



Forestry Department

Food and Agriculture Organization of the United Nations

BRIEF ON NATIONAL FOREST INVENTORY NFI

INDIA

Forest Resources Development Service

Rome, June 2007



Strengthening Monitoring, Assessment and Reporting (MAR) on Sustainable Forest Management (SFM)

FAO initiated activities to strengthen Monitoring, Assessment and Reporting on Sustainable Forest Management in January 2006 with the objective to facilitate development of harmonized forest related national monitoring, assessment and reporting (MAR) for contributing directly to the improvement of national sustainable forest management (SFM) regimes. It also aims to catalyze national discussions, analyses, policy actions and planning that promote national SFM regimes besides clarifying the contribution of forests to global environment and to human well-being. This initiative shares the ambition of the Collaborative Partnership on Forests (CPF) about simple, harmonised, efficient and action oriented MAR systems both at international and national levels and thus provides a response to some of the key recommendations made by the CPF task force on streamlining the reporting on forests with particular focus on national capacity building.

The MAR initiative has recently updated goals include country capacity building for better, consistent and regularly updated information to facilitate implementation of non-legally binding instrument (NLBI) on SFM, adopted at UNFF 6 (2007) that aims to,

- Strengthen political commitment and action at all levels to implement effectively sustainable management of all types of forests and to achieve the shared four global objectives ((a) reverse the loss of forest cover worldwide, (b) enhance forest-based economic, social and environmental benefits, (c) increase significantly the area of protected forests worldwide, and (d) reverse the decline in official development assistance for SFM;
- Enhance the contribution of forests to the achievement of the internationally agreed development goals, including the Millennium Development Goals, in particular with respect to poverty eradication and environmental sustainability; and
- Provide a framework for national action and international cooperation.

All countries can participate in this initiative, although the actual level and intensity of their involvement may vary among them. The initiative is organized under the Forest Resources Development Service (FOMR) of FAO Forestry Department. The contact persons are:

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The MAR-SFM Working Paper Series is designed to reflect the activities and progress of the MAR on SFM programme of FAO. Working Papers are not authoritative information sources – they *do not* reflect the official position of FAO and should not be used for official purposes. Please refer to the FAO forestry website (www.fao.org/forestry) for access to official information.

The MAR-SFM Working Paper Series provides an important forum for the rapid release of preliminary findings needed for validation and to facilitate the final development of official quality-controlled publications. Should users find any errors in the documents or have comments for improving their quality they should contact Kailash.Govil@fao.org or Dan.Altrell@fao.org.

Brief Note on MAR-SFM Working Paper Series (AP) on NFI- Brief

The NFI – Brief for a country attempts to provide a bird’s eye view of the National Forest inventories (NFI). However, some countries conduct forest inventories at sub-national and or field management unit level. Therefore, this brief presents brief information on the forest inventories in a country at national level, sub-national level and or field management level depending on the available information.

It is useful to regularly update our understanding of elements and specifications of forest inventories because the information generated by forest inventories is simply manifestation of its span, design and methods to collect and analyse the primary information during its implementation. This is important because the NFI provides information on the state and trends of forest resources, their goods and services, and other related variables that support. It also defines the policy and trade decisions, science and field initiatives, national and international reporting, and direct and indirect contribution of forests to society like poverty alleviation. Regular updates are necessary because countries do change the set of elements, their specifications, designs and methods over period of time to address new emerging demands and to take advantage of new technologies.

The purpose of developing the NFI-briefs is, therefore, to document (working paper) the current and historical span of elements (variables or fields), their specifications, sampling designs and methods used in NFI. The document may serve as data source as well as reference material.

These briefs have been initially developed on the basis of the country submission to FAO. The initial draft of this report was sent to following national focal point for review and country validation before its finalisation.

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B. Compilation and Supervision

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General Information

India is a sovereign country in South Asia. It is the seventh-largest country by geographical area, the second most populous country, and the most populous democracy in the world. Bounded by the Indian Ocean on the south, the Arabian Sea on the west, and the Bay of Bengal on the east, India has a coastline of over 7500 kilometres. It borders Pakistan to the west, China, Nepal, and Bhutan to the north-east and Bangladesh and Myanmar to the east. In the Indian Ocean, India is in the vicinity of Sri Lanka, Maldives, and Indonesia. The capital of India is New Delhi while the largest city is Mumbai.

Map of the Country



Figure 1. Map of India

(Source: <https://www.cia.gov/library/publications/the-world-factbook/geos/bg.html>)

Land Area and Landuse

The total area of India is 3 287 260 square km and the following table presents the categorisation and projection of land use in India for 1990, 2000 and 2005 (FRA 2005).

Table 1. Categorisation and projection of land use in India (FRA 2005).

FRA 2005 Categories	Area (1000 hectares)		
	1990	2000	2005
Forest	63 939	67 554	67 701
Other wooded land	5 894	4 732	4 110
Other land	227 486	225 033	225 508
Other land of which with tree cover	815	815	815
Inland water bodies	31 407	31 407	31 407
TOTAL	328 726	328 726	328 726

Forests

India is endowed with forest resources rich in diverse flora and fauna. Forest area is estimated to cover 67.7 million ha constituting 20 percent of the total area. Madhya Pradesh accounts for the largest forest cover of the country (20 percent) followed by Arunachal Pradesh (10.8), Orissa (7.3), Maharashtra (7.3) and Andhra Pradesh (6.9). The seven North-Eastern states together comprise 25.7 percent of the total forest cover.

Forest types vary from Tropical Rain Forest in north-eastern India, Western Ghats and Andaman and Nicobar Islands to Desert and Thorn Forests in Gujarat and Rajasthan, Rich mangrove Forests in West Bengal, Orissa, Andhra Pradesh and Andaman and Nicobar Islands to Dry Alpine Forests in Western Himalayas.

From the functional point of view (see table 2), it is estimated that approximately 10 million hectares of forests are managed as Protection Forests for the protection of catchments, conservation of soil in eco-fragile areas and other reasons, while 14.6 million hectares are maintained as Protected Areas for conservation of biodiversity. Over 14 million hectares are managed as production forests to meet demands of forest products for industries, railways and defence, while nearly 29 million hectares are used for meeting multiple needs of people in general and tribal and rural poor.

Table 2. Designated function of forests in India

FRA 2005 Categories / Designated function	Area (1000 ha.)		
	1990	2000	2005
Production	16 260	14 678	14 336
Protection of soil and water	10 000	10 000	10 000
Conservation of biodiversity	12 740	14 322	14 664
Social services			
Multiple purpose	24 939	28 554	28 701
No or unknown function			
Total forest	63 939	67 554	67 701

Forests are not distributed evenly in India: they are concentrated in Northeast, the Himalayas and Shiwalik Ranges, the Central Belt, Andaman and Nicobar Islands, strips along Western Ghats, Eastern Ghats and other hilly areas, and in patches of coastal mangroves (see figure 3). India has also a large network of Protected Areas for in-situ conservation on wild flora and fauna. At present there are 80 National Parks and 441 wildlife sanctuaries covering about 148,849 sq. km area.

With regard to canopy cover, forest area is classified as Very Dense Forest (VDF: >70 percent crown density), Moderately Dense Forest (MDF: 40-70 percent crown density) and Open Forest (OF: 10-40 percent crown density). Non-forest cover includes Scrub and non-forest area (see figure 2) below. According to the latest State of Forest Report (2003) the forest area of India is composed as outlined in Table 3, indicating that half of the forest resource is moderately dense.

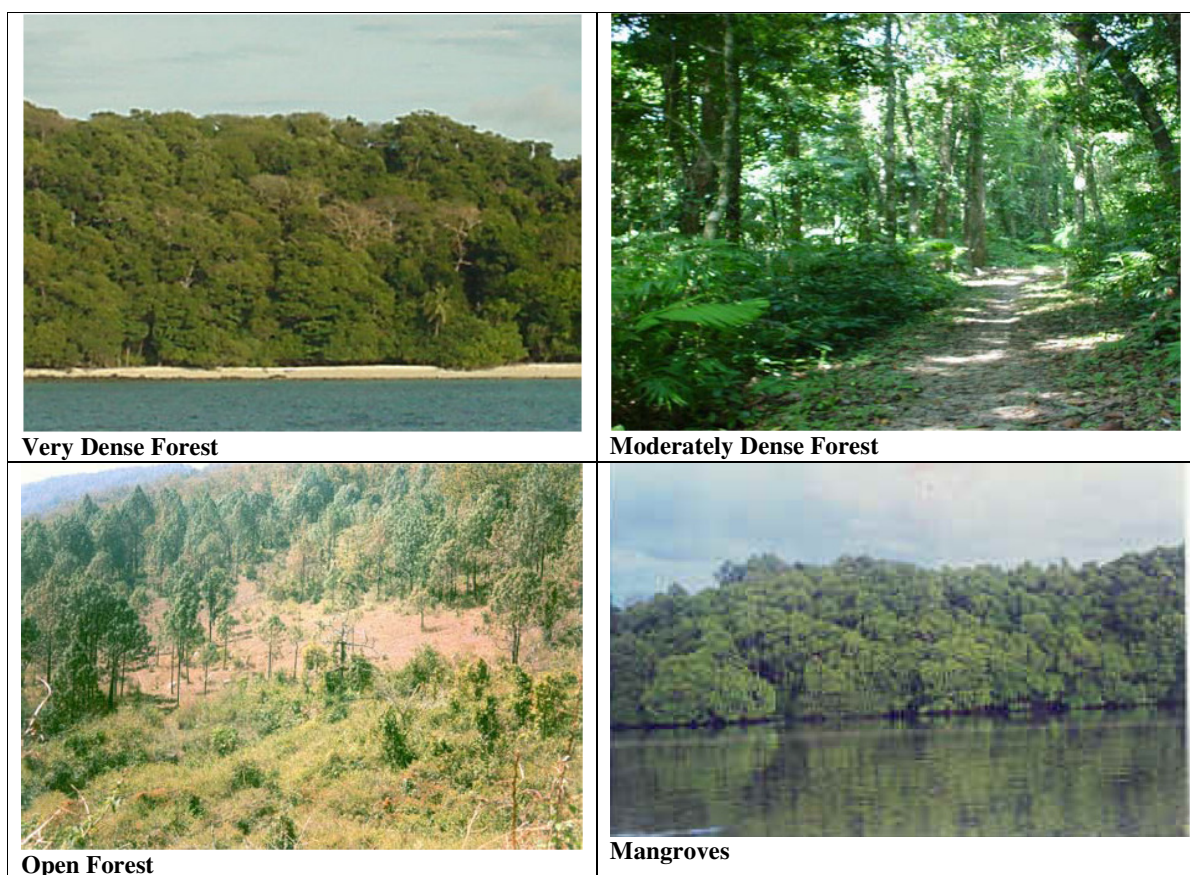


Figure 2. Images of Forest classes based on canopy density

Table 3. Status of Forest Cover in India

Class	Area (Km ²)	Percent of geographic area
Forest Cover		
a) VDF	51 285	1.56
b) MDF	339 279	10.32
c) Open	287 769	8.76
Total forest cover*	678 333	20.64
Non-forest cover		
Scrub	40 269	1.23
Non-forest**	2 568 661	78.13
Total Area	3 287 263	100

* Including 4,461 Km² of Mangroves (0.14% of geographical area)

** Excludes scrubs and includes water bodies

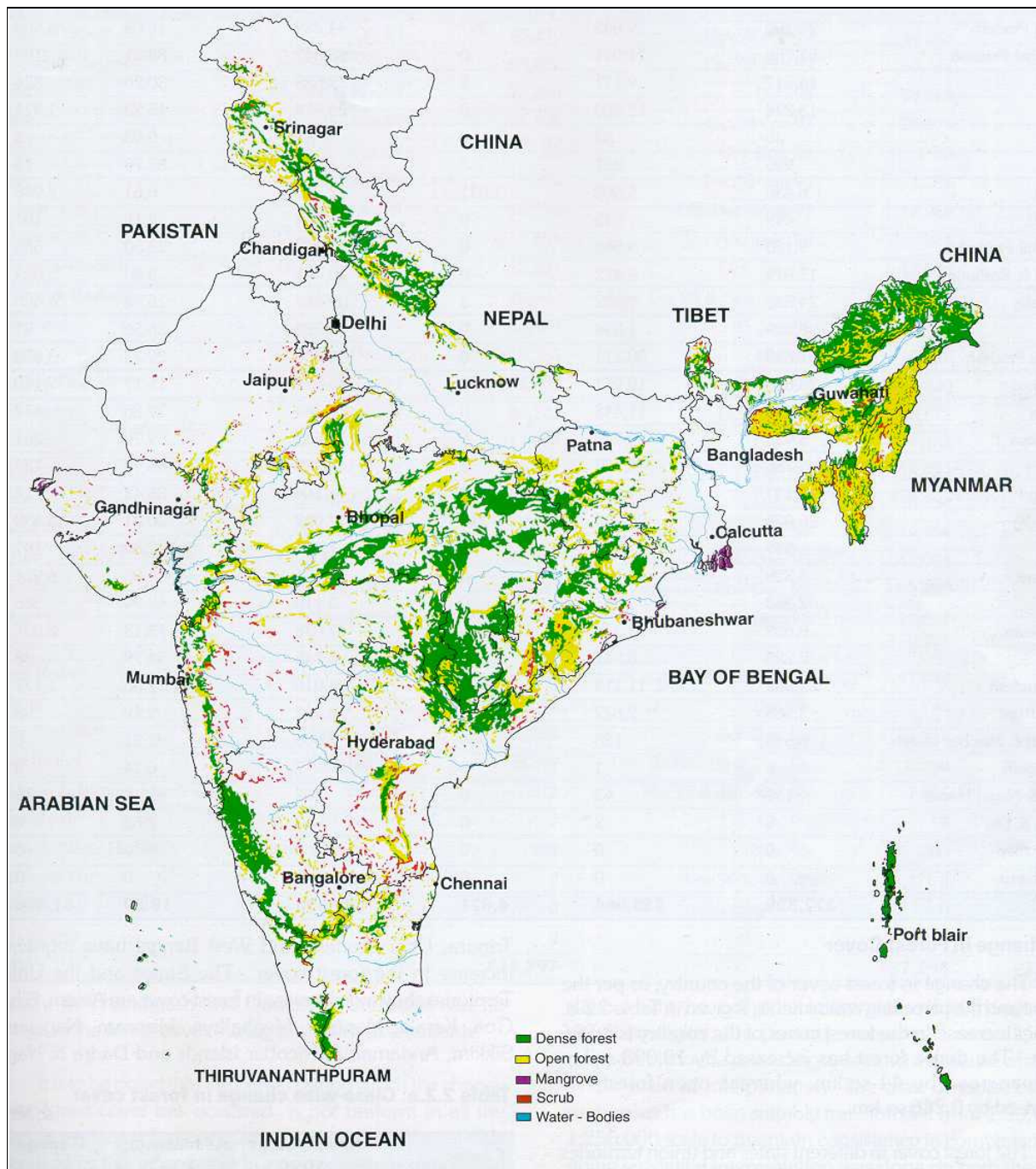


Figure 3. Forest Cover of India

Brief History of Forest Inventories

Forest Survey of India (FSI) has been conducting national assessments of forest resources since 1965. FSI initially used aerial photographs and ground inventory to assess forest resources then, in the early eighties, remote sensing satellite data have also been utilized.

Today, information of forest resources over the last five decades are generally obtainable from three different sources: (i) year-wise land use statistics compiled by the Ministry of Agriculture which is based on revenue records (ii) information on forest area based on legal status of land compiled from State Forest Departments and (iii) assessments of forest cover using modern technologies of remote sensing.

Since 1986, FSI has been assessing forest cover on a two year cycle and is releasing the findings to the public through its “State of Forest Report” (SFR). Each successive assessment has made improvements in methodology, resolution and techniques of interpretation, for example the interpretation for the last two assessments (SFR 2001 and 2003) were totally digital and implemented at scale of 1:50,000. The first seven SFRs (1987 to 1999) gave information of only forest cover while SFR 2001 provided information of forest cover as well as tree cover. The extent of forest and tree cover estimated in all the States and Union Territories (UT) of the country during the previous eight assessments is reported in Table 5 while a summary of previous inventories is presented in table 6. In addition to information on forest cover, FSI also has conducted special studies to provide information on the growing stock of forests, tree cover (trees outside forests), and pilot studies.

Table 5. Forest and Tree Cover in Different Assessments (1987 to 2001) (km2)

	1987	1989	1991	1993	1995	1997	1999	2001	
State/UT	Forest Cover	Forest Cover	Forest Cover	Forest Cover	Forest Cover	Forest Cover	Forest Cover	Forest Cover	Forest & Tree cover
Andhra Pradesh	49,573	47,290	47,290	47,256	47,112	43,290	44,229	44,637	53,648
Arunachal Pradesh	64,132	69,002	68,757	68,661	68,621	68,602	68,847	68,045	68,523
Assam	25,160	24,832	24,751	24,508	24,061	23,824	23,688	27,714	29,656
Bihar	28,482	26,668	26,668	26,587	26,561	4,832	4,830	5,720	9,413
Jharkhand	-	-	-	-	-	21,692	21,644	22,637	25,331
Delhi	15	22	22	22	26	26	88	111	151
Goa	1,240	1,255	1,255	1,250	1,250	1,252	1,251	2,095	2,157
Gujarat	11,991	11,921	11,907	12,044	12,320	12,578	12,965	15,152	19,188
Haryana	513	513	513	513	603	604	964	1,754	3,280
Himachal Pradesh	12,480	12,480	12,480	12,502	12,501	12,521	13,082	14,360	14,757
Jammu & Kashmir	20,905	20,449	20,449	20,443	20,433	20,440	20,441	21,237	23,454
Karnataka	32,268	32,104	32,199	32,343	32,382	32,403	32,467	36,991	44,437
Kerala	10,292	10,292	10,292	10,336	10,336	10,334	10,323	15,560	16,706
Madhya Pradesh	130,099	135,541	135,541	135,396	135,164	74,760	75,137	77,265	83,016
Chhattisgarh	-	-	-	-	-	56,435	56,693	56,448	59,983
Maharashtra	45,616	44,044	44,044	43,859	43,843	46,143	46,672	47,482	55,751
Manipur	17,475	17,685	17,685	17,621	17,558	17,418	17,384	16,926	17,021
Meghalaya	16,466	15,645	15,875	15,769	15,714	15,657	15,633	15,584	15,724
Mizoram	19,084	18,170	18,853	18,697	18,576	18,775	18,338	17,494	17,589
Nagaland	14,394	14,399	14,321	14,348	14,291	14,221	14,164	13,345	13,415
Orissa	53,253	47,227	47,205	47,145	47,107	46,941	47,033	48,838	53,202
Punjab	943	1,338	1,343	1,343	1,342	1,387	1,412	2,432	4,066
Rajasthan	12,758	12,884	12,889	13,099	13,280	13,353	13,871	16,367	21,653
Sikkim	2,756	3,041	3,041	3,119	3,127	3,129	3,118	3,193	3,207
Tamil Nadu	17,472	16,992	16,992	17,005	17,045	17,064	17,078	21,482	27,536
Tripura	5,953	5,535	5,535	5,538	5,538	5,546	5,745	7,065	7,133
Uttar Pradesh	31,226	33,627	33,609	33,961	33,986	10,751	10,756	13,746	21,291
Uttaranchal	-	-	-	-	-	23,243	23,260	23,938	24,386
West Bengal	8,432	8,015	8,015	8,186	8,276	8,349	8,362	10,693	13,957
A & N Islands	7,601	7,622	7,622	7,624	7,615	7,613	7,606	6,930	7,013
Chandigarh	2	5	5	5	7	7	7	9	11
Dadra & N. Haveli	238	206	206	206	204	204	202	219	246
Daman & Diu	0	0	0	0	0	0	0	6	10
Lakshdweep	0	0	0	0	0	0	0	27	27
Pondicherry	0	0	0	0	0	0	0	36	71
Grand Total	640,819	638,804	639,364	639,386	638,879	633,397	637,293	675,538	757,009
Percent	19.49	19.43	19.45	19.45	19.43	19.27	19.39	20.55	23.03

Table 6. History of Assessments

Publication Year ¹	Title ²	Institution ³	Ground Inv. Year(s) ⁴	Remote Sensing		Estimation Level ⁷	Country Coverage (Full/Partial, %) ⁸	Thematic cover ^{**}
				Data Year(s) ⁵	Scale of Interpretation ⁶			
1987	State of Forest Report	Forest Survey of India		1981-83	1:1 million			
1989	State of Forest Report	Forest Survey of India		1985-87	1:250000			
1991	Report on Forest Resources Survey (Manipur State)	Forest Survey of India			1:250000	states, group of districts		NF, TV, FO, FF
1991	State of Forest Report	Forest Survey of India		1987-89	1:250000			
1993	State of Forest Report	Forest Survey of India		1989-91	1:250000			
1995	State of Forest Report	Forest Survey of India		1991-93	1:250000			
1996	Report on Forest Resources Survey (Sambalpur District of Orissa State)	Forest Survey of India			1:250000	district	full	NF, TB, FO, FF
1997	State of Forest Report	Forest Survey of India		1993-95	1:250000			
1999	State of Forest Report	Forest Survey of India		1996-98	1:250000			
2001	State of Forest Report	Forest Survey of India		2000	1:50000			
2003	State of Forest Report	Forest Survey of India		2022	1:50000			

****Legend:** **NF**=Natural Forest; **PL**=Plantations; **OWL**=Other Wooded land; **FAC**=Forest Area Change; **TV**=Total Volume; **TB**=Total Biomass; **CV**=Commercial Value; **PA**=Protected Areas; **BD**=Biodiversity; **FO**=Forest Ownership; **WSP**=Wood Supply Potential; **NWGS**=Non-wood Goods and services; **TOF**=Trees outside of forest; **FF**=Forest Fires

Legend:

[1] Publication Year	Year in which the assessment was published
[2] Title	Title of the assessment
[3] Institution	Institution(s) responsible for the Assessment
[4] Ground Inventory Year(s)	Year or Interval of years during which the field inventory has been carried out
[5] Remote Sensing Data Year(s)	Year(s) of the Remote Sensing Images
[6] Remote Sensing Scale of Interpretation	Scale of Remote Sensing Images (e.g. 1:250,000)
[7] Estimation Level	Whether the Assessment was at National, Sub-national, District, Management Unit, etc. level
[8] Country Coverage (Full / Partial, %)	Amount of country area covered by the assessment (e.g. full, partial). If partial, indicated by % of total area.

National Forest Inventory Design

Forest Survey of India (FSI) has been conducting field inventory for estimating the growing stock (volume) and other parameters of the forests by laying out systematic sample plots since 1965. So far about 80 percent of the country's forest areas have been inventoried including some areas more than once and about 140 reports have been published. During the Five Year Plan (2002-2007), FSI conducted field inventory of forest resources inside and outside forest including vegetation survey and estimation of soil carbon in forest.

Remote Sensing

The utilization of remote sensing has evolved in time following technological improvements. For the first assessment (SFR 1987) the satellite data were interpreted visually at a scale of 1:1 million. The subsequent assessments, until 1999, were based on visual interpretation of satellite data at a scale of 1:250,000 while SFR 2001 was based on digital interpretation of satellite data at 1:50,000 scale. A summary of satellites, sensors and data properties used for various forest cover assessments carried out so far, is presented in Table 7.

Table 7. Satellite data for forest cover assessment from 1987 to 2003

Assessment Year	Data Period	Sensor	Data Form	Spatial Resolution	Spectral Resolution	Scale of Interpretation
1987	1981-83	Landsat – MSS	Hard Copy FCC	80 m	4 Bands	1:1 million
1989	1985-87	Landsat- MSS	Hard Copy FCC	30 m	7 Bands	1:250000
1991	1987-89	Landsat - MSS	Hard Copy FCC	30 m	7 Bands	1:250000
1993	1989-91	Landsat - MSS	Hard Copy FCC	30 m	7 Bands	1:250000
1995	1991-93	IRS-1B LISS II	Hard Copy FCC & Digital	36.25 m	4 Bands	1:250000
1997	1993-95	IRS-1B LISS II	Hard Copy FCC & Digital	36.25 m	4 Bands	1:250000
1999	1996-98	IRS-1C/1D LISS III	Hard Copy FCC & Digital	23.5 m	4 Bands	1:250000
2001	2000	IRS-1C/1D LISS III	Digital	23.5 m	4 Bands	1:50000
2003	2002	IRS-1D LISS III	Digital	23.5 m	4 Bands	1:50000

Source: Forest Survey of India - State of Forest Report 2003

Survey Design

Each 1:50,000 scale Survey of India topo-sheet is divided into 36 grids of $2\frac{1}{2}' \times 2\frac{1}{2}'$, and each one is further divided into 4 sub-grids of $1\frac{1}{4}' \times 1\frac{1}{4}'$ forming the basic sampling units. Two of these sub grids are randomly selected and the corresponding sub grids in all the $2\frac{1}{2}' \times 2\frac{1}{2}'$ grids are selected to form the sample. The intersection of diagonals of such sub grid is marked as centre of plot on the map. At the centre of selected sub grid a plot of 0.1 ha area is laid out in each such grid and data is collected from the plots falling in forest area only.

Field Inventory

Layout of field plot

The plot centre, reached after covering the desired distance and bearing from the reference point, represents the centre of the 0.1 ha. plot (the point of intersection of two diagonals: NE to SW and NW to SE). The length of each diagonal measures 44.72 m. After fixing the plot centre, the four corners of the plots are also fixed (NE at 45^0 , SE at 135^0 , SW at 225^0 , NW at 315^0) by measuring 22.36 m. horizontal distance (half of the diagonal, as shown in figure 4).

Within the 0.1 ha plot, sub plots of 1m x 1m are laid out at each corner for collecting data on soil, forest floor (humus and litter carbon). Data regarding herbs and shrubs (including regeneration) are collected from four square plots of 1m x 1m and 3m x 3m respectively. These plots are laid out 50 meters from the centre of 0.1 ha plot in all four directions along diagonals in non-hilly area and along trails in hilly areas. In the case of hilly areas the plot is taken randomly 2-10 meters away either side of the trail (see Figures 5 and 6).

Measurements

Measurements carried out in the field are recorded by means of a number of field forms which are listed in the table below. A selection of these forms is also included as annexes in this report.

Table 8. List of data collection forms

Field Form No.	Item
1.	Plot Approach Form
2.	Plot Description Form
3.	Plot Enumeration Form
4.	Sample Tree Form
5.	Bamboo Clump Analysis Form
6.	Bamboo Enumeration and Analysis Form (non-clump forming)
7.	Bamboo Weight Form
8.	Herbs, Shrubs and Regeneration Form
9.	Soil and Forest Floor Carbon Form and Soil and Forest Floor Sample Card
10.	Special study for volume utility classes.

The plot description form is intended to record information at plot level including administrative and mapping references and land use classes. Topography, slope, altitude, soil data and canopy closure are also recorded at this level (refer to Annex 1 for details).

In the plot enumeration form data of trees and bamboo clumps are recorded. Trees below 10 cm. diameter at breast height over bark and dead trees of having utility less than 70 % are not enumerated. For each valid tree the following is recorded: Species Name, Species Code and Dbh. The diameter of trees is measured at a height of 1.37 metres from ground level

measuring on up hill side of the tree and recorded to the nearest centimetre (see Annex 2 for details).

The data of trees of 10 cm. and above standing in the 1/4th area of the total plot (0.025 ha.) are measured as sample trees. Data is collected from the North quadrant of the plot. The Sample Tree Form (see annex 3) is used to record additional tree measurements including crown cover and height.

Different forms are used for clumping and not-clumping bamboo (annexes 4 and 5) while data on herbs (usually not exceeding 1m in height with soft stem) and shrubs (usually not exceeding 3m in height with woody stem) are recorded in a separate form (see annex 6). Finally, soil data is also recorded separately. A full detailed explanation of the measurements and field methodologies utilized is available in the “Manual of Instructions for Field Inventory-2002” specifically designed for the training of inventory crews.

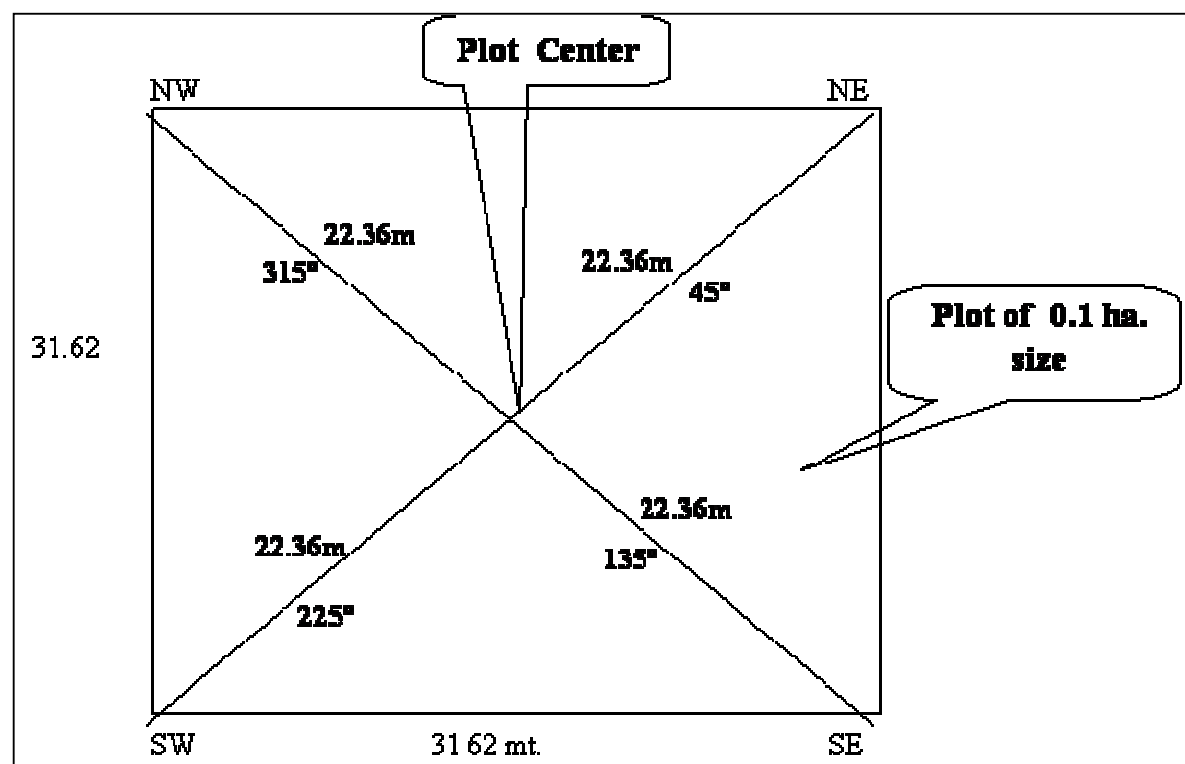


Figure 4. Layout of plot in the field

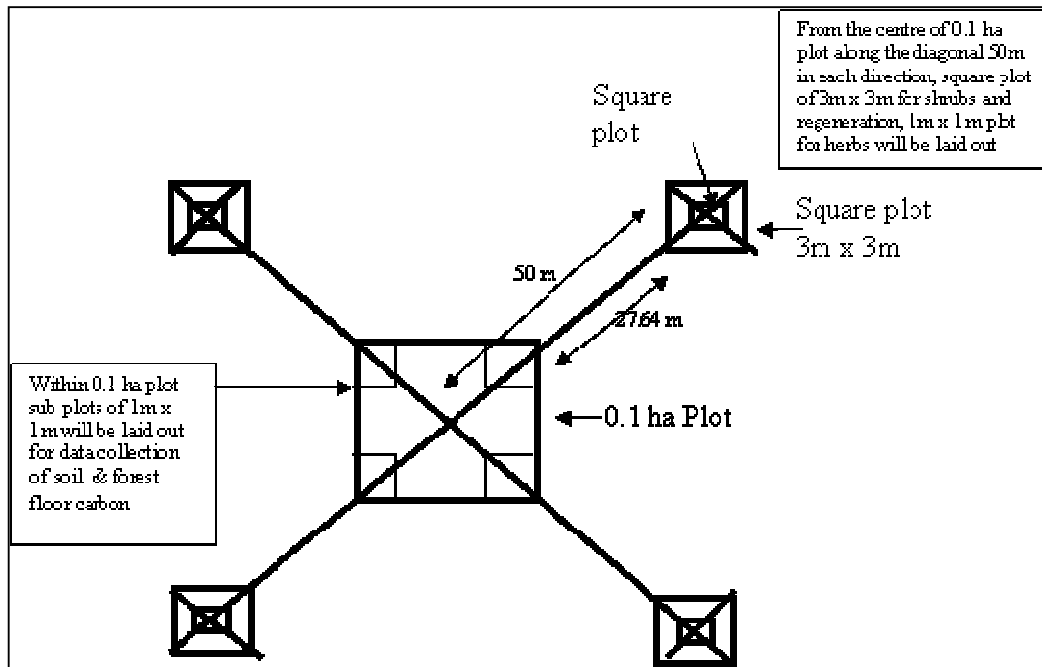


Figure 5. Delineation of plots and sub-plots in the Non-hilly area

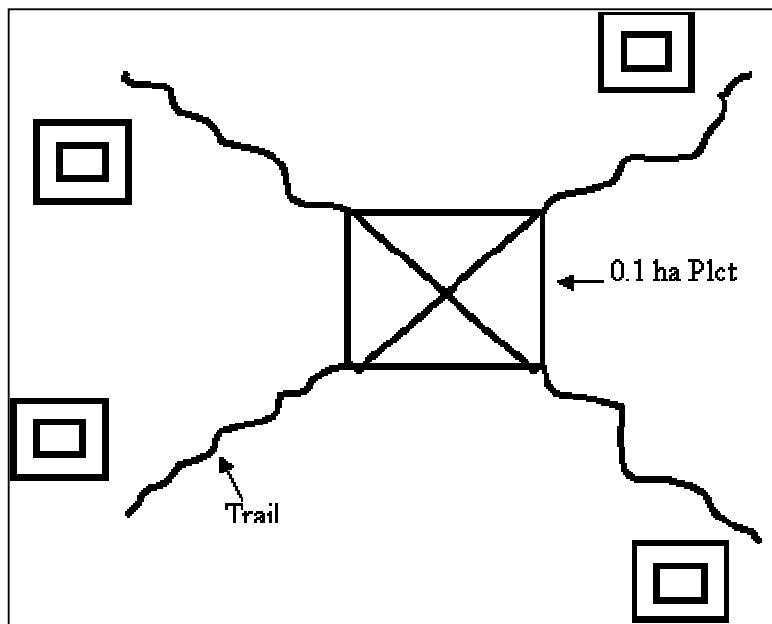


Figure 6. Delineation of plots and sub-plots in the Hilly area

Content and Methodology of data collection in NFI

Geo-physical

	N	SN	MU	Methodology
Geo-Coordinates	X			Field Survey
Altitude	X			Field Survey
Topography	X			Field Survey
Orientation (or Aspect)	X			Field Survey
Slope	X			Field Survey
Soil	X			Field Survey
Geological structure	X			Field Survey
Rainfall				

Bio-Physical

	N	SN	MU	Methodology
Number of trees	X			Field Survey
Diameter of trees	X			Field Survey
Height of trees	X			Field Survey
Length of stem	X			Field Survey
Stump height	X			Field Survey
Age class	X			Field Survey
Twigs				
Bark				
Leaves				

Forest extent

	N	SN	MU	Methodology
Forest land area	X			Remote sensing & Field Survey
Area of forest canopy/crown cover	X			Remote sensing & Field Survey
Area under forest management	X			Reports
Area under formal forest management plan	X			Reports
Area under sustainable forest management	X			Reports
Forest area with certification				
Area under public owned forest	X			Reports
Area under private owned forest	X			Reports

Forest characteristics (Naturalness) and forest type

	N	SN	MU	Methodology
Primary forest				
Modified natural forest				
Semi-natural forest				
Productive plantation				
Protective plantation				
Coniferous				

Broadleaved				
Mixed forest				
Forest area by dominant species (bamboo, mangroves, rubber)				
Forest area by ecological zone (tropical, subtropical, temperate, boreal, polar)				

Use (designated functions) of forests

	N	SN	MU	Methodology
Area of forest under production				
Area of forest for protection of soil and water				
Area of forest for conservation of biodiversity				
Area of forest for social services				
Area of forest for multiple purpose				
Forest area available for wood supply				
Forest area within protected areas				

Social Services

	N	SN	MU	Methodology
Area of forest managed for recreation				
Area of forest managed for tourism				
Area of forest used for education				
Area of forest managed for conservation of cultural/spiritual site				

Mapping of forest distribution

	N	SN	MU	Methodology
Distribution of forests	X			Remote Sensing with ground verification
Forest Characteristics				
Land use	X			
Administrative/political/legal boundaries	X			Remote Sensing
Designated functions of forests				
Other wooded land				
Other land with tree cover				
Other land				

Status of the forest and disturbances affecting forest health and vitality

	N	SN	MU	Methodology
Disturbance by insects				
Disturbance by diseases				
Disturbance by other biotic agents				
Disturbance by fire				
Disturbance caused by other abiotic factors				

Biodiversity

	N	SN	MU	Methodology
Tree species				
Shrub species				
Herbs species				
Endangered species				
Critically endangered species				
Vulnerable species				
Native species				
Endemic species				
Introduced species				

Beneficiaries of forest goods and services

	N	SN	MU	Methodology
By locality of user (e.g. indigeus/local/national)?				
By good/service (e.g. timber, fuelwood, NWFP, bamboo/rattan, water, etc) used by them				
By ecomic class of the beneficiaries (high, medium, low income)				
By level of dependency on forest (as percentage of total employment)				
By physical accessibility to the forest (distance from forest)				

Ecomic value

	N	SN	MU	Methodology
Removal of timber				
Removal of fuelwood				
Removal of other wood products				
Removal of wood products derived from forest under sustainable management				
Removal of wood products derived from forest plantations				
Removal of n wood forest products				
Annual allowable cuts/yields				
Social services				
Environmental services				
Employment				
Support to livelihood of communities				
Market price/cost of wood in forest				
Market price/cost of n wood forest products				
Estimate of value of social services				
Estimate of value of environmental services				

Estimate of value of employment				
Estimate of the contribution of forest sector to national economy				

Policy, legal and institutions (PLI) framework

	N	SN	MU	Methodology
Forest policy	X			Reports
Forest legislation	X			Reports
Forest administration	X			Reports
Forest education and research	X			
Annual outlay, expenditure, investment in forestry sector	X			Reports

Bibliographies and References for further reading

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PLOT DESCRIPTION FORM

Job .	Survey code	Form Code	FSI Zone	Phy. Zone	State	District	Forest Division	Mapsheet .	Grid code	Lat.	Long.	Legal Status	Land Use
1-3	4	5-6	7	8-9	10-11	12-13	14-15	16-21	22-25	26-31	32-37	38	39-40
	1	01											

Terrain Data						Soil Data						Crop Data										Bamboo Data				Plantation potential	Distance from road (km)	Distance from river/stream (m)	Plot status	Degraded Forest				
General Topography	Slope	Position on slope	Altitude	Aspect	Rockiness	Humus	Soil colour	Soil consistency	soil texture	Coarse Fragments	Soil depth	Soil erosion	Origin of stand	Crop composition	Capy layer or storey	Top height	Size class	Intensity of regeneration	Species under regeneration	Injuries to crop	Fire incidence	Grazing incidence	Presence of weeds	Presence of grass	Bamboo density					Bamboo quality	Bamboo flowering	Bamboo regeneration	Biotic influence	Natural calamity
41	42-44	45	46-49	50	51	52	53	54	55	56	57	58	59	60-61	62	63-64	65	66	67-70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85

Job .	Form Code	Mapsheet .	Grid code
1-3	4-5	6-11	12-15
	02		

Total . of bamboo clumps	Total . of trees
72-74	75-77

[illegible]

SAMPLE TREE FORM

Job .	Form Code	Mapsheet .	Grid code
1-3	4-5	6-11	12-15
	03		

Total . of trees
52-53

Species name	Tree serial .	Species code	Dominance	DBH OB (cm)	DBT (mm)	Tree height (m)	Crown width (m)		Species name	Tree serial .	Species code	Dominance	DBH OB (cm)	DBT (mm)	Tree height (m)	Crown width (m)	
							CW1	CW2								CW1	CW2
	16-17	18-21	22	23-25	26-27	28-29	30-31	32-33		34-35	36-39	40	41-43	44-45	46-47	48-49	50-51

BAMBOO CLUMP ANALYSIS FORM

Job .	Form Code	Mapsheet .	Grid code
1-3	4-5	6-11	12-15
	04		

Average culm height (in dcm)		Bamboo quality
Upto 1 cm top dia	Upto 2 cm top dia	
72-74	75-77	78

Species		Clump Sl..	Clump Dia- meter (cms)	Clump size class	Green sound culm						Green damaged culms						Dry sound			Dry damaged culms			Deca- yed culms	Total . of culms		
Name	Code				Current year's	One to two years old			Over two years old			Current year's	One to two years old			Over two years old										
						2<5 cms	5<8 cms	8+ cms	2<5 cms	5<8 cms	8+ cms		2<5 cms	5<8 cms	8+ cms	2<5 cms	5<8 cms	8+ cms								
	16-19	20-22	23-25	26	27- 28	29- 30	31- 32	33- 34	35- 36	37- 38	39- 40	41- 42	43- 44	45- 46	47- 48	49- 50	51- 52	53- 54	55- 56	57- 58	59- 60	61- 62	63- 64	65- 66	67-68	69-71

BAMBOO ENUMERATION & ANALYSIS FORM (N CLUMP FORMING)

Job .	Form Code	Mapsheet .	Grid code
1-3	4-5	6-11	12-15
	05		

Species		Green sound culm							Green damaged culms							Dry sound culms			Dry damaged culms			Decayed culms	Average culm height in dcm.	Total . of culms
Name	Code	Current year	One to two year old			Over two year old			Current year's	One to two year old			Over two year old			2<5 cms	5<8 cms	8+ cms	2<5 cms	5<8 cms	8+ cms			
			2<5 cms	5<8 cms	8+ cms	2<5 cms	5<8 cms	8+ cms		2<5 cms	5<8 cms	8+ cms	2<5 cms	5<8 cms	8+ cms									
	16-19	20-22	23-25	26-28	29-30	31-33	34-36	37-38	39-41	42-44	45-47	48-49	50-52	53-55	56-57	58-60	61-62	63-64	65-67	68-69	70-71	72-73	74-76	77-80

HERBS, SHRUBS & REGENERATION FORM

Job .	Form Code	Mapsheet .	Grid code	Plot location	Slope	Altitude	Aspect
1-3	4-5	6-11	12-15	16	17-19	20-23	24
	07						

Herb Plot size: 1m × 1m
Shrub & Regeneration Plot size: 3m × 3m

Herbs							Shrubs							Regeneration					
Species		Herbarium reference .	. of plants				Species		. of plants				Herbarium reference .	Species		Diameter at breast height (cm)	. of plants		
Name	Code		Collar diameter class (mm)				Name	Code	Collar diameter class (cm)					Name	Code		Category of regeneration		
			0-2	2-5	5-8	8+			0-2	2-5	5-8	8+					1	2	3
	25-30	31-36	37-39	40-42	43-45	46-48		49-54	55-57	58-60	61-63	64-66	67-72		73-76	77	78-79	80-81	82-83