flue and headache were the common diseases found amongst the *Jhumias* and rubber growers.

Going by the responses of the sample farmers, diarrhoea was a major disease in all the sample blocks of the selected districts. But the occurrence and spread of diarrhoea and malaria was recorded to be much lower amongst the rubber cultivators. Higher income earned by the rubber growers might have helped them to maintain a sound health management programme for them and their families. The pattern of treatment for various diseases, as followed by the sample farmers is depicted in Table-4.8.

Table - 4.8
Pattern of Treatment Amongst the Sample Farmers

(Per cent)

Districts	Blocks	Pattern of treatment									
		Shifting cultivators					Rubber cultivators				
		PHCs	*Kabiraj*	Medical shop	Friends	*Tantrik*	PHCs	*Kabiraj*	Medical shop	Friends	*Tantrik*
North	Dasda	32	32	20	12	4	40	30	20	0	10
Dhalai	Ambassa	6	40	20	10	24	36	30	12	10	12
Gomati	Amarpur	16	32	22	20	10	66	12	15	9	0

Source: Field Survey.

Fig-4.14
Percentage of Sample Households Dependent on PHCs for Medical Treatment

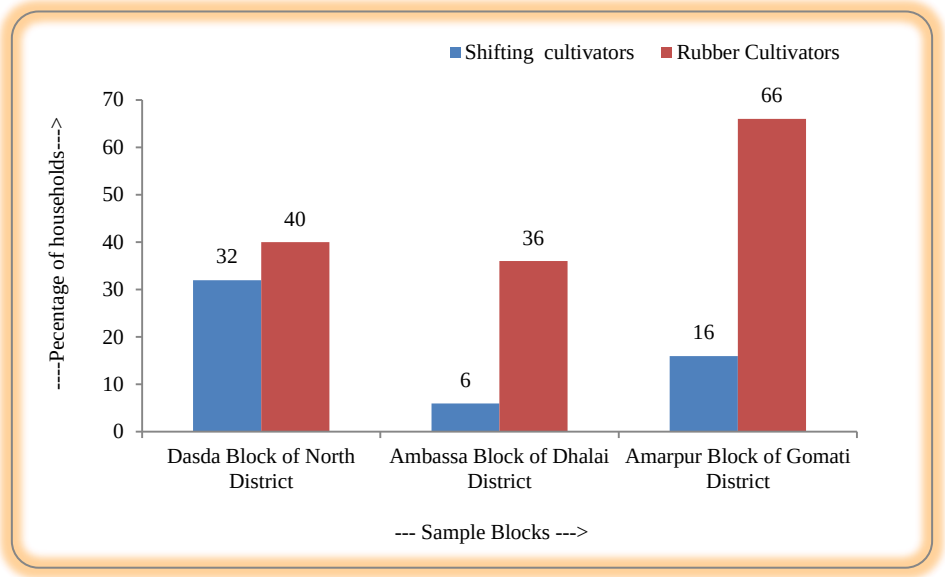


Fig.-4.15
Percentage of Sample Households Dependent on *Kabiraj* for Medical Treatment

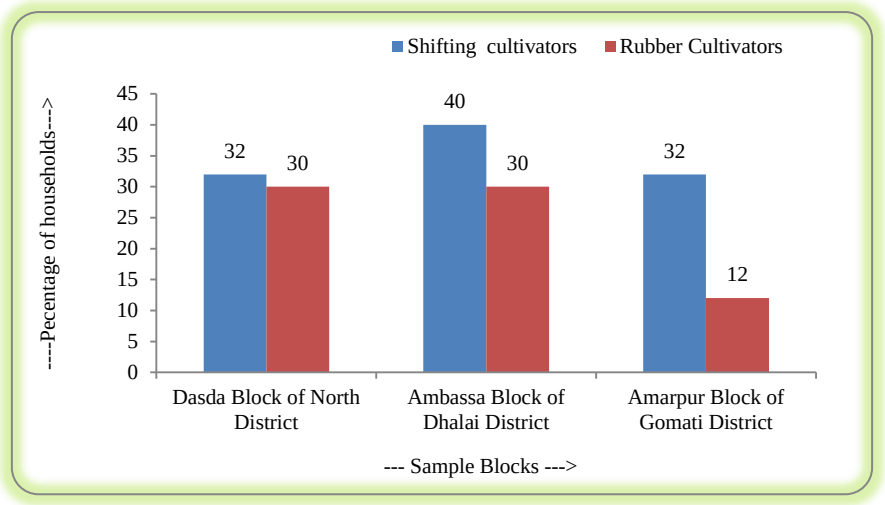


Fig.-4.16
Percentage of Sample Households Dependent on Medical Shop for Medical Treatment

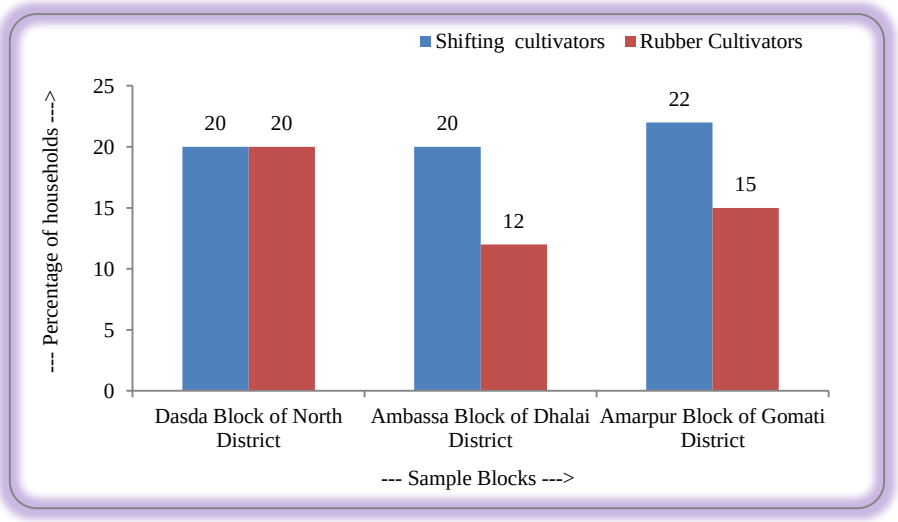


Table-4.8 and Figures 4.14 to 4.18reveal that for treatment of diseases, both the groups of farmers were dependent on Primary Health Centre (PHC), *Kabiraj*, advice of the owner of the medical shop (Pharmacy), friends and village *Tantrik*. As per the data available, only 6 to 32 per cent of the *Jhum* cultivators used to visit PHC while 36 to 66per cent of the rubber farmers depended on PHC in the sample districts. About 32 to 40 per cent of *Jhum* farmers and 12 to 30 per cent of rubber farmers went to *Kabiraj* for treatment. Nearly, 20 to 22 per cent of *Jhum* farmers and 12 to 20 per

cent rubber farmers took medicines as per advice of the medical shop owners. And about 10 to 20 per cent of the *Jhum* farmers used to consult with their friends at the

Fig.-4.17
Percentage of Sample Households Dependent on Friend's Advice for Medical Treatment

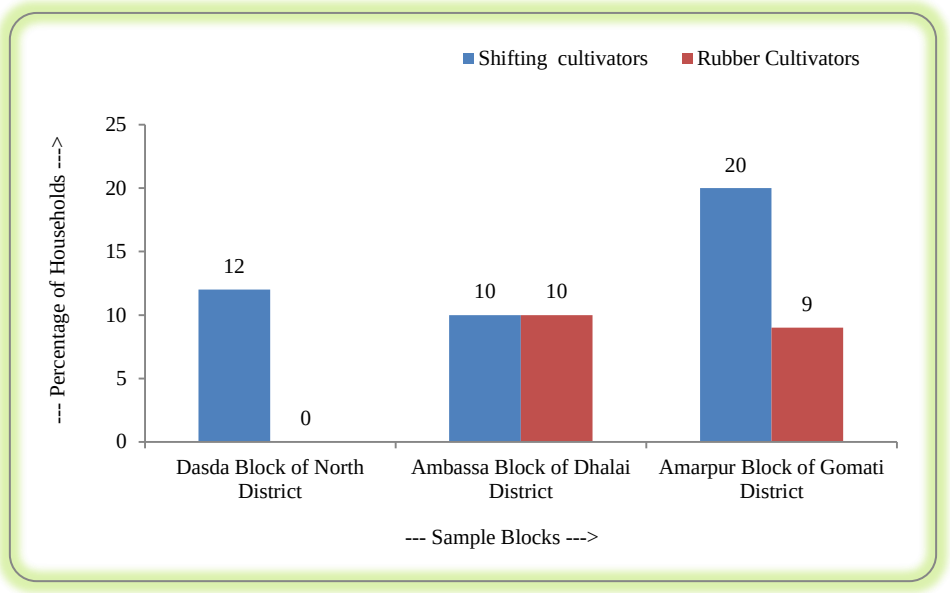
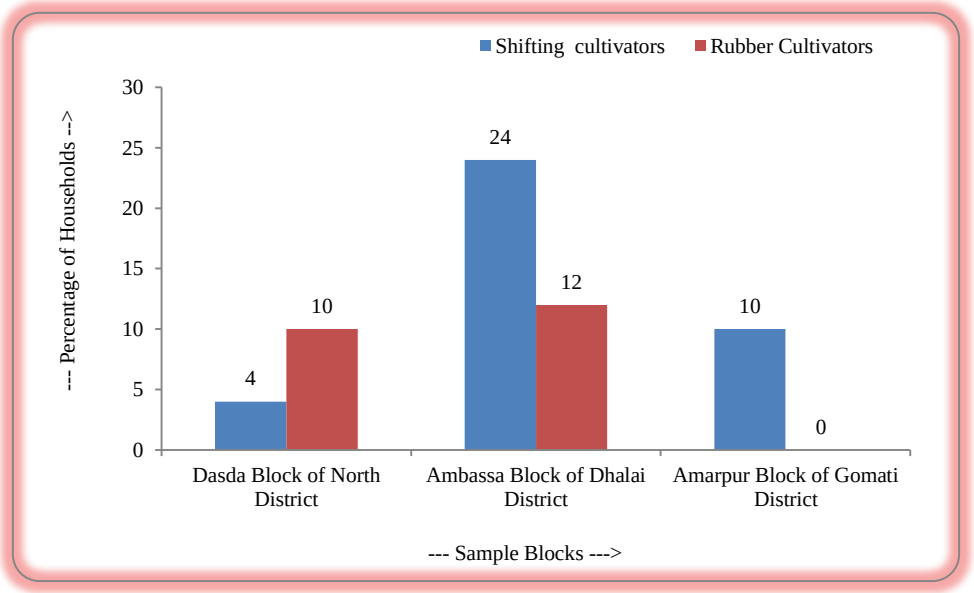


Fig.-4.18
Percentage of Sample Households Dependent on Tantric for Medical Treatment



time of illness, as against 9 to 10 per cent in case of rubber growers. However, both the farmer groups were not free from superstitious beliefs. Nearly 4 to 24 per cent of

the *Jhumias* and 7 per cent of the rubber farmers, on an average, went to *Tantric* for treatment of their diseases in the study areas.

Foregoing analysis clearly indicates that the status of health & hygiene, particularly in respect of *Reang* tribe in the sample districts is far from satisfactory level. However, it was ascertained from the sample respondents that the situation had improved quite a lot in recent years. With adoption of settled cultivation coupled with the initiative of the Government of Tripura, people are becoming more and more aware of the importance of health & hygiene and scientific methods of treatment for diseases. Instead of going to *Kabiraj* and village *Tantrik*, the tribes are now more inclined to visit the PHCs in nearby areas to get effective treatment by the qualified doctors and nurses, free of cost.

It goes without saying that the task before the Government to bring in perceptible changes in the life of this chunk of population is a herculean one, but not insurmountable. A well-conceived plan backed by strong political patronage can definitely show light of the day in mitigating the miseries of the people, thereby giving them the opportunity to feel the joy of life in course of time.

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Rubber Sheet Manufacturing Machine in the RPS of Purana Senapati Para of Gomati District

Rubber Garden under RPS of Purana Senapati Para of Gomati District

CHAPTER - V

RUBBER PLANTATION AND LOCAL ENVIRONMENT

Tripura is the second largest producer of natural rubber (*Hevea brasiliensis*) in India, both in terms of area and production, next only to Kerala. It was first introduced in the Northeast India with the twin objectives of increasing the forest cover and to rehabilitate the tribal people who hitherto practiced shifting cultivation, a method in which a part of the forest is cleared, cultivated, harvested and then left fallow by turns for it to recover its fertility. One of the political notions was that the age-old shifting cultivation could not meet the growing aspirations of the tribal people to lead a better living, and rubber plantations can provide long-term employment and land rights as well. Considering the suitability of the agro-climatic conditions of the region, the Rubber Board of India, a Central Government Undertaking made an entry into the Northeast in the 1980s and within the region, Tripura became the forerunner in this endeavour. The area under rubber plantations in the State grew from 574 hectares in 1967 to 70,295 hectares in 2014.

Eco-friendliness nature of rubber plantations has been reiterated by many of the researchers in earlier decades. It has been found very effective in harnessing the carbon dioxide and releasing oxygen in the atmosphere. That may be another reason why, rubber was introduced in Tripura as a part of the afforestation programme by the State Forest Department. The relation between rubber and environment can very well be manifested in terms of biomass generation, natural recycling, sustainability issues and soil conservation, as highlighted by many of the authors. Past experiences also indicate that besides giving a viable alternative to the landless tribal people of the State, rubber plantations had mitigated the ecological imbalance caused by the traditional shifting cultivation, thereby restoring the degraded forestlands.

But some of the recent studies indicate startling findings, which have raised eyebrows of all concerned connected with the ecology of the State. The rubber plantation is mostly grown as monoculture and as such, it offers lower biodiversity. The scientists consider monocultures as ‘biological deserts’ because of the fact that unlike natural forests, they don’t accommodate diverse plant and animal species and on that count, debilitating effect of monocultures was contemplated with rubber plantations, including that of disturbance of ground water reserve and soil quality.

Under the given scenario, an attempt was made to capture the general viewpoints of the enlightened respondents among rubber cultivators on the effect of rubber plantation on the local environment across the sample districts. However, it is an arduous task to quantify the environmental changes in terms of real value measure. The changes in common environmental parameters like temperature, rainfall, drought, soil erosion and depletion of forest cover, as perceived by the farmers, were assessed and are presented in Table 5.1 and Fig.5.1. In addition to farmers' perceptions, relevant literatures were also consulted to arrive at an overview of the prevailing situation of the State.

One can very well see the variation of perceptions among the rubber growers with respect to different environmental parameters in Table 5.1. In order to derive the growers' perceptions at aggregate level, simple statistical technique used by the CMA, IIM, Ahmedabad was applied. Accordingly, the responses of the rubber growers were classified as 'Strongly agree' with score 5, 'Agree' with score 4, 'Partially agree' with score 3, 'Disagree' with score 2 and 'Strongly disagree' with score 1 against the common notions relating to the local environment. Average rating in respect of each of the environmental parameters was worked out by adding all the responses in percentage multiplied with the assigned scores and the total was divided by hundred. Precisely, the following formula was used to arrive at the average rating.

Average Rating, $\mathbf{R} = (\sum_{\mathbf{i=1}}^{\mathbf{5}} \mathbf{r_i}\, \mathbf{p_i})/\mathbf{100}$

Here, $r_{i,}$ indicates rating value, where, i=1,2,3,4,5 (r_1=1, r_2=2,……r_5=5) and p_i indicates the percentage of respondents in r_i

The average ratings of perceptions at aggregate level clearly indicate that the rubber growers did not agree with the common notions that there was soil erosion (score 2.00) or rise in temperature (score 2.03) or occurrence of drought-like situation (score 2.35). In case of destruction of valuable trees, the farmers partially agreed with the perception (score 2.67) because of rubber plantations. But a sizeable number of rubber growers (score 3.55) opined that there was a decline in the rainfall pattern over the years. The same pattern of rainfall was witnessed in the district of North (score 3.40), Gomati (score 3.42) and Dhalai district (score 3.82), as reported by the sample respondents.

Decline in rainfall, as reported by the sample respondents may not be solely for rubber plantation; it was a cumulative effect of total environmental changes, including that of on-going *Jhum* practices still followed by a sizeable number of tribal farmers.

Table - 5.1
Farmers' Perceptions on Rubber Plantations and Environment

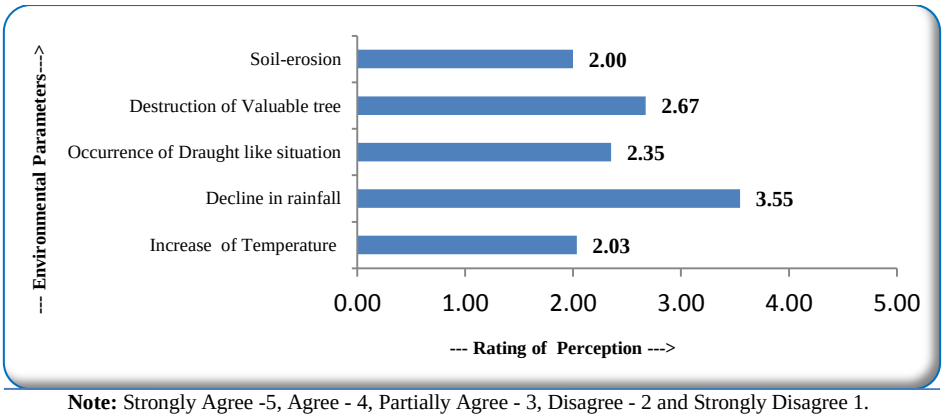
(in per cent)

Environmental change	Strongly Agree	Agree	Partially Agree	Disagree	Strongly Disagree	Total	Average Rating
North District, Tripura							
Increase of Temperature	0.00	4.00	8.00	70.00	18.00	100.00	1.98
Decline in rainfall	40.00	16.00	4.00	24.00	16.00	100.00	3.40
Occurrence of Drought like situation	0.00	14.00	30.00	42.00	14.00	100.00	2.44
Destruction of Valuable tree	0.00	0.00	60.00	36.00	4.00	100.00	2.56
Soil-erosion	0.00	0.00	10.00	70.00	20.00	100.00	1.90
Dhalai District, Tripura							
Increase of Temperature	0.00	4.00	10.00	60.00	26.00	100.00	1.92
Decline in rainfall	40.00	26.00	10.00	24.00	0.00	100.00	3.82
Occurrence of Drought like situation	2.00	6.00	12.00	66.00	14.00	100.00	2.16
Destruction of Valuable tree	20.00	10.00	6.00	44.00	20.00	100.00	2.66
Soil-erosion	0.00	12.00	20.00	44.00	24.00	100.00	2.20
Gomati District, Tripura							
Increase of Temperature	0.00	4.00	22.00	64.00	10.00	100.00	2.20
Decline in rainfall	6.00	40.00	44.00	10.00	0.00	100.00	3.42
Occurrence of Drought like situation	0.00	10.00	36.00	44.00	10.00	100.00	2.46
Destruction of Valuable tree	0.00	30.00	20.00	50.00	0.00	100.00	2.80
Soil-erosion	0.00	0.00	10.00	70.00	20.00	100.00	1.90
Overall, Tripura							
Increase of Temperature	0.00	4.00	13.33	64.67	18.00	100.00	2.03
Decline in rainfall	28.67	27.33	19.33	19.33	5.33	100.00	3.55
Occurrence of Drought like situation	0.67	10.00	26.00	50.67	12.67	100.00	2.35
Destruction of Valuable tree	6.67	13.33	28.67	43.33	8.00	100.00	2.67
Soil-erosion	0.00	4.00	13.33	61.33	21.33	100.00	2.00

Note: Strongly Agree -5, Agree - 4, Partially Agree - 3, Disagree - 2 and Strongly Disagree 1.
Source: Primary Survey data

A graphical presentation is given at Fig 5.1 below:

Fig.- 5.1
Average Rating of Farmers' Perceptions on Rubber Plantations *vis-a-vis* Local Environment in Tripura



Note: Strongly Agree -5, Agree - 4, Partially Agree - 3, Disagree - 2 and Strongly Disagree 1.

Historically, the rubber growers of the State of Tripura were shifting cultivators for years and with the passage of time, they started accepting rubber as their primary means of living.

The environmentalists, these days, interpret the *Jhum* system as hazardous for its effect in terms of progressive degradation of soil, environment and production base and at the same time, leading to deforestation, degraded forests and loss of habitat for great variety of fauna (Kox, 1990). The perils of deforestation are now being felt mainly in the form of high velocity wind, high temperature, low rainfall and shortage of drinking water. Despite these negative influences and despite number of attempts made by various Governments of North-eastern States, including that of Tripura and its various agencies, the system continued unabated because (a) most of the *Jhum* cultivators were not aware and/or convinced about the negative impact of *Jhum* cultivation on environment and (b) for the inherent merits of food security, topographical viability and equity implications (Bhaduri, 2015). As against this, available literatures amply demonstrate that rubber was introduced in Tripura as a part of afforestation programme, which is now embedded with the local environment of the State. The commercial potential was realized much later.

The eco-friendliness of rubber plants was well documented by Bhowmik (2006) in his paper titled, 'Impact of Rubber Plantation on the environment of Tripura'. In consideration of the opinion given by the sample farmers, one can very well refer to those advantageous features of rubber plantations, as indicated here in under.

Plant biomass is not only for its use as timber, firewood and fuel but also for purification of the atmosphere through photosynthesis. The Rubber plantations are unique for their heavy canopy owing to the large Leaf Area Index (LAI), which is often six or more (Dev Kumar *et. al*, 1998). The photosynthesis rate of a mature rubber leaf is 10 to 15 µ mol CO_2 per m^2 per second as compared to 5 to 13 µ mol CO_2 per m^2 per second in many other tree species (Nataraja & Jacob, 1991 ; Sethuraj & Jacob, 1997). Thus, for these two special characteristics of large LAI and high rate of photosynthesis, the biomass production per unit land area in rubber plantations are very high & makes it a very efficient candidate for fast afforestation of marginal and denuded lands preventing further degradation of their exposed soils.

The nutrient recycling through litter accumulation is very high (Joseph, 1945) and there is significant accumulation of organic matter to the soil from rubber tree,

which helps to improve the soil organic matter & water content. The rubber plantations are also beneficial for improving physical (bulk density, porosity), chemical (nutrient availability) and biological (soil moisture) properties of the soil, as reported by Krishna Kumar *et al*. (1995).

Rubber plantation, requires much less amount of chemical fertilizer than field crops (Singh 1994) and also lower quantity of other inputs like water, insecticides & pesticides, as compared to comparable crops like tea & cardamom. It is an example of low intensity agriculture whilst sustaining the productivity of the soil, unlike many other field crops.

Though not of premium quality, rubber wood is also considered to be an important source of timber, once the rubber trees lose their economic viability in production of latex. Immediate replanting can help in conserving the environment under such circumstances.

The root concentration in rubber plantations occurs in the top 18 cm of the soil & horizontally they spread up to 2 meters from the plant base (Philip at al., 1996). Being a surface feeder, rubber tree affords good soil binding and erodibility of soil is considerably reduced (Sethuraj, 1996). Because of its thick canopy, direct radiation is not cut down and thus moisture status is improved & soil erosion is prevented. The reduced soil temperature leads to reduced oxidation of soil organic matter and favour its build up (Jacob 2000).

Under the circumstances, it is important to educate the *Reang* tribe of Tripura practicing shifting cultivation to go for rubber plantations, considering its vast potential for income generation and ecological protection capacity, particularly through front line demonstration and community action (Upadhyay, 1995), so that they become aware and ready to accept it happily and as quickly as possible.

But it was too early on the part of the rubber growers to comment objectively on the effect of rubber plantations on local environment. They have been reaping higher benefits in terms of income on sustainable basis so far, together with prolonged employment and land rights. The scientists, at different point of time have linked monoculture of rubber to reduction in water reserves, soil productivity and biodiversity, particularly in the areas which are susceptible to insufficient water availability and soil erosion. According to Arun Jyoti Nath (2018) of Assam University, rubber plants require 60 to 80 per cent more water in comparison to other plants in the forest, which not only depletes ground water but also take away from the

share of other plants. Another study by Abhik Majumdar (2014) of NIT, Agartala found that many latex processing industries were discharging partly treated or untreated waste water in the surrounding environment which could contaminate soil and ground water. But rubber's impact on ground water reserve, soil stature or rainfall needs to be studied more intensively before coming to a logical conclusion. At the same time, it has to be accepted that the potential contribution of rubber to climate change mitigation depends mostly on what it replaces and the ways it is carried out.

On queries on effect of rubber plantations on local ecosystem, the growers conceptually opined that at the most there can be decline in productivity of agricultural plots adjacent to the rubber plantations because of its shade cover, which can hinder the interception of sunbeam for other crops. Also, there was no record of any depletion of ground water level due to rubber cultivation adopted by the farmers. And occasional reduction in rainfall, they added, was attributed to deforestation and not for introduction of rubber plantations. At times, pungent smell emanating from the latex processing units can be a disturbing factor for the residents of neighbouring localities. It was because of the use of chemicals for conversion of latex into rubber sheets, which can very well be avoided by raising those processing units in places far off from the residential areas, in one hand, and by restrictive/selective use of chemicals, on the other.

By and large, the respondent farmers were not sure of any negative effect of rubber plantation on local environment so far, rather there were marked improvement in maintaining the ecological balance in the study area through added biomass, prevention of soil erosion and development of watershed *etc*.

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CHAPTER – VI

CONSTRAINTS OF RUBBER PRODUCTION

By constraint, we mean something that imposes a limit or restriction or that prevents something from occurring. Production of natural rubber plays an important role in the economic development of Tripura. As indicated elsewhere, it is the 2nd largest contributor to the total production of natural rubber in India. The rubber growers of the State, like any other economic livelihood options, suffer from a number of problems, which apparently include dearth of skilled labour, high input costs, lack of stable price and market. It goes without saying that the forest dwellers depend mostly on natural forest produce. They used to supplement their food requirements from the forest products such as wild nuts & fruits, roots, various leafy vegetables, bamboo shoots, *etc.* The change of biodiversity of natural forest area for any economic activity evidently is an alarming issue in the context of global or local environment. These issues cannot be considered as isolated ones, rather are being encountered globally in different rubber growing countries.

As the present study is an attempt to see the socio-economic transformation of a particular tribe (*Reang*) through rubber plantations in the State of Tripura, it will be imperative to identify the constraints, if any, faced by the rubber growers. As such, the sample respondents were asked to offer their feedback for the constraint analysis and accordingly the results are documented and presented in the following table across the sample districts.

While perusing through the responses of the sample farmers, it was noted that basically they came across a set of seven major problems, namely, (a) shortage of good quality seedlings, (b) low price of rubber sheets, (c) non-availability of fertilizer and pesticide on time, (d) low rainfall, (e) environmental pollution from rubber sheet production, (f) extinction of edible forest produce due to rubber plantation and (g) limited biodiversity. In addition, there were the common problems of lack of awareness and support, dearth of skilled labour, high input cost and inferior quality of rubber sheets, as reported by a small section of respondent farmers.

Specific responses against each of the problem areas were obtained from all the sample respondents and were assigned scores from 5 to 1 on the basis of intenseness of the problems in terms of ‘Strongly agree’ (5), ‘Agree’ (4), ‘Partially

agree' (3), 'Disagree' (2) and 'Strongly disagree' (1). And finally, the average rating of each of the problem was worked out by adding the product of all the respondents' views in percentage and the scores assigned for it, divided by hundred.

Careful perusal of Table 6.1 indicates that at aggregate level, low price of rubber sheets topped the list of constraints encountered by the sample respondents with a score of 4.80 (strongly agreed), followed by shortage of good quality seedlings with score 4.59 (strongly agreed) and non-availability of fertilizer and pesticides on time with a score of 4.51 (strongly agreed). In terms of intensity, four other constraints were rated lower (partially agreed), more specifically, extinction of edible

Table - 6.1
Constraints of Rubber Production as perceived by the Sample Farmers Across the Sample Districts

(in per cent)

Constraints	Strongly Agree	Agree	Partially Agree	Disagree	Strongly Disagree	Total	Average Rating
North District, Tripura							
Shortage of good quality seedlings	80.00	10.00	4.00	6.00	0.00	100.00	4.64
Low price of rubber sheets	90.00	4.00	2.00	4.00	0.00	100.00	4.80
Non- availability of fertilizer and pesticides on time	78.00	8.00	4.00	10.00	0.00	100.00	4.54
Decrease of productivity of Latex due low rain fall	4.00	26.00	10.00	50.00	10.00	100.00	2.64
Environmental pollution from rubber sheet production	6.00	16.00	14.00	56.00	8.00	100.00	2.56
Extinction of edible forest produce due to rubber plantation	18.00	20.00	6.00	50.00	6.00	100.00	2.94
Change of biodiversity of the forest area due to rubber plantation	12.00	20.00	8.00	36.00	24.00	100.00	2.60
Dhalai District, Tripura							
Shortage of good quality seedlings	74.00	18.00	4.00	4.00	0.00	100.00	4.62
Low price of rubber sheets	90.00	10.00	0.00	0.00	0.00	100.00	4.90
Non- availability of fertilizer and pesticides on time	76.00	16.00	4.00	4.00	0.00	100.00	4.64
Decrease of productivity of Latex due low rain fall	6.00	16.00	28.00	40.00	10.00	100.00	2.68
Environmental pollution from rubber sheet production	12.00	20.00	8.00	40.00	20.00	100.00	2.64
Extinction of edible forest produce due to rubber plantation	16.00	22.00	4.00	46.00	12.00	100.00	2.84
Change of biodiversity of the forest area due to rubber plantation	14.00	18.00	10.00	40.00	18.00	100.00	2.70
Gomati District, Tripura							
Shortage of good quality seedlings	70.00	16.00	10.00	4.00	0.00	100.00	4.52
Low price of rubber sheets	70.00	30.00	0.00	0.00	0.00	100.00	4.70
Non- availability of fertilizer and pesticides on time	60.00	24.00	6.00	10.00	0.00	100.00	4.34
Decrease of productivity of Latex due low rain fall	14.00	14.00	8.00	50.00	14.00	100.00	2.64
Environmental pollution from rubber sheet production	14.00	16.00	4.00	50.00	16.00	100.00	2.62
Extinction of edible forest produce due to rubber plantation	12.00	20.00	8.00	50.00	10.00	100.00	2.74
Change of biodiversity of the forest area due to rubber plantation	14.00	16.00	8.00	46.00	16.00	100.00	2.66
Over all, Tripura							
Shortage of good quality seedlings	74.67	14.67	6.00	4.67	0.00	100.00	4.59
Low price of rubber sheets	83.33	14.67	0.67	1.33	0.00	100.00	4.80
Non- availability of fertilizer and pesticides on time	71.33	16.00	4.67	8.00	0.00	100.00	4.51
Decrease of productivity of Latex due low rain fall	8.00	18.67	15.33	46.67	11.33	100.00	2.65
Environmental pollution from rubber sheet production	10.67	17.33	8.67	48.67	14.67	100.00	2.61
Extinction of edible forest produce due to rubber plantation	15.33	20.67	6.00	48.67	9.33	100.00	2.84
Change of biodiversity of the forest area due to rubber plantation	13.33	18.00	8.67	40.67	19.33	100.00	2.65

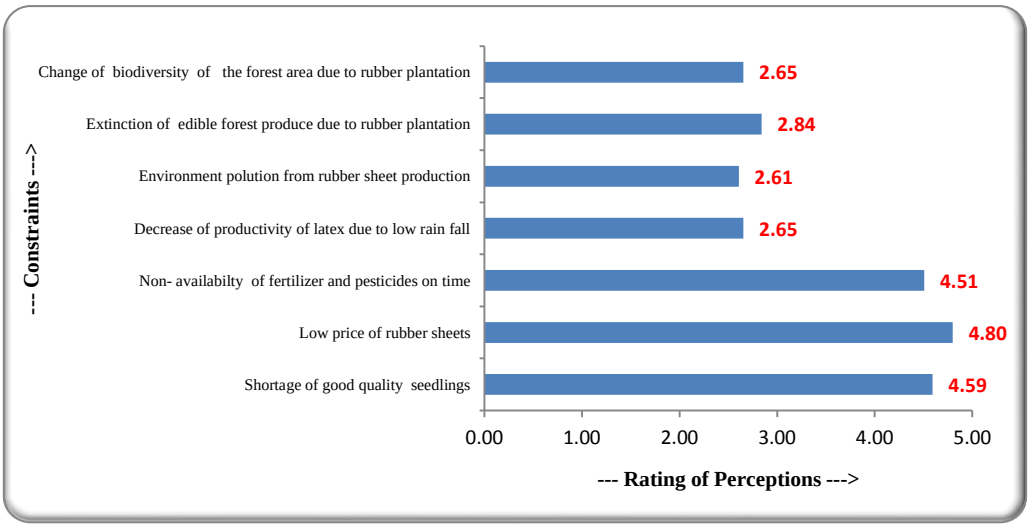
Note: Strongly Agree -5, Agree - 4, Partially Agree - 3, Disagree - 2 and Strongly Disagree 1.
Source: Primary Survey data

forest products (score 2.84), decrease in productivity of latex (score 2.65), change of biodiversity (score 2.65) and pollution from rubber sheet production (score 2.61). District-wise responses also indicated a similar pattern so far as the constraints were concerned.

In situ analysis brings about the fact that low price rubber sheet may be attributed to quality issues, as the sheet manufacturing technique was reported to be very old, involving manual labour. A section of the respondents (about 42 per cent) were of the view that decline in the productivity of latex was due to low rainfall. Also, 42 per cent of the respondent farmers opined that extinction of edible forest produce due to mass plantation of rubber had brought in some changes in their food habit as well.

Thirty seven per cent of the sample farmers thought that the common diseases like diarrhoea, cough and skin disease occurred to them might be because of pollution from rubber sheet production. In this context, Tekasakul P. and S. Tekasakul (2006) in their paper on "Environmental Problems Related to Natural Rubber Production in Thailand" viewed that problems in rubber latex industry are particularly water and odour pollution, while main problem in block rubber is odour. Further, they viewed that dilution of natural rubber latex before mixing with formic acid and transporting the rubber slabs, lubricating the rubber sheets when being squeezing and washing the containers and the factory floor, which result in large amount of waste water. As such, appropriate treatment is needed to avoid environmental effects or pollution.

Fig- 6.1
Overall Rating of Constraints of Rubber Production as perceived by the Sample Farmers



Overall rating of the constraints of rubber production, as perceived by the sample farmers are presented in Fig-6.1 above.

One can very well see that there can be two different perspectives for studying the status of rubber plantations in the State of Tripura, *e.g.* economic and ecological perspectives. Economically speaking, rubber plantations have provided a viable alternative to rehabilitate the tribal people, including *Reang* PTG at the behest of Rubber Board of India and the Government of Tripura, thereby bringing marked transformation in their livelihood pattern. And for that matter, both the entities (the Government and the Rubber Board) must come forward to take appropriate measures to ensure timely supply of quality planting materials and agrochemicals, including fertilizer, together with a stable rubber price. From ecological point of view also, rubber plantations, as per the opinion of the respondents, are providing vast green coverage to the mother earth and no significant adverse effect to the environment could be established, as discussed at length in chapter V. Pollution, as pointed out by some of the scientific studies can be well taken care of by resorting to timely measures by the Government or associated agencies.

The Government of Tripura should plan comprehensively to lay more thrust on promotion of rubber cultivation in the State, by educating the people and providing adequate support to the growers for resolutions of the constraints being faced by them. At the same time, one has to follow a precautionary approach, keeping abreast of the findings of the on-going scientific studies on impact of rubber plantations on environment across the globe.

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CHAPTER – VII

REANG TRIBE OF TRIPURA AND RUBBER PLANTATIONS: SOME SUGGESTIONS FOR IMPROVEMENT

7.1 Rubber in Tripura

Rubber (*Hevea brasiliensis*) in Tripura was introduced as a part of afforestation programme by the Government and in course of time, it becomes an excellent avenue of rehabilitating the tribal population, hitherto practicing shifting cultivation in the hilly terrains. Low elevation regions of the Northeast, with near tropical climatic conditions soon emerged as the principal rubber growing zone in the country. And today, Tripura ranks 2nd, next only to Kerala in rubber production in India. At the behest of Tripura Forest Development and Plantation Corporation Limited (TFDPC) and with continuous support of the Rubber Board, a PSU under the Government of India, rubber plantations have given a boost to the State economy in terms of superior quality latex production, manufacturing of high end as well as utility furniture made of rubber wood and employment generation for a large chunk of tribal population, besides serving as an effective soil conservation initiative.

The present study to see the socio-economic transition especially among the *Reang* tribe due to wide acceptance of rubber plantations has prompted the investigators to consider it to be an excellent success story from the State of Tripura. All the family members, as a unit were found to contribute towards raising of rubber plants with a common responsibility, as it was a question of livelihood. Supports from the Government and Rubber Board successfully provided them with all backward and forward linkage, with the establishment of rubber processing plants at community level.

Involvement of Self Help Group (SHGs) in rubber processing unit was yet another indication of women empowerment in the study area. The women members were found to take real interest in undertaking the diverse activities of the rubber processing units, thereby opening up a new vista for society at large. Adoption of a new venture like rubber plantations had given them the taste of income, employment and a status in the community.

Success of paradigm shift from *Jhum* to rubber cultivation by the *Reang* tribe had also sensitized and encouraged the other tribes of the State and poor Scheduled

Caste people to go for it in a massive way even with institutional borrowings. The industrialists from other States also got attracted to start rubber plantations in Tripura. Besides enhancing income and improving health, education and socio-political status of the *Reang* families, it has brought out a revolutionary change in the mental make-up of the participants. It has helped building a new confidence, self-respect and a sense of equality amongst themselves. Under the changed situation, undoubtedly, it would be a great challenge before the Government to tap the opportunity of involving them in a new kind of livelihood patterns.

As per a study conducted by the Regional Office of the NBSS & LUP, ICAR, Tripura has the capacity to extend rubber plantation area to more than 1 lakh hectares. The State may take up rubber as a growth engine for development through extensive promotional campaign, including rehabilitation of tribal population as well as development of downstream industries.

Essentially, the study was on socio-economic transformation of an ethnic group in Tripura through rubber plantation, and not a beneficiary- based study under any ongoing Govt. Scheme. During course of investigation, it was observed that the respondents were hesitant enough to come forward to avail off the benefits of various schemes because of the long gestation period of rubber plants (6 to 7) years. Uncertainty of livelihood during this interim period happened to be a major concern for them.

However, with the intervention of line departments, a section of respondents have started inter-cropping with quick-growing horticultural crops in newly established rubber gardens which provided them with an alternatively additional source of income.

Decline in rainfall, as reported by the sample respondents may not be solely for rubber plantation; it was a cumulative effect of total environmental changes, including that of ongoing *Jhum* practices still followed by a sizeable number of tribal farmers.

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, popularly known as Forest Rights Act (FRA), 2006 recognizes the rights of the forest-dwelling tribal communities and other traditional forest dwellers to forest resources, on which these communities were dependent for a variety of needs, including livelihood, habitation and other socio-cultural needs. Under the provision of this Act, 1.7 lakh hectares of land has already been allotted to

more than one lakh tribal families. The Government of India has also permitted raising of rubber plantations in the lands allotted under FRA, 2006. Tripura is endowed with suitable agro-climatic conditions for rubber cultivation and the Government can very well come up with a pragmatic action plan to uplift the economy of the State to a newer height through promotion of rubber plantations.

7.2 Shifting Cultivation: The Precursor

Shifting cultivation, popularly known as *Jhuming,* is an age-old practice mostly followed by the tribals in the hilly areas of different parts of the country. Here the farmers used to slash and burn one plot of forest land and cultivate crops like paddy, brinjal, chillies *etc*. And then in the next year, they go for another plot of hill land, leaving the existing *Jhum* land for new vegetation to come up and after a few years, they come back to the same plot of land for cultivation again. This entire process constitutes a cycle called *Jhum* cycle.

Major ecological arguments against the shifting cultivations include (i) destruction of forests and biodiversity, (ii) causes soil erosion and nutrient loss and (iii) effect of burning on soil fertility (Karthik*e. al,* 2009). These and other similar environmental impacts are considered as consequences of shortened *Jhum* fallow cycle, which are likely, an offshoot of increasing human population.

Moreover, being a subsistence farming system with very low output input ratio (Tripathi and Barik, 2003), yields and net returns are barely enough to survive (Banerjee *et l.*, 1986).

Further, it was also argued that due to increase in population (Mourtem, 2008), poor yield, erosion of top soil on account of rain and wind, *Jhum* cultivation has become highly uneconomic. From environmental point of view also, soil degradation, soil erosion, deforestation, environmental changes and loss of a great variety of fauna (Kox: 1990) are the major issues in and around the practice of *Jhum* cultivation.

It was also an important finding of the study that all the *Jhumias* were not only living below the poverty line but also were a deprived lot in terms of economy, education, health & hygiene, drinking water, cleanliness and sanitation and socio-political benefits.

Earlier, with relatively low density of population and long *Jhum* cycles (15-20 years), tribal people could manage their livelihood. But the situation had undergone a sea change over the years, largely due to phenomenal increase in population in the wake of substantive improvement in health infrastructure and declining mortality.

This has made the traditional agricultural practices highly unsustainable and a genuine search for alternative livelihood options in place of *Jhum* became inevitable (Behera & Nayak, 2017). Searching alternatives to 'shifting cultivation' was also based on the perception that in one hand, it keeps the cultivator in perpetual poverty and on the other hand, it damages the 'service functions' of the eco-system. Deterioration of life supporting eco-system has further impacted the productivity of land resources. Therefore, the target was to find suitable options, which may be more profitable as well as ecologically less detrimental or beneficial.

With these premises, a number of options were proposed by different researchers, and were tried in different countries. In India/Tripura too, similar attempts were made and numbers of alternatives to the shifting cultivation were tried over last several decades, which included agro-forestry practices, settled terrace cultivation, intensified valley cultivation with a shift to plantations/horticultural crops on hill slopes (Ramkrishnan: 2001) at the behest of ICAR Research Complex for North-Eastern Region; Agriculture and Tribal Development Departments of different N-E States.

But, as most of these measures failed to curb shifting cultivation in hilly forest lands, the Government took different approaches towards resettling mainly through four plantation schemes, *viz*., Horticulture, Rubber, Tea and Coffee. Resettling scenario of the period 1986-87 to 2004-05 had clearly established that rubber could be the most important remedy under the given situation.

Studies had revealed that adoption of modern rubber cultivation may increase the farmer's income, by about 8-9 times or more (Ray *et.al*, 2017 and Acharjee, 2019). In addition, due to settling in a particular area in a micro family (Ganguly, 1990), they could reap the benefits of education, health, hygiene and all other social and political privileges as amenable to other fellow citizen. The findings of the present study have also reaffirmed that rubber plantations can be a viable alternative to shifting cultivation for bringing about a new kind of transformation in the livelihood patterns of the tribal population in Tripura.

7.3 Suggestions for Improvement

Looking into the problems encountered by the sample beneficiaries and the aged-old social inertia, the following suggestions are made for appraisal and intervention of various agencies for socio-economic transformation of different tribal

groups including the *Reangs*, living in the State of Tripura through better livelihood options.

- The productivity of natural rubber in Tripura (Less than 800 kg/ha as against a national average of 1500 kg/ha) has remained stagnant since last 4 decades, which needs immediate attention of the associated R & D agencies and other support services.
- Quality planting materials need to be provided to the rubber growers to build up and retain confidence
- The gestation period for natural rubber production was found to be about 6 to 7 years. As such, technical feasibilities may be explored for raising other crop and livestock activities in combination, for supplementary income generation.
- Most of the rubber growers used to dry the rubber sheets in the open sunlight in the study area. Use of drying machine can reduce the cost of scarce labour as well as protect the farmers from post-harvest losses.
- The Government/Rubber Board may come forward with a kind of policy to fix the price of the rubber sheets well in advance, which is expected to cover the cost of production plus a minimum of fifty per cent margin.
- Establishing market linkage can be yet another important actionable strategy for the benefit of the *Reang* and other tribes of the State.
- Credit on easy terms may be made available for the needy growers at the initial stage.
- The input costs, mainly fertilizers and pesticides cost are to be regulated/subsidized and may be made available on time.
- The new growers need to be educated and trained on modern agro-techniques of rubber cultivation with method and result demonstration.
- Formation of rubber producing societies may be encouraged to leverage umpteen numbers of benefits.
- Private players may be encouraged to play effective role in the entire channel from production to consumption.
- There should be strict vigil on the part of the Government, particularly on environmental issues and precautionary approaches are to be adopted for addressing the problems of sustainability, soil conservation, biomass

generation and biodiversity on acceptance of rubber in the cropping patterns of the localities.

- Aggressive campaign may be launched to sensitize and inspire the tribal communities, who are still practicing shifting cultivation for mass acceptance of rubber as a viable alternative.

7.4 Conclusion

The findings of the present study have amply demonstrated that there were significant changes in the lives and living of the *Reang* tribe of Tripura with the adoption of rubber plantations. The same model can very well be replicated in the areas with similar techno-economic conditions. Accordingly, the State Government in association with the Rubber Board may come forward with a robust policy support in the line suggested above, to encourage and inspire the people to go for it. With successful introduction of rubber in the cropping patterns, a comprehensive action plan can be developed for the State as a whole, which will protect the ever-degrading forest land in one hand and simultaneously address the economic, environmental and social security issues and women empowerment on the other. At the same time, urgent necessary actions are imperative to get rid of the problems relating to price realization, quality planting materials, input costs and skilled labour as identified by the respondent farmers.

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APPENDIX - I

Action Taken Report on Comments

Name of the peer reviewer: Prof. B. C. Roy
Hony. Director
Agro-Economic Research Centre,
Visva Bharati, Shantiniketan, West Bengal

1. **Title of report**

SOCIO-ECONOMIC TRANSFORMATION OF *REANG* PRIMITIVE TRIBAL GROUP THROUGH RUBBER PLANTATION IN TRIPURA

2. **Date of receipt of the Draft report** July 30, 2021

3. **Date of dispatch of the comments** September 08, 2021

4. **Comments on the methodology**

The study is based on sample drawn from three villages, one from each districts. It would have been better to select/cover more than one village from a particular district without increasing total number of samples. However, considering the Covid-19 situation even this particular attempt is praiseworthy.

To evaluate the impact of rubber plantation instead of using pre-post /with-without approach the study made a comparative analysis between rubber growers and *jhum* cultivators. Is it a fact that *Reang* tribal are practicing only Jhum & Rubber?
The analytical tools used to satisfy the objective 3 & 4 should be mentioned.

Action: In the hilly area of Tripura, a village is consists of clusters of scattered hamlets or habitants. Samples are drawn from the clusters of hamlets under a village for each sample blocks. Therefore, one village having large number of clusters of hamlets was selected from each sample block of each sample district. It was done due to time constraints and Covid-19 situation.

As our field and available secondary level information, the livelihood of a large majority of *Reang* tribe traditionally depends on *Jhum* cultivation. Now a large chunk of *Reang* tribe is practicing rubber cultivation in lieu of *Jhum* cultivation at the instance of Tripura Govt and Rubber Board. As they live in a remote area, they do not have much skill to engage themselves in any other activities elsewhere in the urban areas. Hence, Jhum and Rubber cultivation are main the source of livelihood for them.

The analytical tool used to satisfy the objective 3 & 4 has been incorporated in the chapter V as per suggestion.

5. **Comments on analysis, organization, presentation etc**.
Detailed analysis is undertaken and organized as required to satisfy the objectives of the study. However, there are few minor corrections needed:

a. It is mentioned in the report that 'output-input ratio in *Jhum* cultivation has come down over the years' then why the area under Jhum is increasing @ 1.75% per annum?

Action: The productivity *Jhum* has declined and cost of cultivation has also increased over the years, for which 'output-input ratio in *Jhum* cultivation has come down. Shrinkage of *Jhum* cycle on account of increasing population might be an another reason for decreasing productivity. Therefore, they have no any other option to meet their food requirement but to bring more area under *Jhum*. All these issues are analyzed in the report.

b. Further, where area under both *Jhum* and Rubber is increasing @ 1.75% and 6.97% per annum (Table-3.2 & 3.4), how can we say there is shifting is taking place from *Jhum* to Rubber?

Action: In our observation, it has been seen that earlier *jhum* area has been replaced by rubber plantation which is going on, in phase manner at the instance of state govt. and Rubber Board of Tripura. That is why growth of area under rubber has increased at a faster rate than that of area under *Jhum* (Fig 3.8). As our observations, we have found that a large number of *Jhumias* are shifting from *Jhum* to Rubber. As we have seen in Table-1.1 that number of *Jhumias* households has declined over the years and we can say that shifting is taking place. At this moment, we cannot forecast on complete shifting from *Jhum* to Rubber in the succeeding years to come as there are lots of constraints to be tackled which has been discussed in proper place in the report.

c. The analytical tools used to satisfy Obj no-3 i.e. to assess the eco-friendliness of rubber plantations is quite weak. Use of CO_2 and release of O_2 is applicable not only to rubber but also to any crops/plants. So some sort of comparative figures (even from review of literature) should be given to support the statement that rubber plantation is more eco-friendly than *Jhum* or other plants.

Action: Done as per suggestion

d. Further, it cannot be justified simply by considering the views of sample farmers. The perception is not uniform and it changes across space and over times. The changes in temperature, rainfall, drought, soil erosion and depletion of forest cover, thus cannot simply be perceived by the farmers (Table 5.1) as these environmental characteristics are influenced by a large number of factors. Only the aged and experienced people's view can somehow be considered but that too with sufficient caution.

Action: It is agreed that the environmental characteristics are influenced by a large number of factors. But our attempt was to collect the views of the respondent farmers only. The rest part is left to the environmental scientist to justify the opinion of the farmers.

e. Table 5.1 is incomplete. It must mention how the perceptions are quantified. Changes can be either in positive directions or in negative directions (increase/decrease; favourable/unfavourable, etc). Further, in Ch-VI, it appears that there are environmental pollution due to production of rubber sheets. This should also be taken into consideration.

Action: As suggested perceptions are quantified with the help of a simple statistical tool which is incorporated in chapter V.

Further, in case of environmental pollution due to production of rubber sheets in chapter VI besides farmers' perceptions, we have added the views of researchers in this regard, elsewhere in the report as suggested.

f. Chapter-VI: Why only 7 constraints are considered? How these constraints were identified and measured? What does available literature says? Use of Garret ranking techniques or any other standard techniques should have been used to prioritize the constraints.
Action: As we know well that the natural environment of a region affected by various environmental parameters. Our identified constraints are based on the feelings and understanding of the farmers. Constraints are measured on farmers' general perception. In this regard, newly we have added available literature on rubber cultivation in the proper place of the report. Same statistical tool is used (as stated in chapter V) to prioritize the constraints, as per suggestion (Table-6.1).

g. The executive summary is too lengthy (19 pages) as it directly taken from the text. Try to comprehend it.
Action: Done as per suggestion.

h. As usual, there are quite a few typographical or formatting errors in write-up are there which needs correction. Below are few examples only:

    i. In Table 1,2 what does col. 6 & 7 indicates? The headings are kept blank.
    ii. Table 3.3: Place the Source below the table (Page 35).
    iii. Fig. 3.4: What does the green coloured bars indicates? Legend for Green box is missing (Page-36).
    iv. Page-iv (Ln or Log?; following **the**? maintain consistency);
    v. Page-v (was to increase or has increased?);
    vi. Page-16 (per favour, of interpreter?), etc.
    vii. There are many such errors are there please check.

Action: All the typographical or formatting errors have been corrected and rechecked thoroughly as suggested.

6. **General remarks**: The researchers have done excellent work on an important topic for Tripura even during Covid-19 pandemic.

7. **Overall view on acceptability of report**: The overall quality of the report is very good and covered important issues and components on the topic. The report may be accepted after making necessary corrections as suggested above.

All the suggestions are incorporated and submitted.

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Interaction with a *Reang* Rubber grower during field visit

A Group Photo with a *Reang* Woman Rubber Grower during Field visit

APPENDIX – II

Action Taken Report on

Comments/Observations/Remarks of the Ministry of Agriculture and Farmers' Welfare, Department of Agriculture and Farmers' Welfare, DES, (AER Division) on the Presentations made by AERC Jorhat on the Draft Study Report-

"SOCIO-ECONOMIC TRANSFORMATION OF *REANG* PRIMITIVE TRIBAL GROUP THROUGH RUBBER PLANTATION IN TRIPURA"

Date of Presentation: October 25, 2021

Date of Receipt of Comments: November 05, 2021

1. Reasons of low beneficiaries were mentioned during presentation were coverage with respect to Govt. interventions and secondly reluctance to avail the government schemes. These may be appropriately included.
   Action: Clarification has been incorporated in the report (page 73).

2. In page no. 38, in addition to constraints mentioned, the reasons for dip in yield may be incorporated.
   Action: Explanation has been incorporated in the report (page 39).

3. Three page Policy Brief on the above report may be sent which may inter-alia, include brief introduction of topic, need for the study major findings and policy recommendations. The cover page may be picturesque depicting subject concerned. This will be forwarded to ministries/deptt. concerned.
   Action: Done as per suggestion.

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Agro-Economic Research Centre for North-East India
Assam Agricultural University,
Jorhat-785013