Characterization of tea plantations of Barak valley, Assam using remote sensing and GIS

CHAPTER – II

STUDY AREA
Study area

2.1 Extensive study area

2.1.1 Administrative boundary

The state of Assam is comprised of three physical divisions namely, the Brahmaputra Valley, the Barak Valley and the hill range. The Barak Valley is situated between longitude 92°15' - 93°15' E and latitude 24°8' - 25°8' N covering an area of 6922 Square kilometers (km²). The valley constitutes 8.9 percent of the total geographic area of the state but contains 11.59 percent of the population as per 2011 census. The region shares its border with Dima Hasao district, state of Tripura and the state of Meghalaya in the North; the state of Manipur in the East; the state of Mizoram in the South and the Sylhet district of Bangladesh in the West. The location map of the study area is shown in Fig. 2.3.

2.1.2 Geographic location

Administratively, the region is comprised of three districts, namely Cachar, Karimganj and Hailakandi. Cachar is the largest and Hailakandi is the smallest district with total geographical area of 3786 km² and 1327 km² respectively and that of Karimganj district is 1809 Km². The boundary map of the three districts is shown in Fig. 2.4.
2.1.3 Physiography

The Barak valley region has an undulating topography characterized by hills, hillocks (locally known as Tillah), wide plains and low lying waterlogged areas (locally called Beel) (Roy and Bezbaruah 2002). Most of the hills have a northsouth spread interspersed by strips of plain areas. The region is flanked by southern belt of Borail range. On the eastern frontier lies the Bhuban range, which is a continuation of the Lusai hills. Most of the hills are rugged and precipitous into which innumerable river cuts deep gorges as they descend upon the plains (Bhattacharjee 1977).

The Barak River is the principal river of the valley, which rises from the southern slope of the lofty ranges of Nagaland and after flowing in a South West direction through Manipur turns north and forms the boundary of Manipur and Cachar. It flows a distance of 192 kms receiving a number of tributaries viz. the Jiri, the Chiri, the Madhura, the Jatinga, the Dolai in the north and the Sonai, the Rukni, the Ghagra, the Katakhal, the Dhaleshwori, the Longai and the Singla in the South. The Barak river and its tributaries are shown in Fig 2.5. The river Barak itself bifurcates into the Surma flowing northwards and the Kushiara flowing southwards at Haritikar near Badarpur. Longai and Singla are the important tributaries of Surma. All these rivers, especially the Barak adopt a meandering path through the alluvial plains, frequently shifting their courses and forming Oxbow lakes. In addition, other freshwater systems, including floodplain, wetlands, tanks and ponds of varying sizes, streams and marshes are found in this region. These ecosystems help in storing the excess water after heavy rainfall. The topography of the terrain is of highly undulating nature, with the central alluvial flats frequently broken by isolated hillocks or tillahs and small hill ranges that merge with the outlying hill ranges projecting at from the main ranges of Jaintia and North Cachar Hills to the North, and those of Mizoram and Tripura to the south and southwest (Gupta, 2000). The altitude ranges from about 10 m a.s.l. at a point in the east region to about 1471 m a.s.l. on the Sherpar Peak in the Borail range in the north (http://srtm.csi.cgiar.org).
2.1.4 Geology

The entire Barak valley consists of massive bedded sandstones, silty stones, conglomerates and shales of tertiary age. This zone is the area of intensive geotectonic activities and there are major tectonic adjustments within its affected seismic zone.

2.1.5 Climate

The climate of the study site is sub-tropical, warm and humid with average rainfall of 242.8 cms, most of which is received during the Southwest monsoon season (May to September). Southwest monsoon usually operates for a longer spell in the Northeastern region compared to other parts of India. Average maximum and minimum temperatures were 30.6°C to 20.2°C respectively as shown in Table 2.1. The climatic variables of the study area are graphically represented in Fig. 2.1.

Table 2.1: Mean- Monthly Metrological Data (average of the year 2008-2012) of Barak Valley, Assam, North East India

<table>
<thead>
<tr>
<th>Months</th>
<th>Avg. Rainfall (cm)</th>
<th>Avg. Max temp (°C)</th>
<th>Avg. Min temp (°C)</th>
<th>Humidity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>1.286</td>
<td>25.58</td>
<td>12.24</td>
<td>55.2</td>
</tr>
<tr>
<td>Feb</td>
<td>0.842</td>
<td>28.58</td>
<td>13.72</td>
<td>51.7</td>
</tr>
<tr>
<td>Mar</td>
<td>9.394</td>
<td>31.72</td>
<td>18.84</td>
<td>53.3</td>
</tr>
<tr>
<td>Apr</td>
<td>21.534</td>
<td>32.36</td>
<td>22</td>
<td>59.15</td>
</tr>
<tr>
<td>May</td>
<td>28.542</td>
<td>32.74</td>
<td>23.48</td>
<td>66.6</td>
</tr>
<tr>
<td>June</td>
<td>48.084</td>
<td>32.66</td>
<td>24.94</td>
<td>67.15</td>
</tr>
<tr>
<td>July</td>
<td>37.124</td>
<td>32.7</td>
<td>25.18</td>
<td>71.3</td>
</tr>
<tr>
<td>Aug</td>
<td>48.482</td>
<td>33.38</td>
<td>24.72</td>
<td>63.4</td>
</tr>
<tr>
<td>Sep</td>
<td>32.322</td>
<td>32.52</td>
<td>23.64</td>
<td>60.1</td>
</tr>
<tr>
<td>Oct</td>
<td>12.368</td>
<td>32.42</td>
<td>22.5</td>
<td>50.85</td>
</tr>
<tr>
<td>Nov</td>
<td>2.136</td>
<td>29.56</td>
<td>16.48</td>
<td>40.7</td>
</tr>
<tr>
<td>Dec</td>
<td>0.87</td>
<td>26.28</td>
<td>13.1</td>
<td>45</td>
</tr>
</tbody>
</table>

Source: Tea Research Association, Advisory Department, Silicoorie, Cachar
2.1.6 General account of vegetation

The Barak Valley region has 3882 km² of the total area under forests, which is about 56.02 percent of the total geographical area (6922 km²) of the region as against 35.28 percent for the state as a whole. The estimates of forest cover in Barak valley reveal that Cachar district represents the highest percent of forest with 59.06 % followed by the Hailakandi district with 59.23 % and the Karimganj district with 47.54 % of the geographic area of these respective districts (State Forest Report 2011). The forest resources that are currently under high economic use include timber as well as non-timbers like bamboo and cane. According to Champion and Seth (1968), the forest vegetation of Barak valley comes under Cachar tropical evergreen forest (1B/C3) and Cachar semi evergreen forest (2B/C2).

2.1.7 Soil

The soils of Barak Valley comes under two textural classes – the plateau and the flat area, and is covered by silty clay and loamy soil while coarse sandy loamy is found in tillah land. In fact the soil of the district is mixture of alluvial, sandy loam, muddy loam superimposed upon stones, gravels and conglomerates. The muddy soil is humus content lying on the river banks and low lying areas. The tillah land is having lateritic soil with high percentage of acidity. The pH value of Barak Valley ranges between 4.5 to 6.5 only. The soil map of Barak valley is shown in Fig. 2.6.

2.1.8 History of Barak valley

Cachar was ruled by the Kachari Kingdom for centuries up to 1832 when British annexed the area under British-India. However, the dominance of Mughal Empire in Karimganj and Hailakandi finally ended with the introduction of British rule in Bengal. The undivided Cachar district (which also includes presently known as Hailakandi district) was included in Assam by British rulers in 1832. The head quarter of the district was Silchar. The British companies established a large number of tea gardens (total 157) in the area and Silchar emerged as a very important center in this part of the country. All
modern facilities like electricity and distribution of purified water to each household through pipe-line, schools and hospitals were established in early twentieth century.

When Assam was constituted as a new province by the British in 1874, two Bengali speaking districts of Sylhet and Cachar were tagged to Assam to meet the revenue deficit of the newly formed province. Since then, Karimganj, an administrative unit of Sylhet district and Cachar district came to be known as Surma valley division. In 1947, the major part of Sylhet district except three and a half thanas of Karimganj subdivision was transferred to erstwhile East Pakistan (now Bangladesh). The remaining part of the Surma valley is also known as Barak valley which was since then been recognized into three districts of Cachar, Karimganj and Hailakandi within the state of Assam.

Nihar Ranjan Ray in his “Bangaleer Itihas” aptly summarises: ‘The Barak – Surma valley is nothing but the northern extension of the Meghna valley (Dacca-Mymensing-Comilla). There is nothing like a natural boundary between these two valleys and that is why, the traditions and culture of these districts of East Bengal so easily spread into Sylhet cachar in ancient and medieval periods’ (Ray 1980).

2.1.9 People and dependence

2.1.9.1 Agriculture

The agricultural sector plays an extremely dominant role in the economy of the region. 2,24,063 hectares comprising 32.43 percent of the total reporting area of the region was in agricultural use in 1997-1998. As per 1991 census about 70.3 percent of the total work force of Barak valley was engaged in primary sector (agriculture and allied activities), 6.26 percent in secondary sector and 23.01 percent in the tertiary sector. Thus, agriculture and allied activities are still the predominant source of livelihood of the population. Paddy is the main agricultural crop of the Barak Valley followed by mustard and sugarcane. Some vegetables like potato, brinjal, cabbage, sweet potato, beans and chillies etc, are also grown on raised lands (tillah) or on the river bank slopes.
2.1.9.2 Plantation

Fundamentally, a plantation is usually a large farm or estate, especially in a tropical or semitropical country, on which cotton, tobacco, coffee, sugar cane, or trees and the like are cultivated, usually by resident labourers.

A plantation is an intentional planting of a crop, on a larger scale, usually for uses other than cereal production or pasture. The term is currently most often used for plantings of trees and shrubs. The term tends also to be used for planting maintained on economic bases other than that of subsistence farming. Plantations may be categorized into:

a. Industrial plantations

Industrial plantations are established to produce a high volume of wood in a short period of time. Plantations are grown by state forestry authorities.

b. Farm or home plantations

Farm or home plantations are typically established for the production of timber and fire wood for home use and sometimes for sale.

c. Environmental plantations

These may be established for watershed or soil protection. They are established for erosion control, landslide stabilization and windbreaks. Such plantations are established to foster native species and promote forest regeneration on degraded lands as a tool of environmental restoration.

d. Other types of plantation

Crops may be called plantation crops because of their association with a specific type of farming economy. Most of these involve a large landowner, raising crops with economic value rather than for subsistence, with a number of employees carrying out the work. Often it refers to crops newly introduced to a region. In the past it has been associated with slavery, indentured labour, and other economic models of high inequity.

Plantings of a number of trees or shrubs grown for food or beverage, including tea, coffee, and cacao are generally called plantations. Some spice and high value crops grown from permanent perennial stock, such as black pepper may also be known as plantation.
2.1.9.3 Tea plantation

Tea gardens are the next most important feature of the economy of Barak Valley. In Barak valley tea plantation began in 1856. The Barak Valley has 107 registered tea gardens and the net area in 1992 under tea plantation was 33026 ha containing 4.8% of the total geographical area of the region. According to 1991 census, tea plantation continues to be an important economic activity providing employment to 10.4 percent of the local population. In 1994, total of 71,280 persons were employed in tea plantations in Barak valley of which 58,591 were permanent employee and remaining 12, 689 were employed temporarily (Mazumder et al. 1998).

Tea plantation is a labour oriented enterprise and requires huge manpower to run the plantation as well as the industry. The local labourers were not sufficient to run the plantation as well as the industry. Therefore, the problem of importing labourers from the neighboring provinces arose. As a result, large number of laborers from poverty and famine stricken areas of Chota Nagpur (Jharkhand), UP, Madhya Pradesh, Orissa, Madras and Bengal were brought to the tea gardens of Assam by the original British planters. Eventually they settled down in the tea plantation premises and have now become part of the local population.

2.1.9.4 Horticulture

The Northeastern states of the country as a whole and Assam, in particular, are endowed with highly productive soil, suitable climate and enough water besides rich forest wealth. It is ideally suited to produce a whole range of plantation crops, fruits and vegetables, flowers and hubs. Barak valley has conducive agro-climatic conditions, favorable for growing wide varieties of horticulture crops like areca nut, coconut, pineapples, oranges, papaya, banana and black pepper.

2.1.9.5 Manufacturing industry

In private factory sectors, the notable industrial units of the region are tea manufacturing units, plywood and saw mills. The notable public sector units set up in the region are Panchgram paper mill under Hindustan paper co-operation in Hailakandi
district and Cachar sugar mill in Karimganj district. About 4.3 percent of the total work force (as per 1991 census) is engaged in manufacturing, processing, servicing and repairing in various industries like paper, plywood, saw mills etc.

2.1.9.6 Fishery

In the low lying areas, beels, ponds, and rivers, plenty of fish farming is practiced for both internal consumption and for sale in the local markets. Karimganj District has huge potential for fishery, being endowed with a large number of rivers, swamps, ponds and other natural water bodies. There are 49 registered beels covering a total area of 4,420 hectares and about 23,535 smaller ponds and lakes covering another 3,545 hectares. Besides, there are 7 river based fisheries in operation. In spite of this, the district is far from being self-sufficient in fish production. Large quantity of fish is imported from distant states of the country and also from Bangladesh.

2.1.10 Demography

As per 2011 census, the demographic profile of the district shows that Cachar has total population of 1736319. Out of the total population, male constitute 886616 and female 849703. Hailakandi has a total population of 659260, out of which male population is 338766 and female population is 320494 while Karimganj district has a population of 1217002, male constitute 620722 and female 596280 out of the total population as shown in Fig. 2.2. Majority of the population of Cachar district belongs to Bengali community. More than 15 % of the total population of Cachar is constituted by the tea and ex-tea labour community. Tea and ex-tea garden community have been split up to Bhojpuri, Hindi, Bengali, Santhali, Oriya, Hindustani and others.
Fig. 2.1: The climatic variables of the study area

Fig. 2.2 Population structure of Cachar, Hailakandi and Karimganj districts, Barak valley (2011 census).
Fig. 2.3: Location map showing study area
Fig: 2.4 Boundary map of Cachar, Hailakandi and Karimganj districts
Fig. 2.5 Barak river and its tributaries
Fig. 2.6 Soil map of Barak Valley

Source: NBSS-LUP
2.2 Intensive study area

The Doloo tea garden was selected as intensive study area for identification of problem areas in tea plantations and identification of marginal lands for alternative crops due to the following reasons. Doloo garden is one of the biggest tea plantations in Barak valley. It lies between 24° 54' 58" - 24° 56' 21" N latitude and 92° 49' 17" - 92° 47' 57 " E longitude. It covers a geographical area of 1682 ha. The area has an altitude of 151 ft. above mean sea level. This study is a pilot study in this region where only a single garden has been studied using LISS III imagery since most of the tea gardens in this region are of relatively small size and cannot be studied in detail using LISS III imageries which have moderate resolution.