CHAPTER III
DATA SOURCE AND METHODOLOGY

3.1. Study area

East Siang district, being the protagonist of the rubber crop, has presently 5 (Five) Sub-divisions and 15 (Fifteen) administrative circles headed by the Deputy Commissioner. The district was created on 1st of June, 1980 bifurcating the erstwhile Siang district with headquarter at Pasighat the oldest towns of the state of Arunachal Pradesh and celebrated centenary way back in the year 2011. It has an area of 4,005 sq.km. and population of 99,214 (as per Population Census 2011) out of which, Male: 50,116, Female: 49,098. Out of the total population of the district, the total Schedule Tribe population is 69,979 (34,533 Male and 35,446 Female) which comprise 70.53 in terms of percentage. The Sex Ratio is 962 female per 1000 male and literacy percentage is 78.94. The Adis¹ comprising Minyong, Pasi, Padam etc. are the principal inhabitants. Apart from Adis, there includes the Galos, the Idu-Mishmis, the Mishings, etc. which are also residing in the district.

The study area lies in between the 27°30’ to 29°42’ North latitudes and 94°42’ to 95°35’ East longitudes. It covers an area of 4,005 sq. km. The altitude of area is ranges from 133 m in foothills to 752 m above mean sea level in the north. Moreover, in some

¹ Also known as 'Abor' means all the hill tribes living along the Brahmaputra Valley
Map showing the Study Area and Sample Villages

East Siang District

Pasighat (HQ)  Ruksin  Nari

- Pasighat (HQ)
- Study Area
- Siang River
- State Boundary
areas the height is ranges up to 2500 m above mean sea level. Being in tropical and sub-tropical belt with large water body and sudden rise of hills that obstructs South West Monsoon, the area is one of the wettest parts of the country. During summer, it is warm and humid and winter experiences cold and strong gorge wind.

The study area is bounded by Upper Siang in the north, Dhemaji district of Assam in the south, Lower Dibang Valley district of Arunachal Pradesh in the east and west by the West Siang district of the state.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>C.D Block</th>
<th>Circle</th>
<th>No. of Village</th>
<th>Total Population</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pasighat</td>
<td>26</td>
<td>11,698</td>
<td>5,785</td>
<td>5,913</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pasighat (Urban)</td>
<td></td>
<td>24,656</td>
<td>12,482</td>
<td>12,174</td>
</tr>
<tr>
<td>2</td>
<td>Mebo</td>
<td>Mebo</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td>14,474</td>
<td>7,381</td>
<td>7,093</td>
</tr>
<tr>
<td>3</td>
<td>Ramle-Banggo</td>
<td>Nari</td>
<td>08</td>
<td>10,926</td>
<td>5,530</td>
<td>5,396</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ruksin</td>
<td>Ruksin</td>
<td>30</td>
<td>20,128</td>
<td>10,113</td>
<td>10,015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oyan-Sille</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Bilat</td>
<td>08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Pangin</td>
<td>Pangin</td>
<td>09</td>
<td>10,200</td>
<td>5,163</td>
<td>5,037</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boleng</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rebo-Perging</td>
<td>07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kebang</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Riga</td>
<td>Riga</td>
<td>07</td>
<td>4,153</td>
<td>2,175</td>
<td>1,978</td>
</tr>
</tbody>
</table>

Total 151 99,214 50,116 49,098

*Source: District Census Handbook, East Siang District 2011*

There are about ten sub tribes who live in twelve circles namely Pasighat, Ruksin, Nari, Boleng, Mebo, Koyu, Bilat, New Seren, Rebo-perging, Pangin, Riga and Sille-Oyan. East Siang is predominantly inhabited by the Adi’s who are known for their colourful Pomung Dance and War Dance called Tapu. The other Indigenous people living in the district are Galo. The Adi and Galo are patriarchal in nature and have rich socio-cultural life. The traditional knowledge is orally passed through generation to generation.
Solung and Mopin are the major agriculture related festival. The local people traditionally follow Indigenous belief with Donyi-Polo as their God but some of them have converted to Christianity in recent decades.

<table>
<thead>
<tr>
<th>Population</th>
<th>Cultivators</th>
<th>Agricultural Labourers</th>
<th>Workers in Household Industry</th>
<th>Others Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>%</td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>Persons</td>
<td>20185</td>
<td>50.18</td>
<td>3365</td>
<td>8.86</td>
</tr>
<tr>
<td>Male</td>
<td>10381</td>
<td>51.42</td>
<td>1956</td>
<td>58.12</td>
</tr>
<tr>
<td>Female</td>
<td>9804</td>
<td>48.57</td>
<td>1609</td>
<td>47.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>193</td>
<td>39.14</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>493</td>
<td>1.23</td>
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<tr>
<td>%</td>
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<td>15979</td>
<td>39.73</td>
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<tr>
<td>Male</td>
<td>10954</td>
<td>46.43</td>
<td>1956</td>
<td>58.12</td>
</tr>
<tr>
<td>Female</td>
<td>5025</td>
<td>30.21</td>
<td>1609</td>
<td>47.81</td>
</tr>
</tbody>
</table>

Source: District Census Handbook, East Siang District 2011

The Table 3.2 reflects the respective size category of workers (main and marginal) of East Siang district. The figure in the table shows that the indigenous community of East Siang district is largely comprise of cultivators. In fact, the samples have been picked from different villages of East Siang district due to the exceptional participation of people of the concerned district in large scale rubber plantation.

3.2. Period of Study

The relevant data for a periods 5 (Five) years i.e. from 2011-12 to 2015-16 has been taken into consideration for the purpose of the study.

3.3. Data Source and Methodology

To make the present study empirical, both quantitative as well as qualitative investigation has been made following statistical techniques. Prior to the application of various research methods and tools of data collection, a thorough literature survey was conducted over rubber plantation as discussed in the previous chapter. Thereafter, a pilot survey was conducted by administering interview schedule to 25 (twenty-five) commercial rubber growers across the three study districts to gather first hand information pertaining to commercial rubber plantation in the given area. During the pilot survey, each and every aspect connected to commercial rubber plantation has been recorded. After reckoning all the concerns associated with the said plantation activity, a
well-structured questionnaires and schedules were developed for final field survey. In addition, other necessities such as selection of sample size, selection of sampling techniques, etc. had also been developed.

Ultimately, having equipped with all the means of data collection, a detailed and yearlong field survey was carried out in the selected study area. In this manner, the required data and facts pertaining to commercial rubber plantation were collected. Further, all the data have been well organised, analysed and interpreted in the most appropriate manner using various statistical methods and techniques.

Henceforth, the above cited incidences have been clearly discussed in the following manner to give more understanding about the sources of data and research methodology used in the present study. These are discussed as under:

3.3.1. Sources of data

The present research edifice is endowed with both primary and secondary data. The primary data comprise of data collected through personal discussion with the respondents, interview, observation, tape recording, opinionnaires and interaction with respondents etc. On the other hand, the secondary data have been obtained from office records, books, magazines, periodicals, journals, news paper articles, statistical handbook and government publications etc.

3.3.2. Sampling and Sampling Techniques

The sampling and sampling technique includes the following:

3.3.2(a). Sample Size

The total population of rubber growers including tappers and non-tappers, registered and non-registered, etc. in the three given study districts consist of approximately 1,500 growers. Out of the given population, a total of 150 (One Hundred Fifty) growers have been selected from the 17 (Seventeen) villages. This comprises approximately 10 percent of the population sample. It is pertinent to be noted that though the study has been made inclusive of entire Siang belt but due to concentration of rubber growers in the lower belt region of East Siang district, the samples have been taken from lower belt only. In addition, only those growers were considered who were undergoing
Sulong and Mopin are the major agriculture related festival. The local people traditionally follow Indigenous belief with Domyi-Polo as their God but some of them have converted to Christianity in recent decades.

Table 3.2 Category of Workers (Main & Marginal) 2011

<table>
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Ultimately, having equipped with all the means of data collection, a detailed and yearlong field survey was carried out in the selected study area. In this manner, the required data and facts pertaining to commercial rubber plantation were collected. Further, all the data have been well organised, analysed and interpreted in the most appropriate manner using various statistical methods and techniques.

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tapping. In other words, those growers who have not yet started tapping have not been included in the study.

3.3.2(b). Sampling Frame

The samples to be studied have been selected from 17 (Seventeen) villages of East Siang district. These villages fall under the administrative jurisdiction of Ruksin and Nari Sub-Division of East Siang district. Following diagram illustrate the sampling frame in better manner:

![Diagram showing sample villages and number of sample respondents]

Figure 3.1. Showing sample villages and number of sample respondents

3.3.2(c). Sampling Techniques

There exist pools of statistical sampling methods or techniques to carry out sampling process. However, in the context of the present study, the snowballing technique (non-random sampling) has been applied in drawing the samples for the present study. The main reason for choosing snowballing sampling technique is due to
the lesser numbers of grower tappers. Moreover, the sample growers have been picked by considering the information received from other growers of the study region and the operation continued till the required numbers of grower tappers were achieved. This is the reason why this technique of selecting sample respondents is known as snowballing. While selecting the samples, utmost care has been taken in compliance with the population complexity in the study area. Moreover, this technique of sampling has been found to be most appropriate while selecting samples from the population.

3.3.3. Tools used for data collection

In order to elicit relevant and factual data from the sample respondents, various research tools have been used. The main tools applied in the present study includes voice recorder, video recorder, interview schedules, questionnaires and schedules (both open-ended and closed ended) etc. By using these tools, relevant data were obtained from the sample growers. The sample growers who can read and write by themselves have been given a well designed questionnaire and interview schedule (both open and close ended). And those growers who cannot read or write were interviewed by administering interview schedule supplemented by voice and video recording. During the course of field study, officers from regional rubber board office as well as field offices were contacted and relevant information were extracted. Apart from this, the opinions of village elders and PRI members with regards to commercial rubber plantation have also been recorded.

3.3.4. Variables used for the study

In order to make the present study more precise and adhering to the laid objectives, a blend of socio-economic and ecological variables have been identified and selected. Through these variables, the effectiveness of commercial rubber plantation towards the growers has been measured. These variables are discussed below in the following manner:

3.3.4(a). Socio-economic variables

The socio-economic variables comprise of the following aspects where rubber plantation has a great bearing. These include the following:
(i) Income generation

Income generation is one of the most important variables to measure the economic potentiality of rubber crop. This is done by measuring the contribution of income earned from rubber crop against the income earned from other sources. For this purpose, five different response levels in terms of percentage were provided to the sample growers to know the contributory percentage of the rubber. The response levels are: ‘1 to 20 percent’, ‘21 to 40 percent’, ‘41 to 60 percent’, ‘61 to 80 percent’ and ‘81 to 100 percent’.

(ii) Employment generation

Another significant variable selected is the employment opportunity provided by commercial rubber plantation to both growers and the society. The respondents were provided to fill a data set read as ‘Up to 100 percent’, ‘up to 75 percent’, ‘up to 50 percent’, ‘up to 25 percent’, and an option such as ‘can’t say’ has also been provided to those who do not have any idea regarding the same.

(iii) Standard of living

The economic progress of an individual can also be judged by his or her living standard. Similarly, the same yardstick is applied to measure the nation’s overall economic growth. Hence, this variable happens to be an effective lick pot in quantifying the role of commercial rubber plantation in this aspect. Under this category, the respondents were provided a set of variables such as ‘Improved fooding standard’, ‘Improved clothing standard’, ‘Improved materialistic standard (TV, Refrigerator, Sofa, Washing machine, etc)’, ‘Improved liquidity position of the family’, ‘All of the above’ and ‘can’t say’.

(iv) Cost of production

Cost of production is the cost incurred by the grower in producing rubber sheets. In this context, production cost includes a variety of expenses such as labour cost, raw materials cost (acid cost), tapping material cost, etc. It is pertinent to be mentioned that there are two stages in commercial rubber plantation viz. pre-maturity stage
(unproductive) and maturity stage (productive). Hence, those costs which involve in maturity stage or productive stage have been duly considered under this category.

(v) Profitability

Commercial rubber plantation is believed to be a profitable economic activity. Profitability therefore forms an essential factor in measuring the economic efficacy of the said activity. For this purpose, inputs regarding ‘cost of’ plantation per hectare, maintenance cost per hectare, production cost per hectare, selling and distribution cost, total income per hectare, other miscellaneous expenses, etc. have been considered. In order to find out profitability, cost-benefit analysis has been duly used.

(vi) Increase in assets holding position

Increase in assets holding position of a grower is indeed a good sign of economic progress of the concerned family which directly or indirectly contributes to the overall economy. Strictly adhering to the laid objectives of the study, this variable has been thoroughly judged by providing an open ended question to the respondents where they have been asked to mention those assets that have been acquired or purchased from the income earned from rubber.

(vii) Recognition in the society

Recognition in the society is indeed a matter pride for any individual regardless of age, gender, economic status, caste, creed, religion, etc. Through this variable, the truth behind how commercial rubber plantation activity enables the growers to get recognise in the given society. To measure this variable, a closed-ended question regarding the same followed by ‘Yes’ or ‘No’ has been provided to the sample respondents. The responses given by the respondents have been duly recorded.

(viii) Increase in social status

Social status is yet another after sought position of people in both organised and unorganised society. It can be achieved, earned and inherited. In the context of the present study, this has been used as a variable to measure the role of commercial rubber plantation in inducing social prestige to the growers. A closed-ended question was asked to each and every sample respondents with ‘Yes’ or ‘No’ responses.
(ix) Supplementing jhum cultivation

In fact, agriculture happens to be the primary occupation of the people of the study region. They also perform jhum cultivation to support their daily expenses where agriculture miserably failed to do so. However, jhum cultivation was found not quite satisfactory and the same also carries serious threats to environment and ecology. On such backdrop, rubber plantation is considered to be more fruitful both in terms of economy and ecology. In order to measure the propensity of how deep rubber plantation has supplemented jhum cultivation, respondents were provided a closed-ended question carrying six responses in the form of percentage such as '81 to 100 percent', '61 to 80 percent', '41 to 60 percent', '21 to 40 percent', '1 to 20 percent', and 'can't say'.

3.3.4(b). Non-economic variables

Keeping in mind the objectives of the study, few non-economic variables or ecological variables have also been precisely applied. These variables help to unearth the truth behind ecological benefits provided by commercial rubber plantation in the study area. The non-economic variables include the following:

(i) Protect environment degradation

The issue of environment degradation has become a crucial global subject. The degrading environment is a major threat for all the mankind of this planet. However, the reason for such setback is not a natural cause but induced by the act of human beings. Hence, it is believed that rubber plantation protect the environment apart from providing economic benefit to the growers. This variable has been specifically used to establish the aforementioned truth. For this purpose, a set of responses has been given to the respondents in percentage. The responses have been categorised as '81 to 100 percent', '61 to 80 percent', '41 to 60 percent', '21 to 40 percent' and '1 to 20 percent'.

(ii) Balanced ecology

Ecological balance constitutes one of the key aspects of the study. The balanced ecology signifies a clean and healthy co-existence of all the living beings. Hence, this variable has been used to measure how significant is the rubber plantation in balancing the ecology. A closed-ended question embedded with a set of responses has been
provided to the respondents in terms of percentages. The responses include ‘81 to 100 percent’, ‘61 to 80 percent’, ‘41 to 60 percent’, ‘21 to 40 percent’, ‘1 to 20 percent’, and ‘can’t say’.

3.3.5. Tools used for analysis of data

The following descriptive statistics have been used to analyse the raw data obtained from the sample respondents pertaining to the selected variables of the study.

(i). Mean

The mean distribution constitute a pivotal tools for data analysis in the present study. Both sample mean and population mean have been extensively used to carry out analytical process.

(ii). Frequency Distribution

Frequency distribution is yet another tool that has been widely employed in the present study. Most of the tables and graphs have been constructed by using frequencies.

(iii). Standard deviation

The standard deviation has been exceptionally noted while performing the statistical analysis.

(iv) Z-test and F-Test

Test statistics viz. Z-test and F-test have been used to test the validity of hypotheses. Z-test has been applied to prove the mean income of respondents after and before undertaking commercial rubber plantation. F-test is used to test the variance of income of sample respondents after and before undertaking commercial rubber plantation.

(v). Correlation analysis

Correlation analysis has been used to find out the degree and direction of relationship between the level of income flow and the size of land holdings for commercial rubber plantation by the sample respondents.
(vi). Graphs and Charts

Graphs and Charts have been instrumental in portraying the frequency distributions of the variables. These are one of the simplest yet effective tools for representing the data. Also the figures and diagrams have been widely used and included in the same category.

3.3.6 Cost benefit analysis

In order to find out the various cost involvement in rubber cultivation such as cost of production, marketing expenses, taxes, and other miscellaneous expenses, etc. the cost-benefit analysis or break-even analysis has been used. This technique also provides a way to measure profitability and break-even point which constitute a vital element of the present study. With a view to acquire better results, the various costs involved have been segregated into two, based on their nature i.e. fixed costs and variable costs respectively.

Accordingly, the following costs are considered as Variable Cost under break-even analysis which includes cost of sapling, cost of planting, cost of agricultural equipments/implements, and cost of fertilisers. While the Fixed Cost comprises of cost of labour, cost of tapping tools or equipments, cost of fencing (bamboo fencing), APMC charges (2% of total sales), and Fixed Overheads (adjusted at 10% of total costs). Moreover, it is to be noted that the analysis has been done for a plantation of 1 (One) Hectare only.

By considering the above cost classifications, following elements of break-even analysis have been calculated. The various elements are mentioned below with their respective formulas:

a) Contribution = Sales – Variable Cost
b) Profit = Contribution – Fixed Cost
c) Profit Volume Ratio = \( \frac{\text{Contribution}}{\text{Sales}} \times 100 \)
d) Break-Even Point = \( \frac{\text{Fixed Expenses}}{\text{PVR}} \times 100 \)
e) Margin of Safety = Actual Sales – Break Even Sales

(Note: PVR stands for Profit Volume Ratio)

The above given technique of data analysis has been worth-mentioning while doing with profitability of the commercial rubber plantation. It provides a basis to
Moreover, the cost-benefit analysis helps in understanding the profitability and other important aspect such as break-even sales, margin of safety, etc. with regards to commercial rubber plantation. The use of this technique further helps to know better the cost of production per hectare and the estimated rate of return.

Hence, the above discussions regarding research methodology constitute the main framework of the present study which is carefully followed and applied while strictly adhering to the already laid objectives. The variables are well framed and the data representing these variables have been analysed by applying appropriate tools. Ultimately, empiric generalisations as well as interpretation have been made by considering the outcomes of the analysis.