Chapter 3: STUDY AREA

3.1 Area of the present study:
Erstwhile Kamrup District is a former administrative district located in Western Assam from which Kamrup Rural (2003), Kamrup Metropolitan (2003), Barpeta (1983), Nalbari (1985) and Baksa (2004) districts were formed. It was a large administrative district in colonial times that has been reducing its size in subsequent periods. The area of erstwhile Kamrup district is 6,882 square kilometers. (Fig.1)

3.2 Location and topography:
Kamrup District is situated between 25.46 and 26.49 North Latitude and between 90.48 and 91.50 East Longitude. The District is bounded by:

North- Bhutan and Goalpara
South- Khasi and Jaintia Hills
East- Darrang
West- Goalpara

3.3 Geology:
Erstwhile Kamrup District lies in the northern fringe area of the Meghalaya Plateau. The isolated hills in the midst of alluvial plain are also known as inselbergs comprising of mostly precambrian gneissic rocks. It is dominated by scattered hillocks with intermittent plains which are extended parts of Shillong Plateau that form the southern boundary of the district.

Various factors like heavy rainfall, floods, soil erosion and undulating terrain have affected the soil formation process, which gave diverse textural classification of
soils in the district. As per textural classifications, red soil is 2.42%, alluvial soil 26.14%, sandy soil 18.08%, sandy loam soil 39.28% and clay loam soil 14.08%. On the whole, the district is having light to medium textured soils suitable for growing the wide range of crops. The soil reaction (Ph) of the district is mostly acidic, in the range of 5.0-6.0. Both the phosphorus and potash content of the soil is in medium category of 10.25 to 15.00 and 110 to 280 kg/ha respectively.

Out of the total cultivable area (2,74,812 ha), 14.45% area accounts as mild acidic, and this can be reclaimed through appropriate soil amendment. Affect of soil acidity prevails in all 17 blocks of the district. Though the extent of acidity is mild in nature, it may turn to severe to very severe in course of time if it is left unattended.

3.4 Climate:
Erstwhile Kamrup District is situated in humid sub-tropical region and is characterized by semi-dry summer and cold in winter. The district experiences a hot summer followed by monsoon season of heavy rainfall and relatively cool winter with scanty rainfall. During the study period the annual rainfall of the district was between 108.04 mm to 206.7 mm; average humidity was 75%; the maximum temperature range was between 22.7-34.3°C and the minimum temperature between 9.9-26.6 °C. (Source: Regional Meteorological Centre, Borjhar)

3.5 Vegetation:
Phyto-geographically, Clarke (1898) classified the whole of North-Eastern India in two distinct regions i.e. Assam and Eastern Himalayas. Hooker (1906) in his botanical division of India included major parts of Assam with the Gangetic Plains, treating the Eastern as a separate area of Assam included Shillong plateau, Patkai,
Nagaland, Manipur, Mizoram and Tripura as an integral part of Burma. Chatterjee (1962) followed Clarke and treated Assam as an area distinct from the Eastern Himalayas because of its unique flora. However, different eminent workers viz., Griffith (1848), Kanjilal et al. (1934-40), Das (1942), Rao and Panigrahi (1961), Rajkhowa (1961), Bhatnagar (1963), Sahni (1981), Rao and Hajra (1986), Baishya (1999), etc. based on physiography, geology, soil types and climatic conditions described the vegetation of Assam in general. Rowntree (1953) made a preliminary study on the vegetation of Assam valley. Das and Rajkhowa (1968) classified the evergreen and deciduous forest of Assam into 14 different biotic formations.

The account in the district levels of Assam, more particularly on the vegetation of Kamrup District, is known through the work of Kanjilal et al. (1934-1940), Rowntree (1953) and Das (1942). The classification of vegetation of Kamrup as well as in the N. E. India was done with regard to the forest cover whereas nearly 69.17% of the total geographical area of this district is occupied by cultivated land. Moreover water bodies are occupying nearly 7.36% area of the total geographical area of this district and forest cover only about 14.75% area.

Keeping the growth and nature of plants in different physio-climatic situations in view, the vegetation of this district can broadly be discussed under the following heads:

1. Semi evergreen forests
2. Moist and Dry deciduous forests
3. Degraded forests and scrublands
4. Scrub jungles and man-made forests
5. Grasslands and savannahs
6. Wetlands
1. Semi-evergreen forests:

Semi-evergreen forests occur only in patches. The storied structure is well-developed in these forests. The top and the middle storied plants of these forests are evergreen or semi-evergreen, with or without few deciduous ones. They are characterized by age old lianas, several epiphytes, bamboos, a well developed perennial ground vegetation. Manas Wild Sanctuary in the north Kamrup preserves a few such patches of primary forests; in the south they are more conspicuous in Mayang, Pantan, Garbhanga and Jora reserve forests.

None of the species is dominating in these semi-evergreen patches. However the upper storey is made up of compact canopies of *Alseodaphne petiolaris* (Meisson.) Hook. f., *Beilschmiedia fagifolia* Nees, *Cryptocarya amygdalina* Nees, etc.

Middle and lower stories are composed of shade tolerant trees and the seedlings of upper tiered trees. They are like *Actinodaphne obovata* (Nees) Bl., *Boehmeria penduliflora* Long., *Polyalthia jenkinsii* Benth., etc. Among the lianas, vines and stragglers, *Pothos scandens* L., *Vitis planicaulis* Hook. f., *Hoya arnottiana* Wight., *Bauhinia vahlii* Wight et Arn., etc.

Shrubby vegetation is also rich in a number of species. *Clerodendron hastatum* ( Roxb.) Lindl., *Pandanus foetidus* Roxb., *Chloranthus elatier* Link., etc. are some of the elements met with in the semi-evergreen forests of this district.

Ground vegetation is rich in numerous perennial herbs and undershrubs along with several annuals. *Capillipedium assimile* (Steud.) A. Camus., *Panicum auritum* Presl., *Peliosanthes teta* And., *Thysanolaena maxima* (Roxb.) O. Kuntze., etc are common. Epiphytic vegetation is composed of mostly of orchids and ferns. *Cymbidium aloifolium* (L.) Sw., *Dendrobium aphyllum* (Roxb.) Fischer., *D. lindleyi*
Steud., *Rhyncostylis retusa* (L.) Bl., etc. are dominating the epiphytic vegetation in these forests.

2. **Moist and Dry deciduous forests:**

Sal (*Shorea robusta* Gaertn.) is a typical element of these forests and on the basis of the presence and absence of this species, the moist and dry deciduous forests are categorized into Sal forests and Moist Deciduous Mixed Forests. Teak patches can also be delimited from these forests, where teak (*Tectona grandis* L.) is widely planted.

Sal forests: Sal belt is the south Kamrup, from the bank of river Brahmaputra to the foothills of Meghalaya, is almost continuous. In this belt Sal is the only thickly populated species.

Champion (1936) divided the Kamrup Sal forests into 2 groups, viz., Wet Hill Sal forests and Moist Sal forests. The Wet Hill Sal forest is interrupted by mixed deciduous trees and bamboos whereas Moist Sal forest include some mixed elements like *Dillenia pentagyna* Roxb., *Bauhinia acuminata* L., *Typhonium typhoides* (L.) Schott, *Rauvolfia serpentina* (L.) Benth. ex Kurz. etc.

Moist Deciduous Mixed forests: In these forests sal is either totally absent or its density is highly diluted by other deciduous and semi-evergreen trees. These forests are richer in shrubby and herbaceous ground vegetation with higher species diversity. Some of the elements found are *Artocarpus chama* Buch-Ham., *Bombax ceiba* L., *Dalbergia sissoo* Roxb., *Dendrocalamus hamiltonii* Nees et Arn ex Munro., *Gloriosa superba* L., *Cyperus cyperoides* (L.) O. Kuntze., *Apluda mutica* L., etc.
Teak Patches: Several patches of teaks are seen in the sal belt. These patches are secondary in origin and resulted through mass plantation on degraded forest lands along hill slopes. The floor often remains full of fallen leaves. Epiphytes are scarce in teak forests.

3. Degraded forests and scrublands:
Degradation of forests in erstwhile Kamrup District is a serious fact. The increasing population, urbanization of villages, followed by gradually increasing industrialization, construction of roads, etc. are some of the common factors. The haphazard extraction of timbers and bamboos for industrial and fuel purpose and for making country buildings is the main disease of forests.


4. Man-made forests:
In south Kamrup, inside some of the reserve forest, sal and teak plantation is widely practiced. Most of the planted trees are of deciduous type which included *Acacia catechu* Willd., *Albizzia lebbek* (L.) Benth., *Anthocephalus chinensis* (Lamk.) A.
Rich., Bischofia javanica Bl., Dalbergia sissoo Roxb., Litsaea monopetala (Roxb.) Pers., Terminalia belerica (Gaertn.) Roxb., etc.

In the valley regions plantation of big trees as shade plants, mostly on road sides has widely been practiced from a long past by the villagers. Trees with wide canopies like Ficus benghalensis L., F. religiosa L. and trees with comparatively narrow canopies like Cassia fistula L., Dillenia indica L., Mangifera indica L., etc. common occurrence in villages.

Forest department has also undertaken several sylvicultural programmes. Mass plantation of fast growing trees like Acacia auriculiformis Cunn. ex Benth. and Eucalyptus maculata Hook. along with Albizzia lebbek (L.) Benth., A. procera (Roxb.) Benth., Bombax ceiba L., Delonix regia (Boj.) Raf., Saraca indica Linn., Terminalia arjuna (Roxb. ex DC) Wight and Arn., etc. are done on road sides.

5. Grasslands and savannahs:

Alluvial grassland and savannah are grass dominated biomes and are the major components of natural vegetation. These savannah are maintained at a sub-climax stage by repeated grazing and burning (Yadava, 1990). They cover the char areas and the banks of the river.

In Manas, Themeda villosa (Poir.) Camus., Arundo donax L., Apluda mutica L., Imperata cylindrica (L.) Beauv., Hemarthria protensa Steud., Polytoca digitata (L. f.) Druce., Saccharum sp. are the common grasses.

Clerodendron viscosum Vent., Crotolaria pallida Ait., Osbeckia nepalensis Hook., Blumia fistulosa Roxb., several species of Desmodium, Sida etc. are intermingled with these grasses.
Cycas pectinata Griff. is the only gymnosperm found growing wild in erstwhile Kamrup District. In forest ecosystems, pteridophytes are represented by a number of species like Angiopteris execta (Forst.) Hoffm., Blechnum orientalis L., and several species of Selaginella, Adiantum, Pteris etc.

6. Wetlands:
A number of water bodies are found in the erstwhile district of Kamrup including several seasonal streams and temporary water bodies like low lying crop fields, ditches etc. and permanent water logged areas like ‘bils’ with surrounding swampy areas pools, ponds and river systems.

Among the free floating hydrophytes, Eichhornia crassipes (Mart.) Solms. is dominating both the running and stagnant water bodies. In stagnant water bodies Pistia stratiotes L., Lemma perpusilla Toer., Trapa natans L., etc. are common along with aquatic ferns like Azolla pinnata R. Br., Salvinia cucullata Roxb. ex Bory., etc. Euryale ferox Salisb., Nelumbo nucifera Gaertn., Nymphoides hydrophylla (Lour.) O. Kuntz., etc. are anchored hydrophytes with floating leaves.

Among the submerged plants Ceratophyllum demersum L., Utricularia bifida Lour. along with several species of algae are suspended hydrophytes found.

Ottelia alismoides (L.) Pers., Vallisneria spiralis L., Hydrilla verticillata (L. f.) Royle., etc. are anchored hydrophytes in ponds and streams.

The emergent amphibious hydrophytes include Alpinia nigra (Gaertn.) Burtt., Alternanthera philoxeroides (Mart.) Griseb., Saggittaria sagittifolia L., Monochoria hastata (L.) Solms., Hymenachne assamica Hitch., etc.