

## CHAPTER – TWELVE

### 12.0 Agro Forestry

#### 12.01 Agro Forestry in India

India has a long traditions of agro-forestry; farmers and land owners in different parts of the country integrate a variety of woody perennials in their crop and livestock production fields depending upon the agro-climatic conditions and local needs.

Agro-forestry land uses fulfill both productive and service functions. The main productive outputs are foodgrains, fuel, wood and fodder but most important service function is soil conservation. It means not only control or erosion but also includes the maintenance as well as improvement of soil, organic, physical and nutrient status (Lyndgren, Nair, 1985)<sup>1</sup>. Management practices are the main deciding factors and determine the merits and demerits of various agro-forestry practices whether they are controlling or aggravating the soil erosion. Nitrogen fixing trees and shrubs growing within practical agroforestry systems are capable of fixing about 50-100/kilogram of nitrogen per hectare per year.

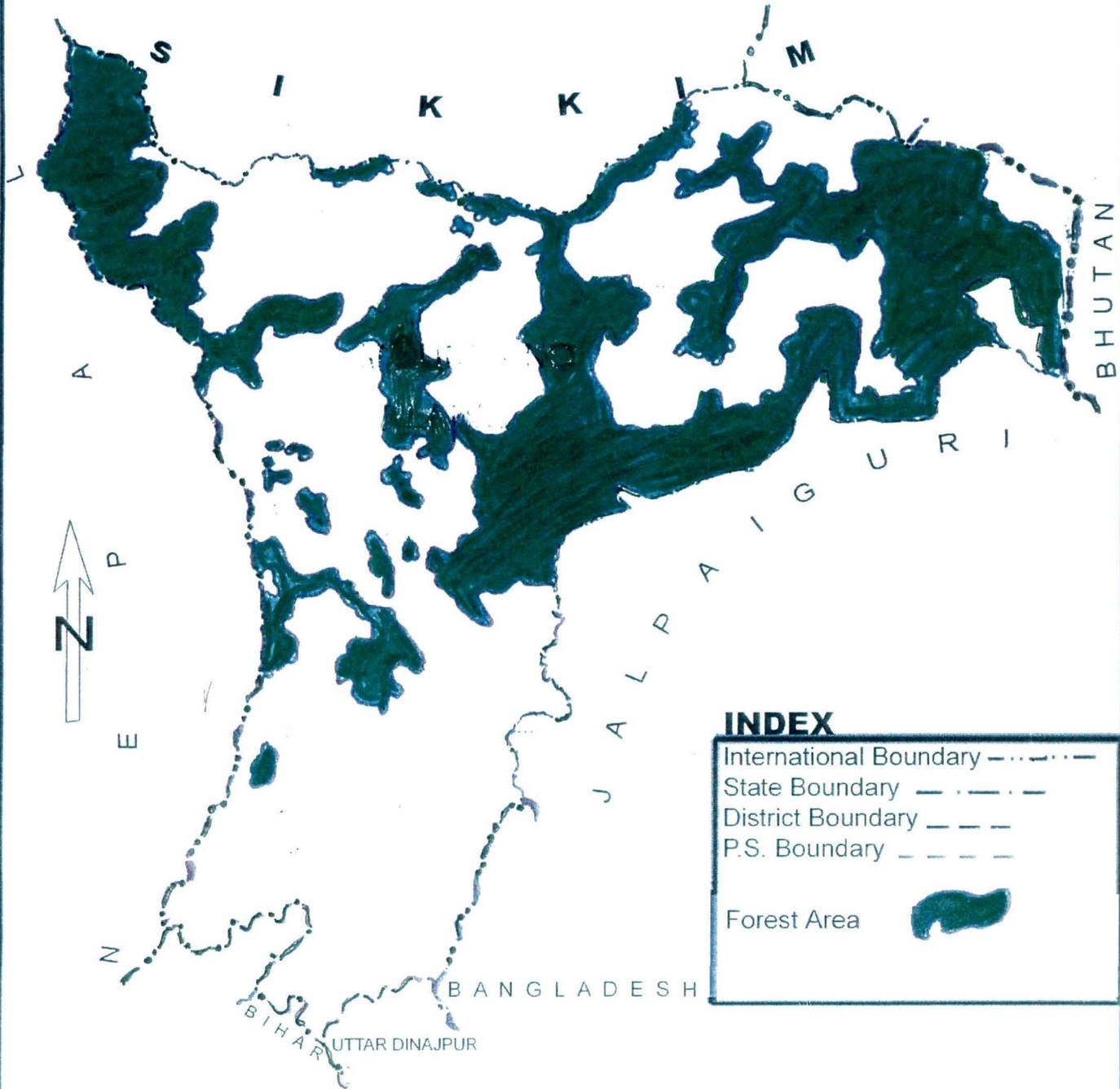
Forests are necessary to maintain ecological balance of the country, so much so that they are called the lungs of the society. The national forest policy, 1988 clearly stated – “National goal should have be to have a minimum of one third of the total land area of the country under forest or tree cover”.

The forest of Darjeeling may be classified into broad groups viz. the hill forest and the plain forests. Figures 12.1 shows forest areas of Darjeeling.

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<sup>1</sup> Lyndgren, B. and Nair, P.K.P. (1985) Agroforestry for Soil Conservation, Soil Erosion and Conservation, IOWA, U.S.A.

# DISTRICT DARJEELING FOREST



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0 5 10 KMS  
SCALE

Fig-12.1

The Darjeeling Himalayan tract belonging to a portion of the lower Himalaya has given rise to an unique forest eco-system. From 150 meters to 3600 meters different types of forest exist within a small area. In 1911 more than 59 percent (1554 sq.kms.) of the total area of Darjeeling district was under forest cover, but it comes down to 38 p.c. or 1204 sq.kms. area in 1987. In hills these forests extend over the ridges above 1800 meters. Forests of considerable extent also extend into the Tistan Rangit valleys. The forests of Darjeeling may be classified into two broad groups viz. the hill forest and the plain forests.

## **12.02 Hill Forests**

The hill forest of the district can be divided into five classes – such as (i) lower hill forests upto 914.4 meter with three sub types (a) sal forests (b) dry mixed forests and (c) wet-mixed forests and (ii) the middle hill forests ranging from 762 meters to 1676 meters (iii) the upper hill forests occurring between 1524 and 2743 meter.

**(i) Lower hill forest :** These forests occupy the Tista and Ranjit valleys within which three main subtypes may be distinguished.

**(a) Sal Forest :** In Darjeeling division sal is gregarious on ridges and spurs and is mainly confined to the Daling series. It is also found in other parts of the district in association with miscellaneous species. Around Badamtam in the Rangit valley pine is common and occurs naturally.

In Kurseong division sal grows pure or mixed with other deciduous species on northern ridges and on southern and eastern slopes of moderate gradient. Sal also grows at an altitude of 3500 feet in the northern portion of Kalimpong range, it occurs up to an elevation of 1500 feet only in the southern part of the range.

**(b) Dry Moist Forest:** Which are mainly deciduous and found on dry ridges spurs and slopes.

(c) **Wet Moist Forests:** Which occur in sheltered pockets in the valleys along jhoras and they are semi-evergreen in character.

### **12.03 (ii) Middle Hill Forests**

Forests of this zone are not well represented in this division because substantial section of forests in this altitudinal range have been given over in the past to the tea estates or to cultivation in the past. Forests of this type are encountered in the upper reaches of the Sumbong and Reyang blocks and lock. The middle hill forest are closed evergreen forests, the trees being mostly short and branchy though of ten attaining considerable girth.

### **12.04 (iii) Upper Hill Forests**

Which are most important in the division because they cover the bulk of its forest area. In composition they more or less correspond to east Himalayan wet temperate forests of the northern wet temperate group. Three altitudinal zones where these forests occur are –

- (a) Lower Zone: Forests under Selimbong, Kankibong, Little Rangit and Lopchu blocks belong to this category. This forest area extends from around 1750 meters to around 2150 meters.
- (b) Middle Zone, extending from 2150 meters to around 2500 meters. Forest in the south Rimbick, Kankibong and Selimbong blocks belong to this category. The important special grown are buk, falant and kotus.
- (c) Upper Zone extending from 2500 meter to around 2750 meter characterized by sunguray katus. Upper forests in Kanikbong, south Rimbick and Raman blocks belong to this category. Oak-hamlock forests are encountered in the upper ranges of the Himalayan moist temperate groups.

- (d) Alpine Forests corresponding more or less to birch and Rhododendron forests, which are found in Sandakphu.

## **12.05 Plain Forests**

Riverain forests occur on sandy soils near river beds, the most important of which are the Acacia, Catechu, Dalbargia, Sissoo forests found along the beds of Tista, Sevok, Mahananda, Rakti, Balason, Mechi, Lish, Gish, Chel rivers. Different types and subtypes of forests are noticed here. Viz. Simul-Siris, Sal, Tun-Gamari, Khair-Sissu, Dry-Mixed and Wet-Mixed.

The Khair-Sissu forest appear where the on sandy soil near the river beds. Along the beds of the Tista Sevok, Mahananda Rikti, Balason and Mechi rivers. Pure Khair associated with a small number of Sissu is found while Siris, Kadam Pitali and Gamari appear to be very widely spaced.

**SimulSiris** : These forests appear further inland where soil is stable. Khair and sissu get gradually sparce and simul seris and some similar species form more or less open forest.

**TunGamari** : The soil here is richer and species appear in intimate mixture with those of the forgoing type. Species usually found are Tun, Gamari, Maina, Khira.

**Sal forest** : In the sal forest sal trees are grown on loamy soil in association with other species such a Pakassi, Chikrassi, Sidha, Kumbhi, Parari etc.

**Dry mixed** : forests occur on foot hills and on dry soil. Density of vegetation is much lower. Las is found scattered in this area. Wet-Mixed forests are found where water table is shallow and drainage is bad. The common species found are chapalish, lali. The crop density is thick and principal vegetations are evergreen. The undergrowth is dense and numerous climbers are found in this region.

## 12.06 Medicinal Plants

Medicinal plants are found in the plain forests are bask, akanda, dhutura, sati, afim and many others.

## 12.07 Agro Forestry

The term agro forestry may be defined as multiple landuse of an area simultaneously to meet the various needs of the cultivators by getting multiple outputs in a sustainable manner. The policy of govt. is to motivate farmers to plant grafts and enable them to supplement their income in years to come. The govt. is trying to increase the area under forest by planting trees by using some of the new terms like – agro-forestry, social forestry and farm forest. In addition to that medicinal forestry (Banerjee, 1982)<sup>2</sup>. Environmental forestry and trees outside forest (TOF) are used for success of the governmental programmes of the forestry. This can be partially done by planting commercially important fuel, fodder and fruit trees. This programme ensures good tree cover of environmental importance (Khatu, 1995)<sup>3</sup>. Agro forestry practices have been used all over the world but mainly found in tropics. By the end of 19<sup>th</sup> century mixed planting concept was used by the foresters. Geographers (Shah, 3000)<sup>4</sup> and environmental scientists have maintained that agro-forestry would occupy a pride in the 21<sup>st</sup> century and beyond. Since last few decades degradation of natural resources and degradation of natural resources and deforestation became an issue of the scientists. Hence, the need was felt of interplanting forest trees with food crops. Agro forestry yields, food, fodder, fruit, fuelwood and industrial raw material (Mughal, 2000).<sup>5</sup>

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<sup>2</sup> Banerjee, B., 1982: Resource Utilization of Darjeeling Himalaya and Conservation of Ecology – Geographical Review of India, vol. 44, pp. 1-15.

<sup>3</sup> Khatu, K.K., 1995: Advances in Kharland Development in Gujarat and Maharashtra, The Deccan Geographer, vol.-33, No.-2, pp. 83-93.

<sup>4</sup> Shah, S. A., 1999: Forest Management Objectives in the Twenty First Century the Indian Forster, Vol. 126, No.-2, pp. 111-118.

<sup>5</sup> Mughal, A.H., Ara, Tabasum and Bhattacharjee, p. 2000: Socio-Economic Aspects of Agro-forestry in Rural Srinagar of Kashmir Valley, The Indian Forests, Vol. 126, No. 3, pp. 234-240.

It has been found in the Darjeeling district that during first two years of laying out a forest plantation, many food crops such as paddy, maize, and mustard combine with the forest trees such as Sal. After a few year, climbers, creepers herbs, shrubs are allowed to grow freely underneath the main forest area. After 15 to 20 years in the older plantation some minor crops such as ginger and turmeric are grown successfully. Cotton and ramie, a kind of tough natural fibres are found suitable as inter cropping in forest plantation. Introduction of indigenous species of economic plant like amlesho, narkat, ginger were introduced to establish an association for plantation activity with individual economic interests of Forest Protection Committee (FPC) members Medicinal Plant like *Chirata* have also been successfully introduced, as inter crops.

In addition to that agro-forestry may work as a supporting tool for livestock, the welfare of rural population and protection of environment (Shelton, 2000)<sup>6</sup>. Tree outside forest (TOF) (Kleinn, 2000) is of the opinion that trees outside forest (TOF) comprise tree formations ranging from single discrete trees to systematically managed trees in agro-forestry systems. Food and agriculture organization (FAO) of the United Nations defines TOF as “Trees on land not defined as forest and other wooded land”. TOF land are classified as follows:

- 1) Trees in urban areas.
- 2) Trees in the core of urban areas.
- 3) Trees associated with permanent crops.
- 4) Trees associated with annual crops.
- 5) Trees associated with pastures.
- 6) Trees along railways, borders, roads, canals, creeks etc.

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<sup>6</sup> Shelton, H.M., 2000: Tropical Forage Tree Legumes in Agroforestry Systems, Unasyalva Vol. 51, No. 200, pp. 25-32.

- 7) Trees along ponds, lakes, dams, playing grounds, research centres, agricultural universities, educational institutions etc.
- 8) Tree groups.
- 9) Trees on uncultivated land.
- 10) Trees on land with low management input.

Carucci (2000)<sup>7</sup> suggested the importance of TOF as the essential tools of controlling desertification. It may be mentioned here that trees are planted in various forms for the purpose of environmental balance, commercial use, natural protection for horticulture and to enhance natural beauty.

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<sup>7</sup> Carucci, R. 2000: Trees outside Forests An essential Tool for Desertification Control in the Sahel Unasylva, Vol. 51, pp, 18-24.