6. Important Characteristics of India's Forests

6.1 Introduction

The important characteristics of India's forest have been analyzed on the basis of National Forest Inventory (NFI). As discussed in Chapter 5, NFI was started in 2002. Under NFI, the country has been stratified into 14 physiographic zones and 60 districts are selected randomly for detailed inventory of forests and Trees Outside Forests (TOF) in a cycle of two years. During NFI, besides actual tree measurements, information on various other important parameters such as forest area under different land use, intensity of regeneration, incidence of fire, injuries to crops, grazing, presence of weeds and grass, soil information, humus, rockiness, bamboo information, plantation potential, biotic influence, etc. is also being collected. All information is presented in this Chapter which is based on the field data collected from 179 districts during the period from 2004 to 2012.

6.2 Area Under Different Landuse Classes

For the entire country, the land-use classification scheme is well laid out and the data is collated, maintained and reported by Ministry of Agriculture, Government of India. In this classification one of the landuse class is forest. As far as forest area is concerned, about 77.18 m. ha area of the country is reported as 'Recorded Forest Area'. The classification of this recorded forest area, under different land use classes is of value for planning and management.

While carrying out forest inventory, the information on 15 land use classes is collected. These are closed forest, dense forest, open forest, scrub, shifting cultivation, young crop of forestry species, trees in line, forest roads, grass land, barren land, agriculture lands without trees in surround, agriculture lands with trees in surround, non-forestry plantations, habitations and water bodies.

The forest cover within RFA is estimated to be 54.41 m. ha which is 70.50 percent of total country's recorded forest area (77.18 m. ha) including non-forestry plantation of 1.22 percent. The area of young crop/plantation within recorded forest area which has trees less than 10 cm dbh, is estimated as 7.95 percent. The assessed area of forest cover as given in this report is 69.79 million ha. The difference between these two figures is due to the fact that the former is forest cover inside the recorded forest area only, the latter includes forest cover outside recorded forest area as well.

Table 6.1: Recorded Forest Area by Land Use

Land Use	Area (sq km)	Per cent of RFA
Very Dense forest	63,907	8.28
Moderately dense forest	261,725	33.91
Open Forest	209,086	27.09
Scrub	43,222	5.60
Shifting Cultivation	6,252	0.81
Young Crop/Plantation	61,360	7.95
Non-Forestry Plantation	9,416	1.22
Others	116,854	15.14
Total	**771,821**	**100**

6.3 Intensity of Regeneration

The process of replacing old crop with younger generation either naturally or artificially is called regeneration or reproduction. Forest regeneration process may also include interventions like assisted natural regeneration, seed origin, enrichment planting, controls to reduce grazing and lopping activities, etc. This activity influences carbon storage through changes in the growth of above-ground and below-ground tree biomass.

Intensity of regeneration refers to the extent the regeneration has been established in an area for a given species or a group of species. The establishment of regeneration depends upon many factors such as presence of weeds, climate, soil, moisture regimes, grazing intensity, diseases, insect attack, fire incidences and topographic factors like; slope and aspect.

For recording intensity of regeneration, four subplots of size 3m x 3m, are laid out at a distance of 30m from the centre of main plot of size 0.1ha, in all the four directions along diagonals. The sample plots which have 9 or more established (tree) plant units (in 36 sq meter) are termed as having 'adequate' regeneration. If the established plant units are less than 9 but are equal or more than 0.5 then the sample point is termed as having 'inadequate' regeneration. If it is less than 0.5 then regeneration is considered 'absent'.

For calculating established (tree) plant units, established, un-established and recruits are given weightage as 1, ½ and ¼ respectively.

Regeneration status at the country level is described in the Table 6.2. According to this table about 48 percent of recorded forest area is having adequate regeneration and about 24 percent area is having inadequate regeneration. Around 10 percent of forest area is not regenerating at all.

Intensity of Regeneration in Forest Area (%)

Absent 10%
Not Applicable 18%
Inadequate 24%
Adequate 48%
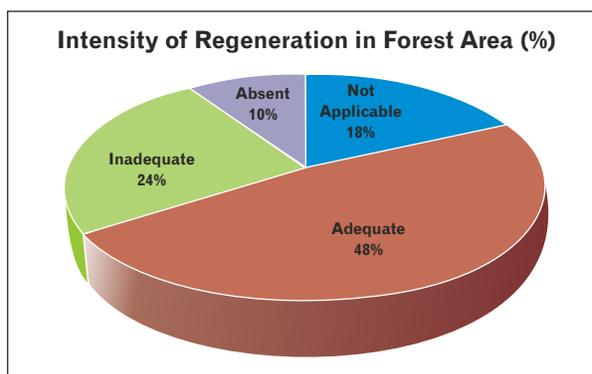
Table 6.2: Intensity of Regeneration in Forest Area

Regeneration Status	Area (sq km)	Per cent of RFA
Adequate	370,937	48.06
Inadequate	187,553	24.30
Absent	75,021	9.72
Not applicable	138,310	17.92
Total	**771,821**	**100**

There is some area within forest area where regeneration is not possible such as forest blanks and barren lands, under agriculture/non-forestry use, non forest plantations, habitation, forest roads and water bodies. Therefore, in such land 'intensity of regeneration' is 'not applicable'.

6.4   Incidence of Fire

Uncontrolled fire is the greatest enemy of the standing vegetation. Severe fires occur in many forest types particularly in dry deciduous forests. Evergreen, semi-evergreen and montane temperate forests are comparatively less prone to forest fires.

The total damage from forest fires is enormous. Not only small trees and regeneration are often killed but severe fires can also damage big trees. Fire scorches are often seen in Sal, Teak and Chir pine forests of the country. Surface fire destroys the organic matter which is very necessary to maintain an optimum level of humus in the soil. Repeated annual fire may decrease the growth of grasses, herbs and shrubs which may result in increased soil erosion. It may also destroy various nutrient elements, particularly nitrogen. Various beneficial micro-organisms are also killed due to fire. Controlled fires may be used advantageously for various purposes. It may be helpful in bringing about regeneration in many forests particularly in moist, semi-evergreen, evergreen and montane temperate forests.

Protection of forests against fires is one of the important operations in forestry management. Protection measures include preventive measures, extinguishing fires after these have been detected and some post-fire operations. In India, prophylactic measures include maintenance of fire lines.

The incidence of fire is observed occularly in a circular area of two ha around the plot center and classified as 'heavy' if more than 50 per cent of the area/crop is affected by fire; 'moderate' if 10-50 per cent of the area is affected by fire; 'mild' if the area affected is less than 10 per cent.

The estimated fire prone area under heavy, moderate and mild fire are 1.33 per cent, 6.48 per cent and 46.10 per cent respectively, making the total forest fire prone area of the recorded forest area as 53.91 per cent.

Incidence of Fire in Forest Area (%)
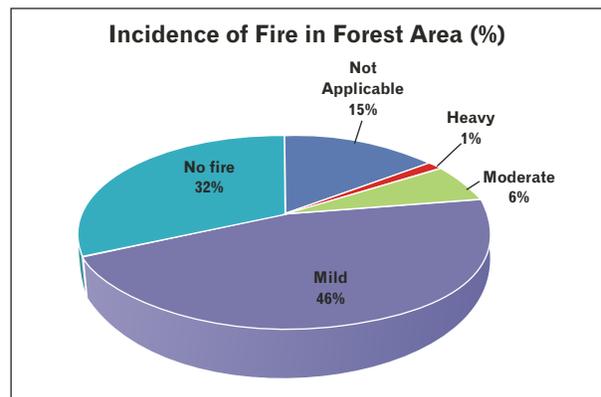
Table 6.3: Incidence of Fire in Forest Area		
Incidence of Fire Class	**Area (sq km)**	**Per cent of RFA**
Heavy	10,265	1.33
Moderate	50,014	6.48
Mild	355,809	46.10
Absent	243,818	31.59
Not applicable	111,914	14.50
Total	**771,821**	**100**

The extent of forest area annually experiencing surface fire which affects ground flora and organic matter is estimated to be 3.69 per cent of recorded forest area. Out of this, pole crop and regeneration is affected in estimated area of 1.42 per cent. Within this area, along with organic matter, ground flora, regeneration, pole crop, big trees are also affected to an extent of 0.48 per cent area.

6.5 Injuries to Crop

The growth, reproduction and yield of vegetation are affected by various factors. Injuries to crop are recorded from the area of two ha around the plot centre if the affected trees form at least 10 percent of the crop. The injuries to crop includes borer attack, leaf defoliator attack, damage by other pests, top drying, girdling, scarring, lopping, wind damage, flood damage, etc.

The major injuries to crop have been observed mainly due to girdling and illicit felling of trees followed by lopping. Only 11.47 percent area is free from injuries. 53.34 percent area is affected by girdling and illicit felling of trees and 6.66 percent is affected by lopping for fodder.

6.6 Grazing Incidence

Grazing means the consumption of any kind of ground vegetation by domestic livestock or wild animals. Grazing has a profound influence on forest vegetation. Light controlled grazing is useful while heavy uncontrolled grazing is very harmful. The benefits of light controlled grazing include reduced density of grass and shrubs and thus reduced fire hazard. The moving cattle break down the thick layer of un-decomposed needles in temperate coniferous forests and expose the mineral soils, thereby creating better soil conditions for germination of seeds of valuable conifers. However, the harmful effects of heavy uncontrolled grazing include crushing of the seedlings of the species along with grass, reducing porosity of soil resulting in poor aeration. The increase in compactness of soil results in increased run-off, progressive depletion of nutritive palatable grasses ultimately resulting in severe land degradation.

The grazing incidence is observed in an area of two ha around the plot centre and recorded as 'heavy' if more than 50 per cent of the area/crop is affected by grazing; 'moderate' if 10-50 per cent of the area is affected by grazing and 'light' if the area affected is less than 10 per cent.

Table 6.4: Incidence of Grazing in Forest Area

Incidence of Grazing Class	Area (sq km)	Per cent of RFA
Heavy	104,427	13.53
Moderate	212,328	27.51
Light	248,140	32.15
Absent	87,293	11.31
Not applicable	119,632	15.50
Total	771,821	100

As per the study, the area which does not have incidence of grazing is only 11.31 per cent. Rest of the forest area is prone to light to heavy grazing per cent.

6.7   Presence of Weeds

Weed is an unwanted plant at a particular site. The presence of weeds over an area of two ha around the plot center is observed and classified as 'very dense' if more than 50 per cent of the surface is covered by weeds, 'dense', if 25-50 per cent of surface area is covered; 'Moderate' if 10-25 per cent; and 'scanty' if less than 10 per cent surface area is covered by weeds.

The study indicates that weeds are absent in only 4.29 per cent of the forest area. About 20.32 per cent area has 'very dense' to dense weeds whereas 59.67 per cent area has 'moderate to scanty' presence of weeds.

6.8   Presence of Grasses

Grasses consist of herbaceous vegetation and belong to the Graminae family. Presence of grass has several important functions such as soil binding property, increased infiltration of water, reduced runoff of water, provide grazing for the animals, etc. To record the presence of grass, the ground cover area of about two ha around the plot center is observed and classified as 'very dense' if more than 50 per cent of the surface is covered by grasses, 'dense' if 25-50 per cent of the surface is covered, 'moderate' if 10-25 per cent of surface is covered and 'scanty' if less than 10 per cent of the surface is covered by grasses and 'absent' if there is no grass.

The following table indicates that the grass is absent in 5.47 per cent of the area. In 36.31 per cent area its presence is 'scanty' and in 26.92 per cent it is moderate. Only about 15 per cent area has dense to very dense presence of grass.

Table 6.5: Presence of Weeds in Forest Area

Weed Cover	Area (sq km)	Per cent of RFA
Very Dense	32,494	4.21
Dense	124,340	16.11
Moderate	238,724	30.93
Scanty	221,821	28.74
Absent	33,111	4.29
Not applicable	121,330	15.72
Total	771,821	100

Table 6.6: Presence of Grass in Forest Area

Grass Cover	Area (sq km)	Per cent of RFA
Very Dense	26,242	3.40
Dense	94,471	12.24
Moderate	207,774	26.92
Scanty	280,248	36.31
Absent	42,219	5.47
Not applicable	120,867	15.66
Total	**771,821**	**100**

6.9   Soil Erosion

Soil erosion is the movement of soil components, especially topsoil, from one place to another. The two main forces causing soil erosion are wind and flowing water. Excessive erosion of top soil reduces both the fertility and the water holding capacity of soil. The resulting sediment is the largest single source of water pollution, clogs irrigation channels, navigable waterways and reservoirs. The process of soil erosion involves a definite loss of valuable plant nutrients and if it becomes sufficiently intense, may lead to the complete depletion of the soil. Forests play a very important role in checking soil erosion either by wind or water. When there is a degradation of vegetation cover, water moves unchecked with a great force and carries soil particles with it resulting in loss of soil fertility, formation of gullies, nallah, etc.

The extent of soil erosion around an area of two ha of the plot centre is classified and recorded as, 'heavy' when areas have deep gullies, ravines, landslips, etc., 'moderate' when mild gullies and rills are formed on the top surface of the soil and 'mild' when only surface erosion has taken place.

The estimate of soil erosion area have been given in the Table 6.7 which reveals that about 9.23 per cent area is free from erosion and 63.03 per cent experiences mild soil erosion.

6.10 Soil Depth

Depth of soil is an important factor for trees, because it holds the necessary space, nutrients and water required by the plant for the growth and stability. Depth of soil depends upon climate, topography etc. for example the depth in hills is less than that in the valleys. Sedentary soils are generally deep unless they are washed down. For example, under favourable conditions, the black cotton soils are the deepest sedentary soils. Among the secondary soils, alluvial soils are very deep.

Table 6.7: Soil Erosion in Forest Area

Soil Erosion Class	Area (sq km)	Per cent of RFA
Heavy	17,289	2.24
Moderate	107,901	13.98
Mild	486,479	63.03
No Erosion	71,239	9.23
Not applicable	88,914	11.52
Total	**771,821**	**100**

The depth of the soil is estimated from the soil sample plots and is also based on all available information like exposed soil profiles on nallah banks, road cutting etc. and on luxuriance of vegetation. The different categories of soil depth are classified and recorded as, 'very shallow' if soil depth is less than 15 cm; 'shallow' if soil depth is 15 cm to 30 cm; 'medium' if soil depth is 30 cm and more but less than 90 cm; and 'deep' if soil depth is more than 90 cm.

Table 6.8 indicates that area under medium and deep categories of soil depth is about 66 per cent.

Table 6.8: Soil Depth in Forest Area

Soil Depth Class	Area (sq km)	Per cent of RFA
Deep	259,100	33.57
Medium	249,916	32.38
Shallow	135,686	17.58
Very Shallow	35,735	4.63
No Soil	3,550	0.46
Not applicable	87,833	11.38
Total	771,821	100

6.11 Rockiness

Rockiness means presence of rocky layers in the soil. Rockiness is related to soil depth. Where rockiness is more, the soil depth is less. Therefore, generally in rocky soils, crop density is less and vegetation is sparse. Rockiness is more in hills as compared to plains and valleys. The rockiness is decided on the basis of presence of rock covering the land surface in a two ha area around the plot center. Small pieces of broken stones, boulders and pebbles are not considered as rock. The various classes of rockiness are categorized and recorded as 'high' when more than 80 per cent area is covered by rock, 'medium' when 30-80 per cent area is covered by rock, 'low' when less than 30 per cent area is covered by rock and 'no rock' when rock is absent.

Table 6.9 reveals that the area under category 'low' and 'no rocks' is more than 75 per cent. The 'high' rocky area was found to be very less.

Table 6.9: Rockiness in Forest Area

Rockiness Class	Area (sq km)	Percent of RFA
High	14,510	1.88
Medium	104,273	13.51
Low	205,536	26.63
No rock	384,290	49.79
Not applicable	63,212	8.19
Total	771,821	100

6.12 Humus

Soil organic matter is an important constituent of soil. It consists of a whole series of organic products which range from un-decayed leaf litter, plant & animal tissues and perfectly decomposed plant & animal materials. The decomposed organic matter is usually referred as humus. Humus is a fairly stable amorphous, brownish black material derived from the decomposition of organic matter. Soil humus is very important for plant growth in number of ways. It supplies plant nutrients and improves most of the physical and chemical properties of soil. Humus is regarded as the life blood of soil mass.

The presence of humus is observed on land surface of two ha area around the plot centre and is measured after removing un-decomposed leaf litter. The different classes of humus are classified and recorded as, 'shallow' when the humus is less than 5cm thick, 'medium' when the thickness of humus layer is between 5cm-10cm, 'deep' when the thickness of humus layer is 10cm and more and 'no humus' when humus layer is absent. The following table reveals that the humus is present in about 54 percent area out of which 43 percent area in under shallow category. No humus is observed in 32.73 percent area.

Table 6.10: Presence of Humus in Forest Area

Humus Class	Area (sq km)	Per cent of RFA
Deep	14,356	1.86
Medium	73,863	9.57
Shallow	331,883	43.00
No humus	252,617	32.73
Not applicable	99,102	12.84
Total	**771,821**	**100**

6.13 Origin of Forest Stand

Forest Stand is an aggregation of tree or other growth, possessing sufficient uniformity in composition, constitution, age arrangement or condition, to be distinguished from adjacent crops and forming a silvicultural unit. The origin of stand may be 'natural' from seeds or of coppice origin or it may be raised artificially either by sowing or planting. This information indicates whether, the forest is natural or manmade. This information is important from the point of view of biodiversity conservation as well.

The origin of forest stand is observed on land surface of two ha area around the plot center and is classified and recorded as 'natural forest of seed origin', 'natural forest of coppice origin' or 'manmade forest'.

Table 6.11 reveals that about 76 per cent area is under 'natural forest' out of which 63 per cent is of 'seed origin'. The plantation forest constitutes only 6 per cent of area.

6.14 Crop Composition

The occurrence, structure, composition and morphology of vegetation differs from place to place. These functions are affected by a variety of factors e.g. climate, soil, succession etc. Broadly, the country has been classified into different floral regions

Table 6.11: Origin of Stand in Forest Area

Origin of Stand Class	Area (sq km)	Per cent of RFA
Natural forest of seed origin	488,949	63.35
Natural forest of coppice origin	97,558	12.64
Man made forest	48,316	6.26
Not applicable	136,998	17.75
Total	**771,821**	**100**

depending upon the similarity in occurrence of floristic composition. These regions are, Western Himalayas, Eastern Himalayas, Indus Plain, Gangetic plain, Central India, West coast Malabar, Deccan plateau, North-east India, Andamans and the Lakshadweep Islands.

'Crop composition' refers to the type of species or group of species which are contained in a forest. According to 'crop composition', forests may be classified in two types; pure forest in which a single particular species dominates and mixed forest composed of trees of two or more species intermingled in the same canopy.

Crop composition of the plot is recorded on the basis of predominance of a particular species which constitute more than 25 per cent of the area. There are 33 crop compositions which are identified and are recorded as per the crop composition found on land surface of two ha area around the plot centre.

Table 6.12: Crop Composition in Forest Area

Crop Composition	Description	Area (sq km)	Per cent of RFA	Mainly found in States/UTs
Fir	When Fir is predominant species and constitute more than 25 per cent	2,547	0.33	ArPr, HP, J&K, Si, UK, WB.
Spruce	Where Spruce is predominant species and constitute more than 25 per cent	849	0.11	HP, J&K, WB.
Fir spruce	Where Fir & Spruce both taken together are predominant species and constitute more than 25per cent	1,235	0.16	HP, J&K, UK.
Blue pine	Where Blue pine is predominant species and constitute more than 25 per cent	2,007	0.26	HP, J&K, UK.
Deodar	Where Deodar is predominant species and constitute more than 25 per cent	1,930	0.25	HP, J&K, UK.
Chir pine	Where Chir-pine is predominant species and constitute more than 25 per cent	14,356	1.86	HP, J&K, Pu, UK.
Mixed conifers	Where no single species is predominant and all conifers taken together constitute more than 50 per cent	3,010	0.39	ArPr, HP, J&K, Si, UK, WB.
Oak Rhododendron Forest	Where Oak and Rhododendron constitute 50 per cent of the crop with at least 15 per cent of minimum of each	6,792	0.88	ArPr, HP, J&K, Si, UK.

Crop Composition	Description	Area (sq km)	Per cent of RFA	Mainly found in States/UTs
Upland hardwoods	Broad leaved species constitute more than 50 per cent in the Upper /chir zone above 1500 metre altitude	8,799	1.14	AP, ArPr, D&N H, HP, J&K, Ka, Ke, Man, Me, Mi, Na, Si, TN, UK, WB
Teak	Where teak is predominant species and constitute more than 50 per cent	36,121	4.68	AP, As, Chh, D&N H, Go, Gu, Ka, Ke, MP, Mah, Man, Me, Od, Ra, TN, Tr, UP, WB
Sal	Where Sal is predominant species and constitute more than 50 per cent	44,611	5.78	AP, ArPr, As, Bi, Chh, Ha, HP, Jh, MP, Me, Od, Si, Tr, UP, UK, WB
Bamboo forest	Where bamboo is predominant and constitute more than 50 per cent	19,141	2.48	AP, ArPr, As, Bi, Chh, D&N H, Gu, Jh, Ka, MP, Man, Me, Mi, Na, Od, Ra, TN, Tr,
Mangrove	Mangrove forests	4,708	0.61	A&N, AP, D&D, Go, Gu, Ka, Ke, Mah, Od, Po, TN, WB.
Garjan forest	Where Garjan is predominant species and constitute more than 50 per cent in the top canopy	1,466	0.19	A&N, As.
Garjan with miscellaneous	Where Garjan constitute at least 25 per cent alongwith misc. species	3,628	0.47	A&N, As, Tr.
Khasi pine	Where Khasi pine is predominant species and constitute more than 25 per cent	772	0.1	As, Me, Mi.
Khair forest	Where Khair trees are predominant and constitute more than 25 per cent	8,181	1.06	AP, Bi, Gu, Ha, HP, J&K, Jh, MP, Pu, Ra, UP, UK.
Salai forest	Where salai is predominant species and constitute more than 25 per cent	3,782	0.49	AP, Gu, MP, Mah, Od, UP.
Alpine pastures	Alpine pastures/Alpine scrub	232	0.03	ArPr, HP, J&K, Si, UK, WB.
Teak with miscellaneous	Occurence of teak over 25 per cent and less than 50 per cent	32,648	4.23	AP, Chh, D&N H, Go, Gu, Ka, Ke, MP, Mah, Mi, Ra, TN, Tr, UP, WB
Sal with miscellaneous	Occurence of Sal over 25 per cent and less than 50 per cent	19,836	2.57	AP, Bi, Chh, D&D, Ha, HP, Jh, MP, Mi, Od, Tr, UP, WB.

Crop Composition	Description	Area (sq km)	Per cent of RFA	Mainly found in States/UTs
Bamboo with Misc. (Mixed bamboo)	Bamboo predominant and not less than 25 per cent	7,332	0.95	AP, ArPr, As, Chh, D&N H, Go, Gu, HP, J&K, Jh, Ka, Ke, MP, Man, Mah, Mi, Na,Od, Pu, Ra, TN, Tr, UP.
Teak mixed with bamboo	Teak and Bamboo together constitute over 50 per cent with each constituting at least 15 per cent	617	0.08	AP, Chh, D&N H, Gu, Ke, TN, Tr.
Salai with miscellaneous	Salai 20-50 per cent	4,708	0.61	AP, Bi, Chh, Gu, Jh, MP, Ma, Od, Ra.
Anogeissus Pendula	Where Anogeissus is predominant species and forms more than 25 per cent of the crop	5,789	0.75	Gu, MP, Ra.
Teak mixed with Sal	Together they constitute more than 50 per cent with at least 15 per cent of each	154	0.02	UP, WB.
Conifers mixed with hardwoods	Where the conifers constitute at least 50 per cent and no single species is predominant	5,171	0.67	ArPr, Ha, HP, J&K, Man, Me, Mi, Na, Pu, Si, UK, WB.
Khair and Shisham	Both constituting over 50 per cent with at least 15 per cent of each	617	0.08	Ha, HP, J&K, Pu, UP, UK.
Oaks	Where Oak/Kharsu Oak/Ban Oak individually or together constitute more than 50 per cent of the crop	6,406	0.83	HP, J&K, UK.
Low land hardwood	Where low land hard woods i.e. miscell-aneous broad leaved spp. constitute more than 50per cent of the crop (At altitudes between 1500-500 mts)	43,917	5.69	AP, ArPr, As,Bi, Cha, Chh, D&N H, Gu, Ha, HP, J&K,Jh, Ka, Ke, MP, Mah, Man,Me,Mi, Na, Od, Po, Si, TN, UK, WB.
Miscellaneous forest	Forest which could not be classified in any of the classes	321,772	41.69	All States & UTs
Eucalyptus	Where Eucalyptus is predominant species and constitute more than 50 per cent of the crop		negligible	-
Eucalyptus with miscellaneous	Occurrence of Eucalyptus over 25 per cent and less than 50 per cent of the crop	77	0.01	Ha, Pu, UP.
Not applicable		158,609	20.55	
Total		**771,821**	**100**	

AP: Andhra Pradesh, ArPr: Arunachal Pradesh, A: Assam, Bi: Bihar, Chh,: Chhattisgarh, GO: Goa, Gu: Gujarat, Ha: Haryana, HP: Himachal Pradesh, J&K: Jammu & Kashmir, Jh: Jharkhand, Ka: Karnataka, Ke: Kerala, MP: Madhya Pradesh, Mah: Maharashtra, Man: Manipur, Me: Meghalaya, Mi: Mizoram, Na: Nagaland, Od: Odisha, Pu: Punjab, Ra: Rajasthan, Si: Sikkim, TN:Tamil Nadu, Tr: Tripura, UP: Uttar Pradesh, UK: Uttarakhand, WB: West Bengal, A&N: A&N Islands, Cha: Chandigarh, D&N: Dadra & Nagar Haveli, D&D: Daman & Diu, Po: Puducherry

The following table reveals that 41.68 per cent area falls under miscellaneous (mixed) forests followed by Sal (5.78 percent), Lowland hardwood (5.69 percent), Teak (4.68 percent) and Teak with misc species (4.23 percent).

6.15 Bamboo Density

Bamboo belongs to the grass family *Poaceae* (Gramineae). In India, there are 125 indigenous and 11 exotic species of bamboos belonging to 23 genera. As per the FAO report on world forest resources, India is second richest country of the world after China in terms of bamboo genetic resources. Bamboo is an important non-wood forest resource found in forest as well as non-forest areas in the country. It is a fast growing, wide spread, renewable, versatile, low cost natural resource. Due to its multiple utility and accessibility to common man, it is also known as poor man's timber.

The bamboo data is observed on land surface of two ha area around the plot center. The presence of bamboo is recorded in nine classes depending upon the number of clumps per hectare for clump forming

bamboo species and number of culms per hectare for non-clump forming species. It is categorized as 'pure bamboo', 'very dense', 'dense', 'moderately dense', 'scattered', 'sparse' and 'no bamboo' depending on number of clumps/ha or number of culms/ha as the case may be. Table 6.13 reveals that 70 per cent of recorded forest area does not have any bamboo. About 7 per cent area has good bamboo density (Pure, Very Dense, Dense and Moderate Bamboo). The regeneration crop of bamboo was observed in two per cent area. The details of classes is given in Annexure-IV.

6.16 Bamboo Quality

For determining the bamboo production capacity of a site, bamboo areas are classified into bamboo-site-quality classes. The main criterion taken for determining the quality of bamboo is height of culms and recorded as 'Site Class I' if average culm height is nine metre or more for *Dendrocalamus strictus* and 14 metre or more for *Bambusa arundinacea*, 'Site Class II' if average culm height is six metre or more but less than nine metre for *Dendrocalamus strictus* and 10 metre or more but less than 14 metre for *Bambusa*

Table 6.13: Bamboo Density in Forest Area		
Bamboo Density Class	Area (sq km)	Per cent of RFA
Pure	1,235	0.16
Very Dense	13,893	1.80
Dense	14,510	1.88
Moderately Dense	23,926	3.10
Scattered	29,561	3.83
Sparse	32,185	4.17
Bamboo present but hacked	9,571	1.24
No bamboo	542,127	70.24
Regeneration crop	16,208	2.10
Not applicable	88,605	11.48
Total	**771,821**	**100.00**

Table 6.14: Bamboo Quality in Forest Area

Bamboo Quality Class	Area (sq km)	Per cent of RFA
Site Class I	38,977	5.05
Site Class II	48,007	6.22
Site Class III	31,027	4.02
Site Class IV	18,987	2.46
Not applicable	634,823	82.25
Total	771,821	100.00

arundinacea, 'Site Class III' if average culm height is two metre or more but less than six metre for *Dendrocalamus strictus* and two metre or more but less than 10 metre for *Bambusa arundinacea* and 'Site Class IV' if bamboo is present and not following in any of the above classes.

Table 6.14 indicates that the area under site quality I, II, III and IV are five per cent, six percent, four percent and two per cent respectively of the RFA.

6.17 Plantation Potential

'Plantation potential' refers to the suitability of the area for tree planting. The plantation potential of an area depends upon several factors such as accessibility of the area, presence of proper seed bed, soil conditions, presence of biotic interference, and climatic factors like temperature range, rainfall distribution, etc.

The plantation potential for those forests where the crown density is 40 percent or more is of no significance because there is hardly any possibility of further plantation. In all other cases the land class to which the sample plot belongs is studied and its potential for supporting tree growth is looked into. Due consideration is also given to aspect, soil depth (more than 20cm), slope (less than 40^0), drainage, crop in the surrounding area, and other biotic and climatic factors. The area around the plot is classified and recorded as plantable, non-plantable and not applicable as the case may be.

6.18 Size Class

In General, forests bear trees of different sizes. They can be characterized by the average size of the trees found within them which is known as size class. Traditionally, the size class of the trees in the forest was to decide forest's readiness for timber harvest for the indented forest products that the timber harvest would yield. With the change in functionality of forests from production of timber to conservation, more so in Indian context, the size class is interpreted from ecological angle. Size class is also useful to describe the forest's use for wildlife. Some wildlife prefers

Table 6.15: Plantation Potential in Forest Area

Plantation Potential Class	Area (sq km)	Per cent of RFA
Plantable	194,422	25.19
Non-plantable	34,578	4.48
Not applicable	542,822	70.33
Total	771,821	100

Table 6.16: Size Class in Forest Area

Size Class	Area (sq km)	Per cent of RFA
Regeneration	105,431	13.66
Pole crop	209,163	27.10
Small timber	93,390	12.10
Big timber	58,813	7.62
Mixed size Class	163,009	21.12
Not applicable	142,015	18.40
Total	**771,821**	**100.00**

large size class forests while others prefer open or shrub forests.

Size class refers to average diameter class or girth class of trees. A crop is classified as, 'regeneration' if crop is predominantly below 10 cm dbh; 'pole crop' if it is 10 cm and above but less than 20 cm dbh; 'small timber' if crop is mainly 20 cm and above but less than 30 cm dbh; 'big timber' if crop of trees with diameter 30 cm and above and 'mixed size' class if tree crop does not have any marked domination of any particular size class.

The estimate for different categories of size class is given in the Table 6.16 which suggests that about 53 per cent area has either regeneration or pole or small timber crop. Only 7.62 per cent area has crop under big timber.

6.19 Biotic Influence

Biotic influence means "the influence of living organisms" on forest ecosystem. It is not only by their interaction with the surroundings but also through their effect on soil thereby largely determining the nature of vegetation occurring in a place.

The biotic influence is observed on land surface of two ha area around the plot centre and recorded as 'heavy' if more than 50 per cent area/crop is affected by the biotic influence, 'moderate' if 10-50 per cent area/crop is affected by the biotic influence; 'mild' if less than 10 per cent area/crop is affected by the biotic influence.

Table 6.17 provides estimates of different categories of biotic influence. It is revealed that only 13.28 per cent area does not have any biotic influence.

Table 6.17: Biotic Influence in Forest Area

Biotic Influence Class	Area (sq km)	Per cent of RFA
Heavy	85,286	11.05
Moderate	156,139	20.23
Mild	334,198	43.30
No biotic influence	102,498	13.28
Not applicable	93,699	12.14
Total	**771,821**	**100.00**