National Forest Inventory

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Forest Survey of India

Forest Survey of India - National Organisation with Mandate of Assessment and Monitoring of Forest Resources of the Country

EVOLUTION OF THE ORGANIZATION

- A National Organization under the MoEF&CC, GOI
- Undertakes Forest Resource Assessment at the National Level
- In service of the Nation since 1965

1965 – PISFR

- Assess availability of raw material for establishment of wood based industries in selected forest rich regions (FAO/UNDP/GOI project)

NCA Report, 1976

1981 – FSI

- Periodic monitoring of the forest resources
- Serve the data needs of development planning
- Serve as nucleus for the technological advancement and consultancy in the field of forest mapping and inventory
- Training of forestry personnel
- Provide institutional base for international cooperation and training

NRSA Report, 1984

1986 – FSI – New Mandate

- Biennial forest cover mapping & preparation of SFR
- Inventory of forests and trees outside forests
- Impart training to forestry personnel in modern forest survey and inventory techniques
- Support and oversee techniques/inventory work undertaken by State/UT forest department.
- Undertake project based activities of the State Forest Departments and central government organizations.

Forest Inventory

"Forest inventory refers to both the tabulated forest information and to the process of measuring and analyzing the data on which the tabulated information is based" (FAO 2010)

Global : International concern (GFRA)
National: Strategic planning and policy making (NFI)
Local : Operative management (Working Plan)

Forest Inventory – Objectives

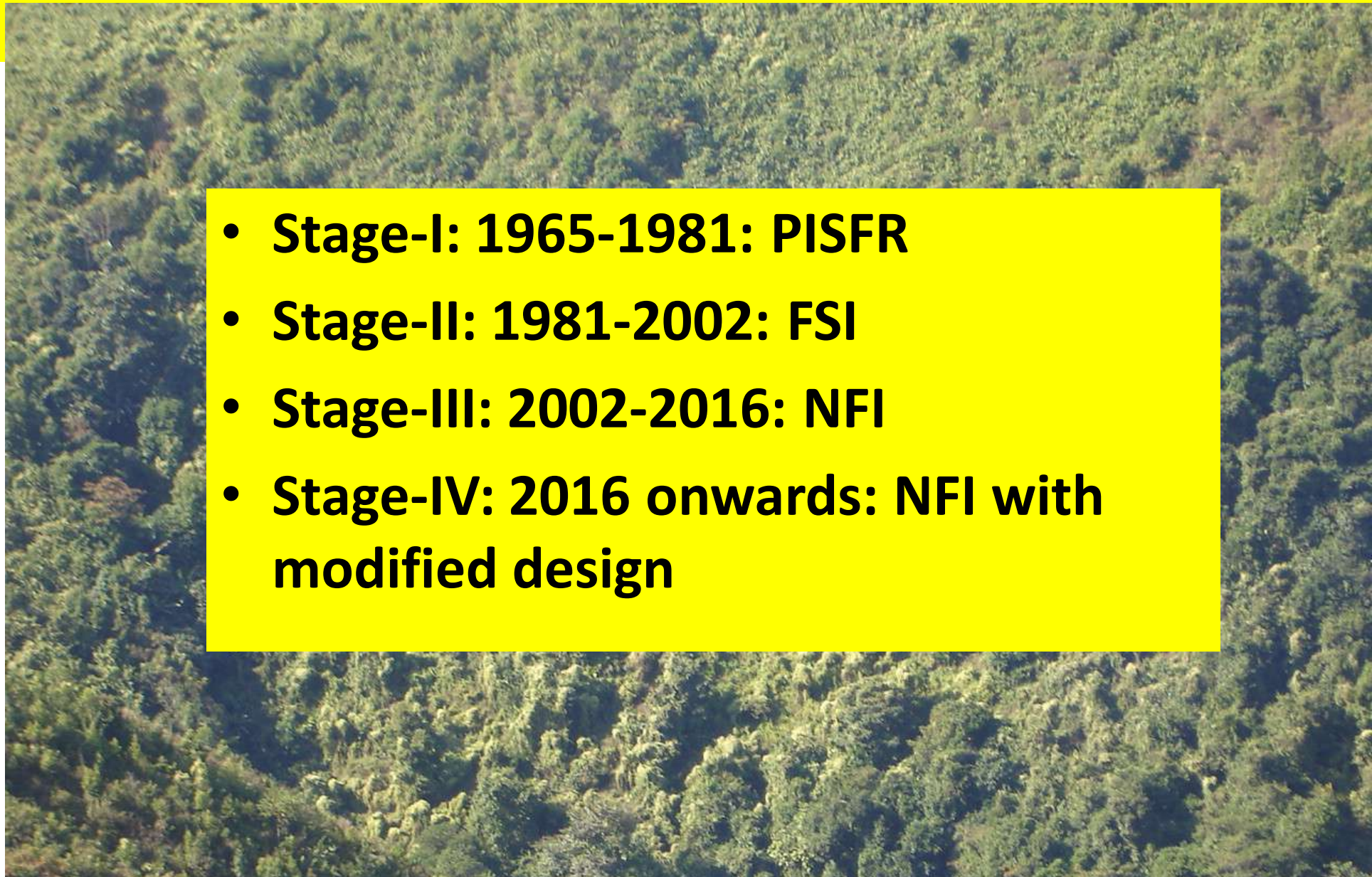
1.Quantitative Information

- State wise growing stock
- Species wise growing stock
- Diameter class wise distribution
- Regeneration status
- Bamboo Assessment from Forest & TOF
- Growing Stock of top ten species in forests and TOF

2.Qualitative Information

- Legal status
- Land use
- Biotic influence
- Fire incidence
- Grazing incidence
- Terrain data
- Soil data etc.

Different stages of Forest Inventory



- Stage-I: 1965-1981: PISFR
- Stage-II: 1981-2002: FSI
- Stage-III: 2002-2016: NFI
- Stage-IV: 2016 onwards: NFI with modified design

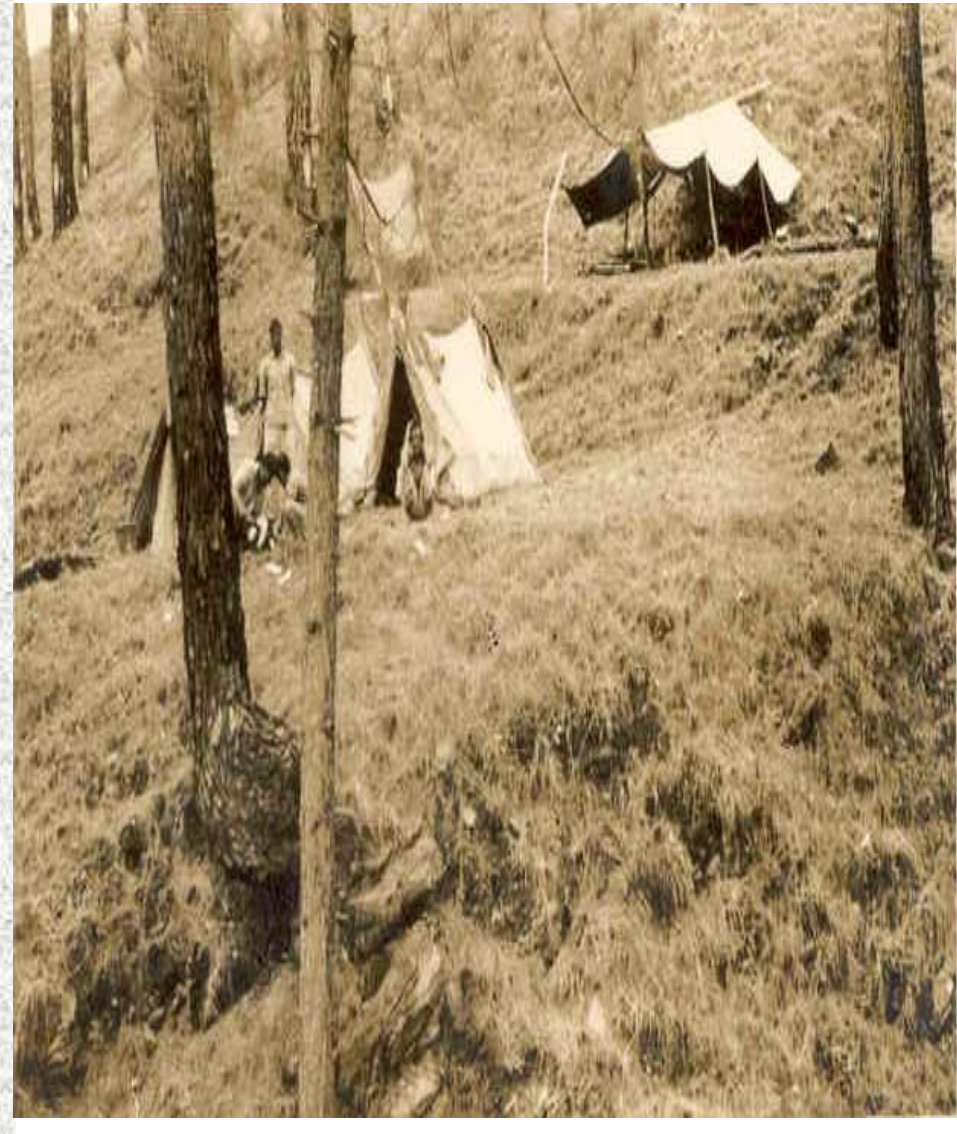
Stage-I: 1965-1981: PISFR

Pre Investment Survey of Forest Resources 1965-1981

- Established in 1965 as a joint project of UNDP, FAO and Govt of India
- Assessment of availability of wood and bamboo for establishing wood based industries
- Target area was industrial catchment of different States/UTS

Pre Investment Survey of Forest Resources 1965-1981

- Arial photographs were used to identified forest area
- Different sampling design was used for different areas
- Pilot study was conducted before main survey for ascertain the sample size.
- Precision level was 10 % at 95 % confidence level



UDAIPUR

Pilot Survey :

The data of the Resources Division of Rajasthan Forest Department was considered to get adequate knowledge regarding the nature of the forest area and its variability.

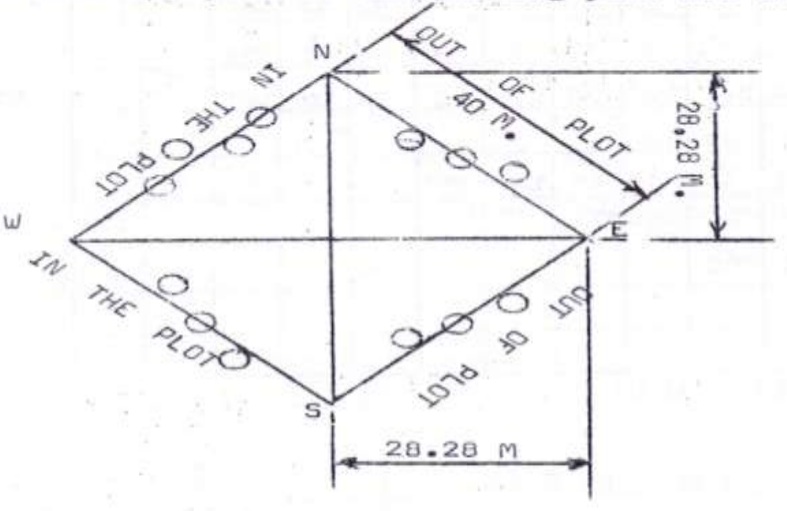
A systematic sampling of varying intensity from range to range was adopted to estimate the growing stock of the area.

Plot size/shape :

Square plot of 0.16 ha. was choosen all over the area lay out the sample plot.

5' ×5' longitudinal and latitudinal interval was sub-divided into four equal parts of $1\frac{1}{4}$' on the map. The inter-section of these longitudinal and latitudinal lines at $1\frac{1}{4}$' were centres of sample plots. The sample plots were $1\frac{1}{2}$' x $1\frac{1}{2}$' and $2\frac{1}{2}$'x $2\frac{1}{2}$' interval depending upon the intensity of the survey required in different ranges.

The forest type analysis and the area information available from the compartmental area analysis in the working plan was used to stratify the area.



ADILABAD

Pilot Survey :

A Pilot Study was taken up to decide the optimum plot size and the number of plots to be surveyed per primary unit to arrive at the required precision. A plot of 40 m. x 40 m. was divided into 16 sub plots of 10 m. x 10 m. size was laid out in 28 randomly selected compertments spread over all the strata.

Wadsa Catchment-
(Chakda district)

Inventory design :

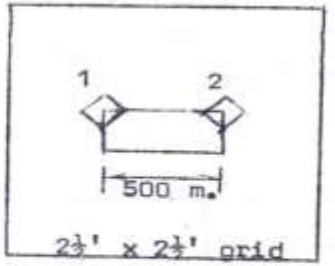
A reconnaissance of the forests of Chakda - shows that Teak is scattered and Bamboo is patchy. Systematic cluster sampling was deemed to be most appropriate in view of the situation and is most convenient from working point of view.

In early part of the survey $2\frac{1}{2}$' x $2\frac{1}{2}$' grid with two plots of 0.1 ha. was adopted and subsequently 4 plots were considered to improve the precision.

Lay out of the plot :

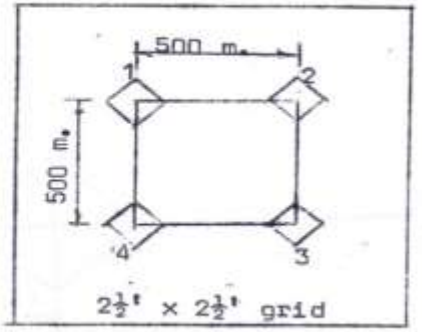
In this design first plot of 0.1 ha. was laid out at the centre of a grid of $2\frac{1}{2}$' x $2\frac{1}{2}$'. Second plot was laid out at a distance of 500 m. apart due east of the first plot.

Four plot design :



$2\frac{1}{2}$' x $2\frac{1}{2}$' grid

In a grid of $2\frac{1}{2}$' x $2\frac{1}{2}$' four plots of 0.1 ha. each were located at the corner of 500 m. square such that the centre of the grid and centre of the 500 metre square plot coincide



$2\frac{1}{2}$' x $2\frac{1}{2}$' grid

(EAST GODAVARI)

Inventory design :

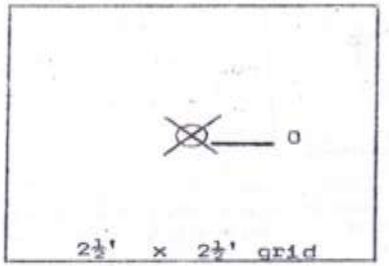
A systematic cluster sampling was adopted to estimate the growing stock of the area within required precision.

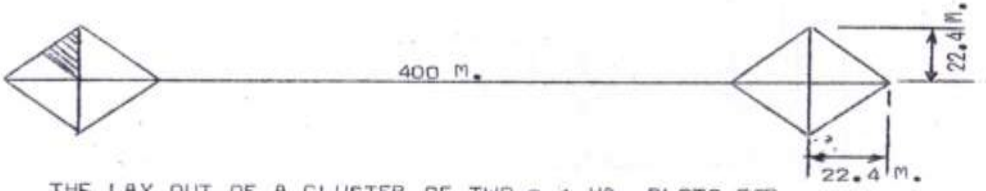
A cluster consisted of 2 plots of 0.1 ha. each and located at a distance of 400 m.

Laying of plot :

The topo sheet was divided into $2\frac{1}{2}'$ x $2\frac{1}{2}'$ grid blocks. The centre of $2\frac{1}{2}'$ x $2\frac{1}{2}'$ grid was located. Plot No. 1 was laid out by measuring a distance of 22.4 m. in all the four corners of the plot centre. Similarly the 2nd plot was located by moving a distance of 400 m. due east.

∠of The laying out ∠plot is shown as below :-





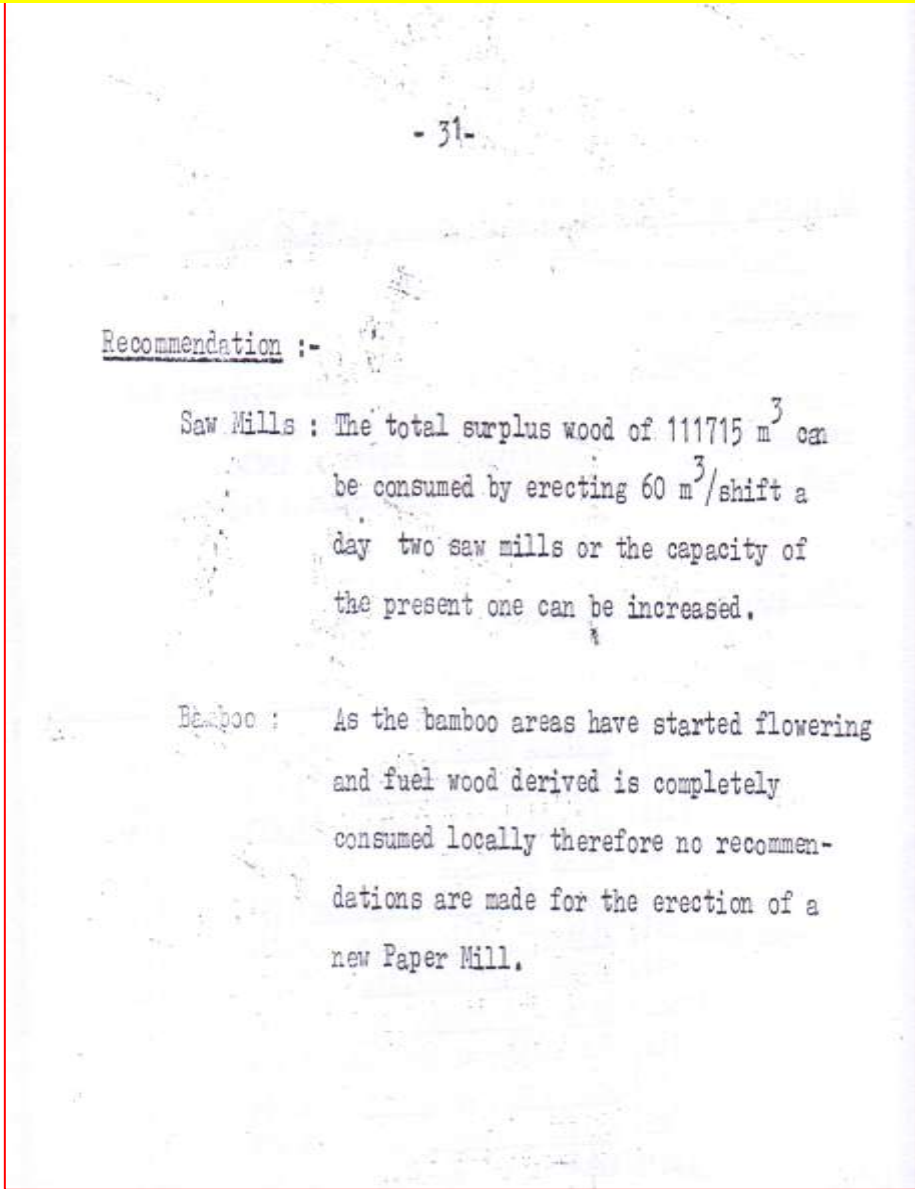
THE LAY OUT OF A CLUSTER OF TWO 0.1 HA. PLOTS FOR EACH $2\frac{1}{2}'$ x $2\frac{1}{2}'$ Grid.

Pre Investment Survey of Forest Resources 1965-1981

- field forms
  - Plot approach Form
  - Plot Description Form
  - Plot Enumeration Form
  - Sample tree form
  - Bamboo Enumeration form
  - Bamboo weight form
  - Tree volume and cull studies

Pre Investment Survey of Forest Resources 1965-1981

- Output
  - Forest type wise area
  - Stem per hectare
  - Volume per hectare
  - Growing stock of Bamboo
  - Potential annual yields of timber and bamboo.



- 31-

Recommendation :-

Saw Mills : The total surplus wood of 111715 m^3 can be consumed by erecting 60 m^3/shift a day two saw mills or the capacity of the present one can be increased.

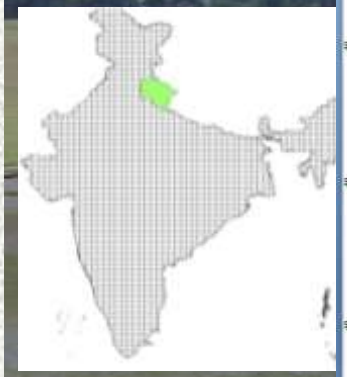
Bamboo : As the bamboo areas have started flowering and fuel wood derived is completely consumed locally therefore no recommendations are made for the erection of a new Paper Mill.

Stage-II: 1981-2002: FSI

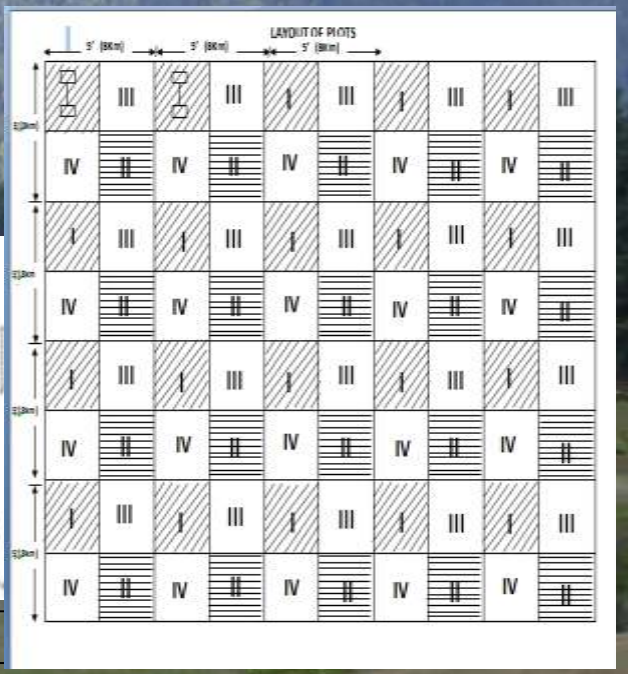
1981-2002: Forest Inventory

- PISFR was renamed as FSI, a fully Govt of India organization in 1981
- Inventory was continued as before with a uniform sampling design. The project areas was divided into grids of 2½' x 2½' and Systematic sampling followed by taking two plots of 0.1 ha in each grid
- Each year only selected districts covered due to limitation of manpower and districts/state level reports produced
- About three fourth of forested area of country could be inventoried in 20 years
- About 140 reports have been published on forest inventory.

- Proposed design for NFI in 1981



INDIA GRID 5 minx 5 min



Stage-III: 2002-2016: NFI

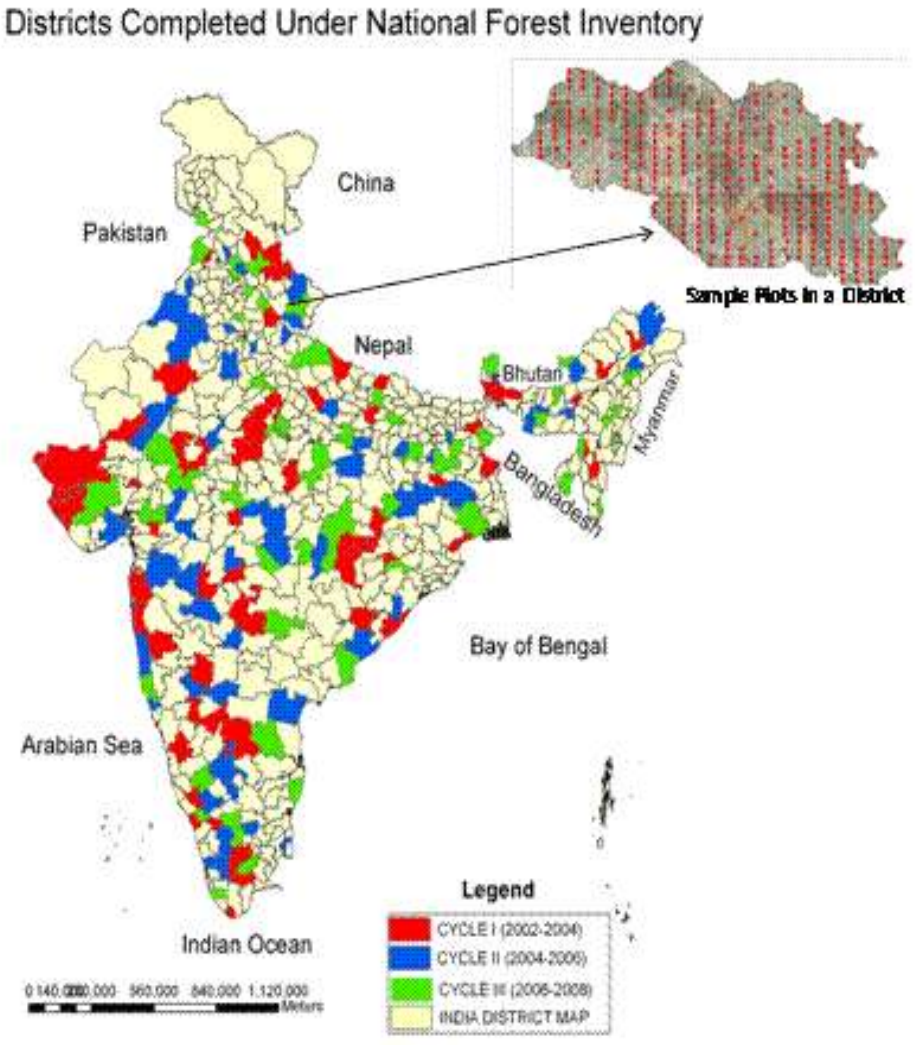
Forest Inventory in India since 2002

From 2002 onwards

- Since all earlier inventory work was carried out in different parts of the country at different time, it was not possible to generate national estimates of growing stock for forest and TOF.
- Therefore, sampling design was modified in 2002 to have a national level estimates of GS both for forest and TOF.
- Thus from 2002 onwards, NFI has three components:
  - Inventory of Forests mainly inside the recorded forest area
  - Inventory of TOF (Rural): outside the recorded forest area in rural areas
  - Inventory of TOF (Urban): outside the recorded forest area in urban areas.

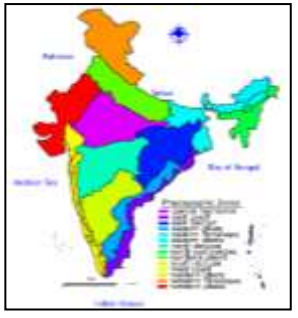
NFI design adopted in 2002

- Country has been stratified into 14 physiographic zones.
- 60 districts are randomly selected spread over the entire country for detailed inventory in a cycle of 2 years
- Both forest and TOF inventories are carried out in the selected districts.
- Forest and TOF (urban) inventory does not require RS data, whereas for inventory of TOF (rural), high resolution satellite data is used.



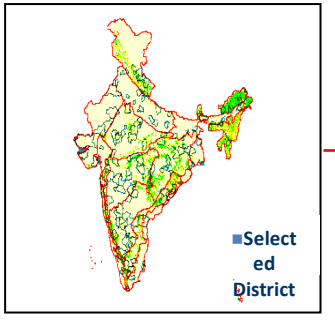
NFI Methodology since 2002

■ Stratified country into 14 physiographic zones



■ A square sample plot of size 0.1 ha is laid out at the centre of each selected forest sub-grid.

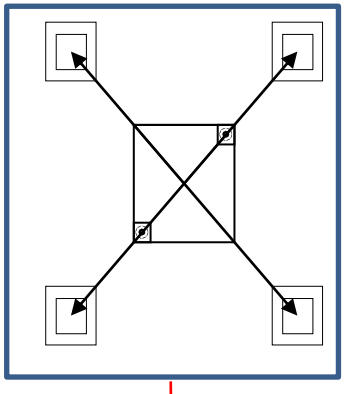
■ 60 districts are selected randomly for inventory in a cycle of 2 yrs

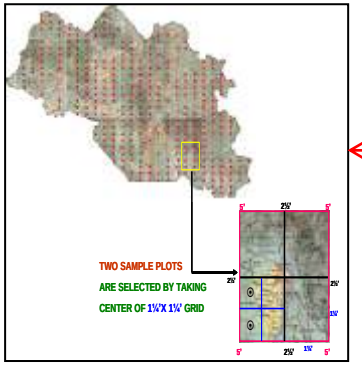


■ Two sub-grids of 1¼′ × 1¼′ are selected randomly.

■ District are divided into grid of **2½′ × 2½′.**

■ Each grid of 2½′ × 2½′ are divided into four sub-grids of 1¼′ × 1¼′ .

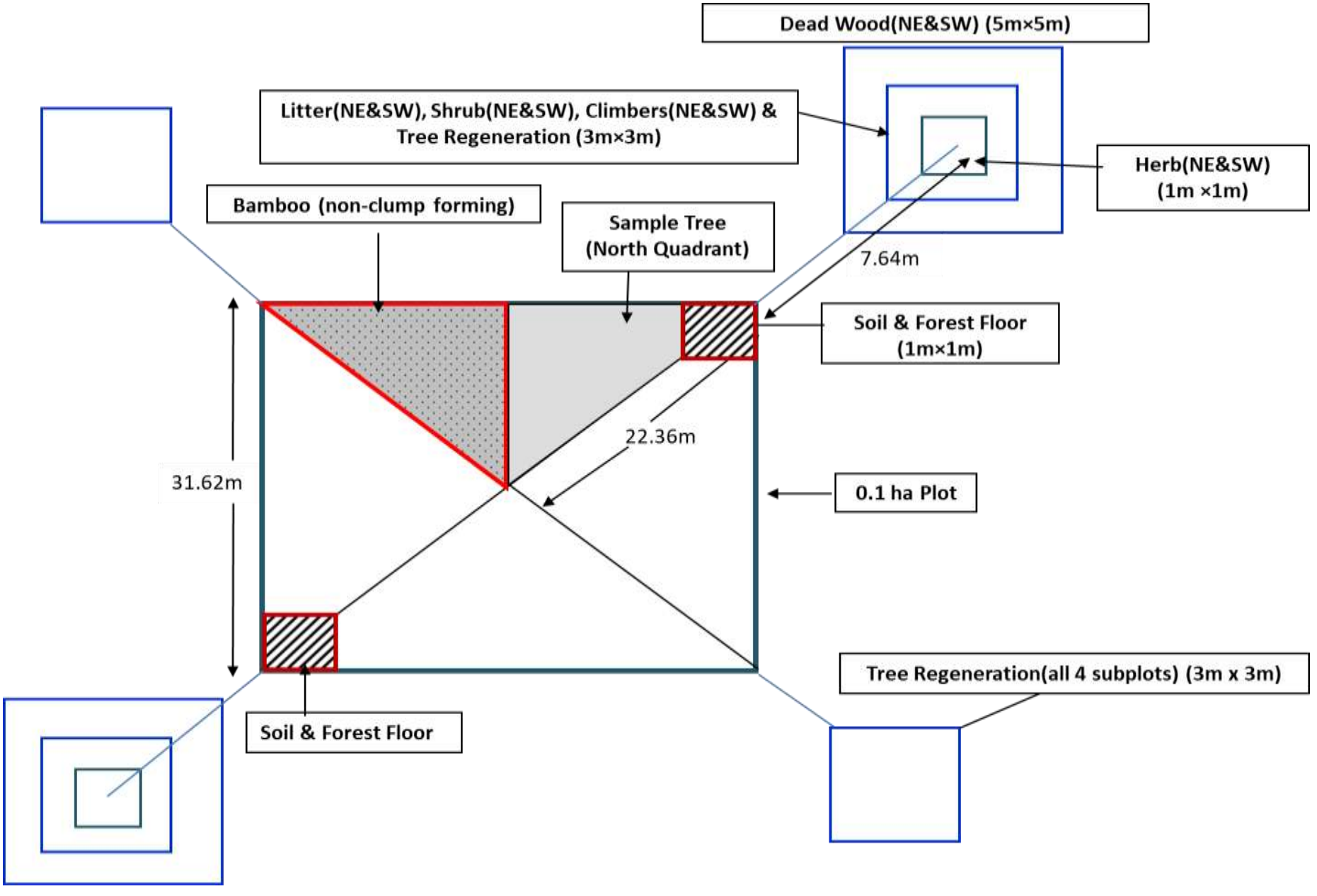




■ **dbh of all tree over 10 cm recorded, litter and soil sample collected, regeneration status, bamboo, land use, legal status, crop composition, etc are recorded.**

■ **Inconsistency check of sample data is done through software and then processed for generating different estimates**

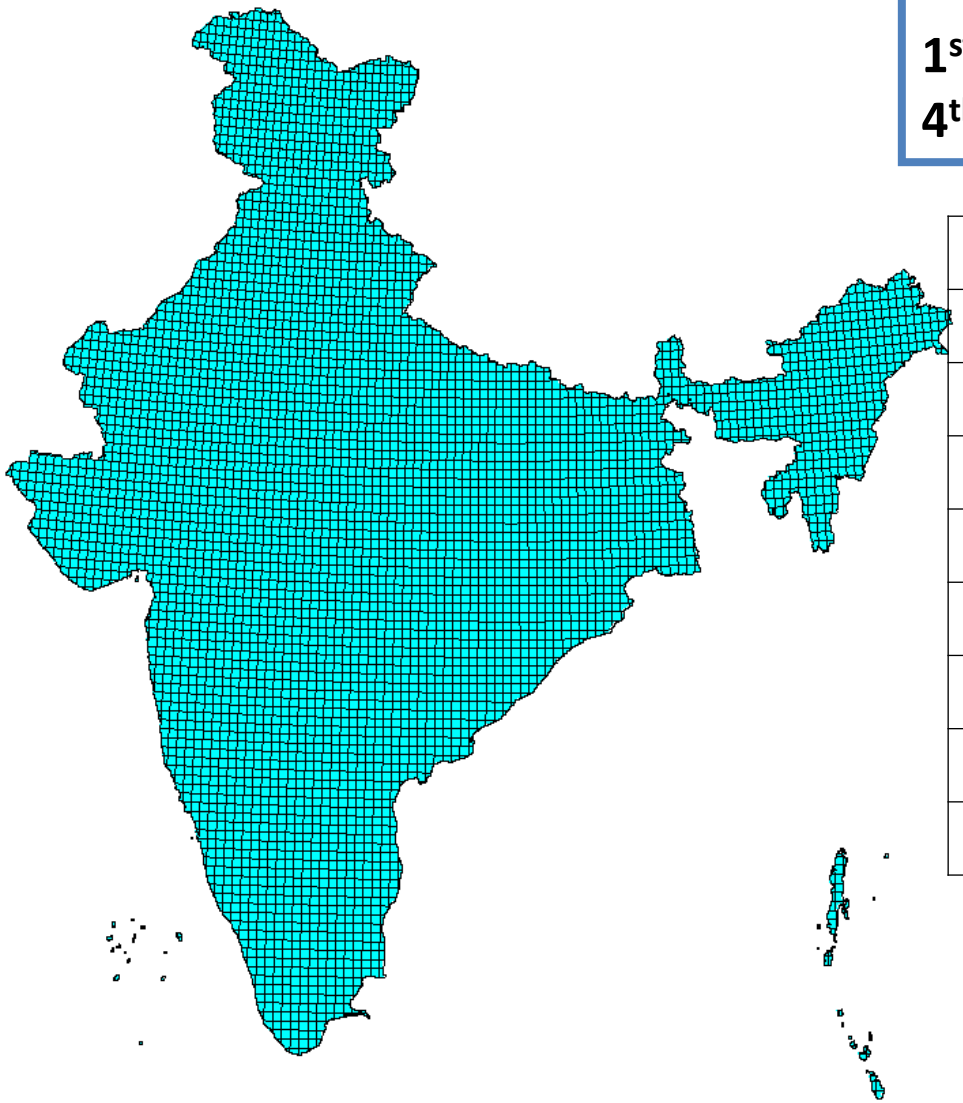
NFI design adopted in 2002



New NFI 2016 onwards

Coverage of NFI

India map (5x5km grids)



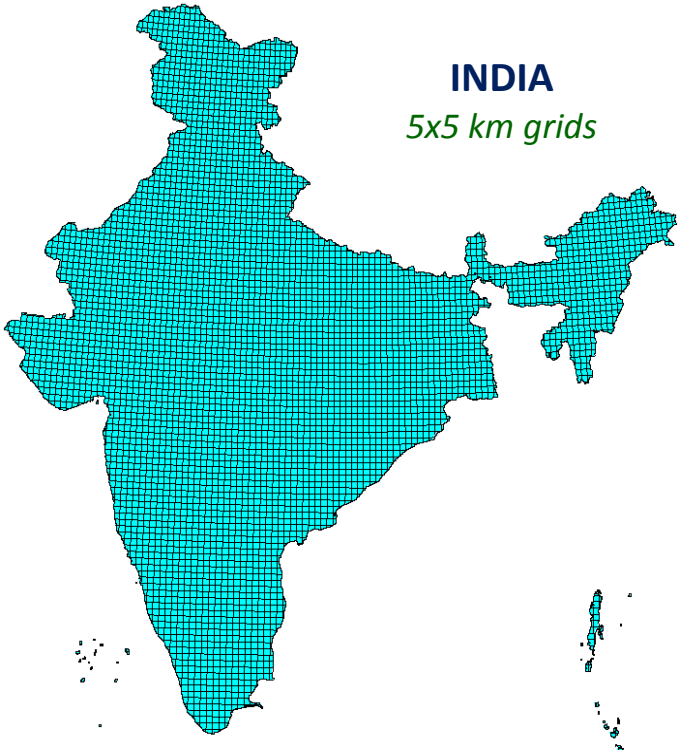
Sampling of grids on 5 yr cycle

1st yr – all 1s 2nd yr- all 3s 3rd yr – all 5s
4th yr – all 2s 5th yr- all 4s 6th yr- all 1s

5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1
2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2
3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3
4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4
5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1
2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2
3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3

National Forest Inventory (contd…)

- Assessment of forest resources at 95% precision for National Estimation (90% for Sub-National)
- Data needs of different organizations e.g NITI Aayog, Finance Commission, SFDs, Universities and Research Organisations
- International reporting e.g. GFRA, UNFCCC NATCOM etc.



approx 7,000 forested & 10,000 TOF grids to be inventoried/ year

Inventory cycle duration

- 05 years for forests and 10 years for TOF
- Approx 100 variables recorded

Outcomes of Invetory of Forest & TOF

- estimate growing stock (stems and volume) inside and outside forest areas
- estimate biomass and carbon stock in the India's forest
- estimate Growth and productivity
- inventory of Important NTFPs
- growing stock of bamboo
- estimate important characteristic of forest such as regeneration, grazing, fire incidence etc.

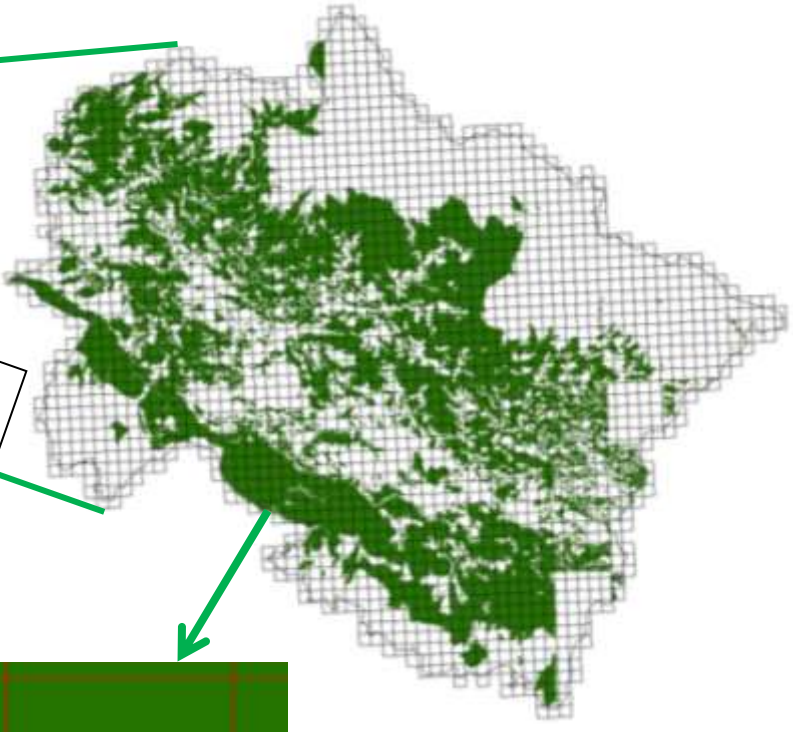
Workload Assessment

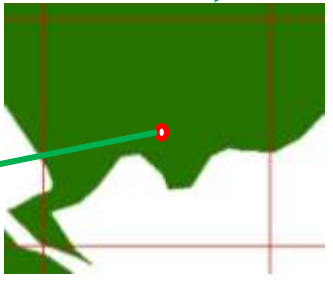
- **Total grids of 5X5 Km – approx. 1,34,000**
- **Forested grids – approx. 33,000**
- **Rest are TOF Grids.**
- **For 5 year cycle, # forest grids/yr – 6,600 (2xpresent work)**
- **For 10 year cycle, # TOF grids/yr – 10,100 (2xpresent work)**

New National Forest Inventory Design

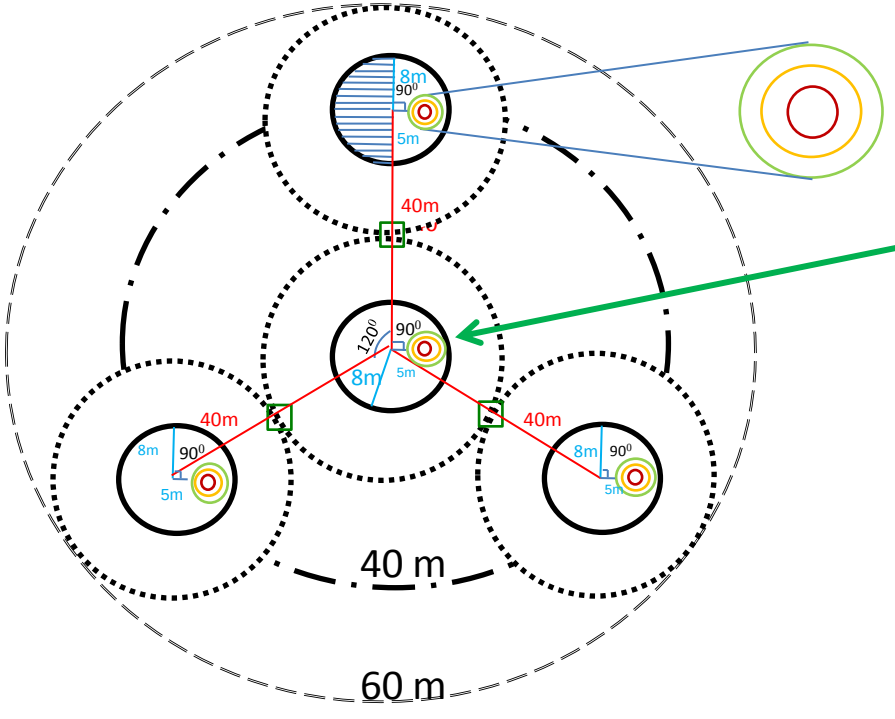
INDIA GRID 5Km x 5Km

Uttarakhand 5Km x 5km grid overlaid on Forest Boundary



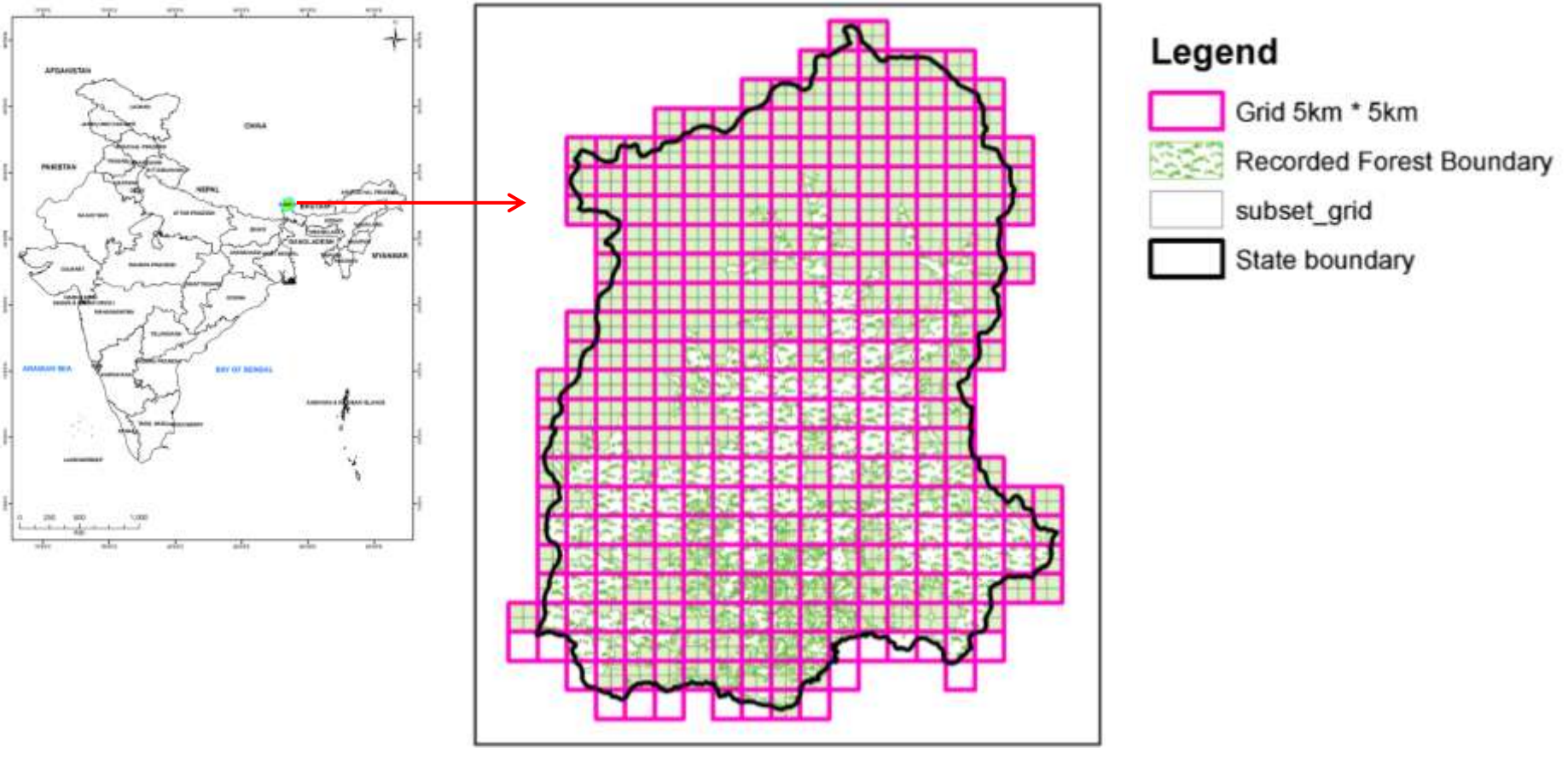


Single Grid of 5Kmx 5Km

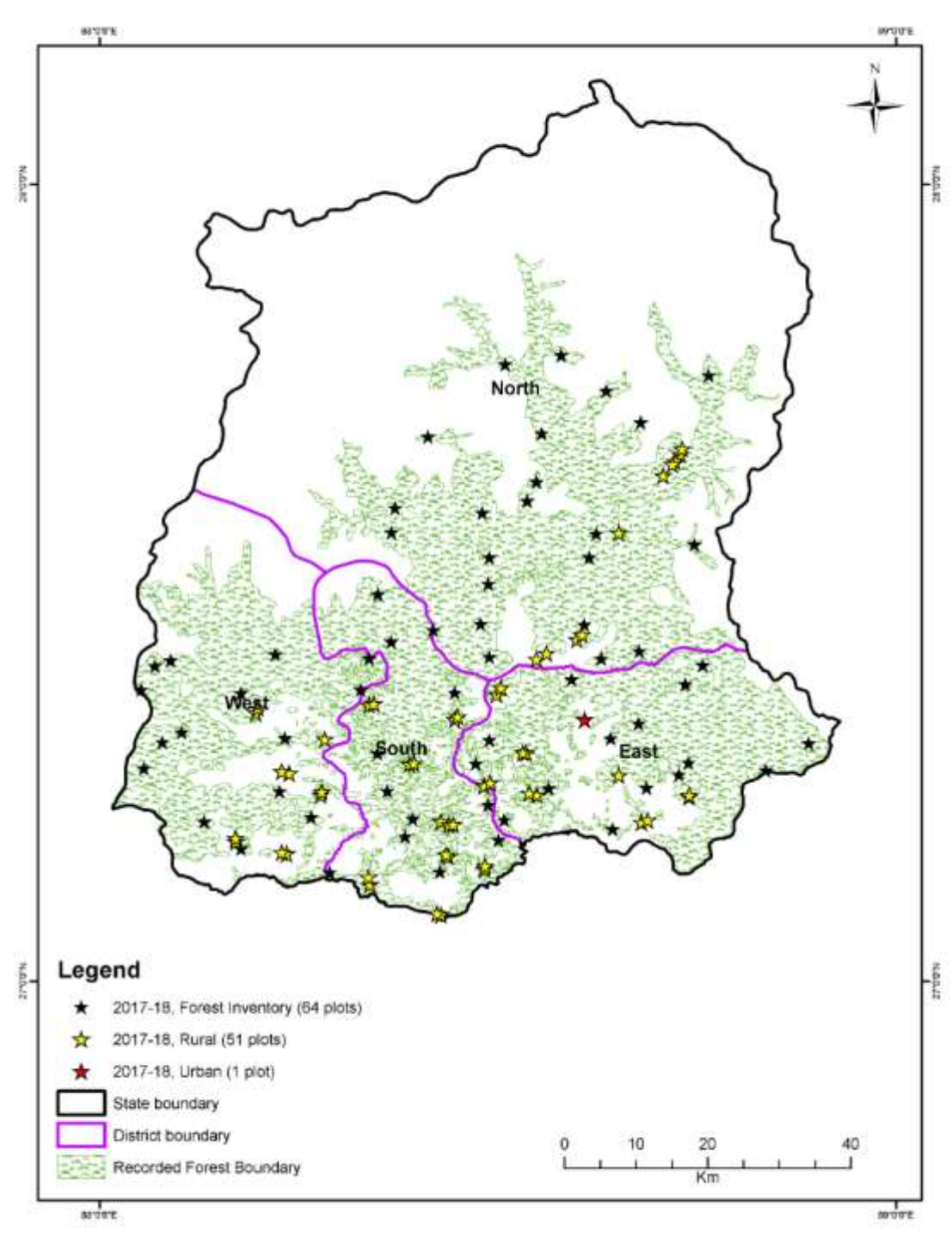


NFI Plot Design

	Subplot	8.0 m radius
	Annular plot	20 m radius
	Lichens plot	40 m radius
	Description plot	60 m radius
	Hub vegetation plot	0.6 m radius
	Shrub regeneration litter plot	1.7 m radius
	Deadwood plot	2.8 m radius
	Soil and forest floor sample plot	1m X 1m at mid point between subplots
	Non clump forming bamboo plot	



In bigger states, required sample points are met with national grid size of 5km * 5km, however for smaller states, this grid is divided into four 2.5km* 2.5km size sub grids



Distribution of NFI (Forest and TOF) inventory points during 2017-18 of 1st cycle of NFI in Sikkim

NFI Field Forms

Field Form No. 1

PLOT APPROACH FORM

Job No.	FSI Zone code	Phy. Zone Code	State code	Forest Division Code	District Code	Mapsheet No.	Grid Code	Name of Camp	Time (hrs.) at which left the camp/plot (IST Time)	Distance covered by vehicle (km)	Time taken in journey by vehicle (in hours)	Latitude & Longitude of the place upto which journey performed by vehicle	
												Latitude	Longitude
1 (3)	2 (1)	3 (2)	4 (2)	5 (2)	6 (2)	7 (6)	8 (6)	9	10 (4)	11 (2)	12 (4)	13 (8)	14 (8)
	01												

Time(hrs.) at which started on foot to plot centre (IST)	Distance covered on foot upto the plot centre (km upto two decimal place)	Time (hrs.) of arrival at the Plot (IST)	Time (hrs) of departure from the plot (IST)	Time (hrs.) at which returned to the camp (IST)	Compassing/Navigation done by (Name of person)	Plot laid out by (Name of person)	Tree Enumeration done by (Name of person)	Height Measurement taken by(Name of person)	B.T. & other measurements taken by(Name of person)	Bamboo enumeration done by(Name of person)	Bamboo weight taken by (Name of person)
15 (4)	16 (4)	17 (4)	18 (4)	19 (4)	20	21	22	23	24	25	26

Herbs/Shrubs/ Climbers/ Regeneration Data collected by (Name of person)	Soil & Forest Floor data Collected by(Name of person)	Details of the Reference Tree(In case of plot status 1& 5)					Latitude and Longitude of the place upto where crew approached (in case of plot status 2/3/4)		Name of the Crew Leader	Remarks (Upto 50 (Fifty) words)
		Reference Tree Sl. No.	Spp Code	Species Name	Distance from Tree to Plot Centre (in meters upto two decimel)	Bearing from Tree to Plot Centre (in degree)	Latitude	Longitude		
27	28	29	30(4)	31	32(4)	33(3)	34(8)	35(8)	36	37
		1.								
		2.								

Date: dd /mm /yyyy

Signature of the Crew Leader

NFI Field Forms

Field Form No. 2

PLOT DESCRIPTION FORM

Job No.	Survey code	Form Code	FSI Zone	Phy. Zone	State	District	Forest Division	Mapsheet No.	Grid code	Lat.	Long.	Legal Status	Land Use	Density for LUC 7&14	Wild life protected area
1 (3)	2 (1)	3 (2)	4 (1)	5 (2)	6 (2)	7 (2)	8 (2)	9 (6)	10 (6)	11 (8)	12 (8)	13 (1)	14 (2)	14 (a) (2)	15 (1)
	1	02													

Terrain Data						Soil Data							Crop Data																		Bamboo Data									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	Canopy layer or storey	Top height	Size class	Intensity of regeneration	Species under regeneration	Injuries to crop due to Girdling	Injuries to crop due to Illicit felling	Lopping for fodder etc.	Fire incidence	Grazing incidence	Presence of understorey vegetation	Presence of grass	Presence of most occurring invasive species	Presence of second most occurring invasive species	Extent of most occurring invasive species	Extent of second most occurring invasive species	Bamboo density	Bamboo quality	Bamboo flowering	Bamboo regeneration	Plantation potential	Distance from road (km)	Type of water bodies in the vicinity of plot	Distance from river/stream (m)	Plot status	Biotic influence	Natural calamity	Date of survey(dd/mm/yy)
16 (1)	17 (3)	18 (1)	19 (4)	20 (1)	21 (1)	22 (1)	23 (1)	24 (1)	25 (1)	26 (1)	27 (1)	28 (1)	29 (1)	30 (2)	31 (1)	32 (2)	33 (1)	34 (1)	35 (4)	36 (1)	37 (1)	38 (1)	39 (1)	40 (1)	41 (1)	42 (1)	43 (2)	44 (2)	45 (1)	46 (1)	47 (1)	48(1)	49 (1)	50 (1)	51 (1)	52 (1)	53 (1)	54 (1)	55 (1)	56 (1)	57 (1)	58

Signature of the Crew Leader.....

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width.
ii) For Lat& Long, seconds to be recorded upto two decimal places, no need to put the decimal point.

NFI Field Forms

Field Form No. 3

PLOT ENUMERATION FORM

Job No.	Form Code	Mapsheet No.	Grid code
1 (3)	2 (2)	3 (6)	4 (6)
	03		

Sub-plot	Slope %	Sub-plot status	Land use class of Sub-plot
5 (1)	6 (3)	7 (1)	7a(2)

Total No. of bamboo clumps	Total No. of trees
22 (3)	23 (3)

Species Name	Code	Dia (cm)	Crown width (meter)		Status of tree (dead/live)	Cause of death in case of mortality	Rotten/ missing cull	Height (in m)			Incidence of insect	Incidence of disease	Decay class
			CW1	CW2				Total height	Uncompacted crown length	compacted crown length			
8	***9 (4)***	***10 (3)***	***11 (2)***	***12 (2)***	***13 (1)***	***14 (1)***	***15 (1)***	***16(2)***	***17 (2)***	***18 (2)***	***19 (1)***	***20 (1)***	***21(1)***

Date……. Signature of the Crew Leader……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

NFI Field Forms

Field Form No. 4

SAMPLE TREE FORM

Job No.	Form Code	Mapsheet No.	Grid code
1 (3)	2 (2)	3 (6)	4 (6)
	04		

Total No. of trees	Sub-Plot no.
23 (2)	24(1)

Species name	Tree serial No.	Species code	Dominance	DBH OB (cm)	DBT (mm)	*Bark Void %*	Tree height (m)	Clear bole height (m)	Species name	Tree serial No.	Species code	Dominance	DBH OB (cm)	DBT (mm)	Bark Void %	Tree height (m)	Clear bole height (m)
5	6 (2)	7 (4)	8 (1)	9 (3)	10 (2)	*11 (2)*	12 (2)	13 (2)	14	15 (2)	16 (4)	17 (1)	18 (3)	19 (2)	20 (2)	21 (2)	22 (2)

Date…….. Signature of the Crew Leader……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

NFI Field Forms

Field Form No.-5

BAMBOO CLUMP ANALYSIS FORM

Job No.	Form Code	Mapsheet No.	Grid code
1 (3)	2 (2)	3 (6)	4 (6)
	05		

Average culm height (in dcm)		Bamboo quality
Upto 1 cm top dia	Upto 2 cm top dia	
38 (3)	39 (3)	40 (1)

Species		Sub-plot number and Clump Sl.No.	Clump Dia-meter (cm)	Clump size	Green sound culm									Green damaged culms									Dry sound culms				Dry damaged culms				Deca-yed culms	Total no. of culms
Name	Code				Current	One to two years old				Over two years old				Current	One to two years old				Over two years old														
						1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm		1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm		
5	6 (4)	7 (3)	8 (3)	9 (1)	10 (2)	11 (2)	12 (2)	13 (2)	14 (2)	15 (2)	16 (2)	17 (2)	18 (2)	19 (2)	20 (2)	21 (2)	22 (2)	23 (2)	24 (2)	25 (2)	26 (2)	27 (2)	28 (2)	29 (2)	30 (2)	31 (2)	32 (2)	33 (2)	34 (2)	35 (2)	36 (2)	37 (3)

Date……..

Signature of the Crew Leader……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

NFI Field Forms

Field Form No. -6

BAMBOO ENUMERATION AND ANALYSIS FORM (NON CLUMP FORMING)

Job No.	Form Code	Mapsheet No.	Grid code	Sub-plot No.
1 (3)	2 (2)	3 (6)	4 (6)	36 (1)
	06			

Species			Green sound culms								Green damaged culms								Dry sound culms				Dry damaged culms				Deca-yed culms	Average culm height in dcm.	Total no. of culms
Name	Code	Current year	One to two year old				Over two year old				Current year	One to two year old				Over two year old														
			1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm		1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm	1<2cm	2<5 cm	5<8 cm	8+ cm			
5	6 (4)	7 (3)	8 (3)	9 (3)	10 (3)	11 (3)	12 (3)	13 (3)	14 (3)	15 (3)	16 (3)	17 (3)	18 (3)	19 (3)	20 (3)	21 (3)	22 (3)	23 (3)	24 (3)	25 (3)	26 (3)	27 (3)	28 (3)	29 (3)	30(3)	31 (3)	32 (3)	33 (3)	34 (3)	35 (4)

Date……. Signature of the Crew Leader……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

NFI Field Forms

Field Form No. 7

BAMBOO WEIGHT FORM

Job No.	Form Code	Mapsheet No.	Grid code
1 (3)	2 (2)	3 (6)	4 (6)
	07		

Species			1 to under 2cm					2 to under 5 cm					5 to under 8 cm					8 cm and over					Green weight of sub-sample for co-relation with dry weight			
Name	Code	Sample No.	Dia in cm	Total length in dcm	Utilisable length in dcm		Weight in grams	Dia in cm	Total length in dcm	Utilisable length in dcm		Weight in grams	Dia in cm	Total length in dcm	Utilisable length in dcm		Weight in grams	Dia in cm	Total length in dcm	Utilisable length in dcm		Weight in grams	Sub-sample culm 1 & under 2 cm dia	Sub-sample culm 2 & under 5 cm dia	Sub-sample culm 5 & under 8 cm dia	Sub-sample culm 8 cm and over
					Upto 1 cm top dia	Upto 2 cm top dia				Upto 1 cm top dia	Upto 2 cm top dia				Upto 1 cm top dia	Upto 2 cm top dia				Upto 1 cm top dia	Upto 2 cm top dia					
5	6 (4)	7 (1)	8 (2)	9 (3)	10 (3)	11 (3)	12 (5)	13 (2)	14 (3)	15 (3)	16 (3)	17 (5)	18 (2)	19 (3)	20 (3)	21 (3)	22 (5)	23 (2)	24 (3)	25 (3)	26 (3)	27 (5)	28 (4)	29 (4)	30 (4)	31 (4)

Date…… Signature of the Crew Leader……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

NFI Field Forms

Field Form No. 8

NTFP (HERBS, SHRUBS and CLIMBERS) AND REGENERATION FORM

Job No.	Form Code	State Code	Mapsheet No.	Grid code	Lat	Long
1 (3)	2 (2)	3 (2)	4(6)	5 (6)	**6 (8)**	**7 (8)**
	08					

Herb Plot size: 0.6 meter radius

Shrub, Climber & Regeneration Plot size: 1.7 meter radius

Sub-Plot number	NTFP (herbs, shrubs and climbers)							Regeneration (Trees)						
	Species			No. of plants				Species				No. of plants		
	Name	Code	Habit (herbs/shrubs/ climbers)	Collar diameter class (mm for herbs /cm for shrubs & climbers)				Name	Code	Diameter at breast height (cm)	Status of tree (alive/dead)	Category of regeneration		
				0-2	2-5	5-8	8+					1	2	3
8(1)	9	10 (3)	11	12 (3)	13 (3)	14 (3)	15 (3)	16	17(4)	18 (1)	19 (1)	20 (2)	21 (2)	22 (2)

Date…… Signature of the Crew Leader……

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NFI Field Forms

Field Form No. 9

SOIL AND FOREST FLOOR CARBON FORM

Job No.	Form Code	Mapsheet No.	Grid code	Lat	Long	Proportion of		Forest floor sample No.	Soil sample No.
						Gravel	Soil		
1 (3)	2 (2)	3 (6)	4 (6)	5 (8)	6 (8)	7 (3)	8 (3)	9 (4)	10 (4)
	09								

Weight of Forest Floor in gms.			Volume of soil	Weight of soil (gms)
Plot 1 (360^0 north)	Plot 2 120^0 azimuth from sub-plot 1	Plot 3 240^0 azimuth from sub-plot 1)		
11 (5)	12 (5)	13 (5)		14 (4)

Date..... Signature of Crew Leader.....

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

NFI Field Forms

SOIL AND FOREST FLOOR SAMPLE CARD

(To be read with Field Form 9)

1. Mapsheet No. _____

2. Grid Code _____

3. Lat. and Long. _____

4. Sample No. _____

5. Date of Collection _____

Signature_____

NFI Field Forms

Field Form No. 10

STUMP, DEAD WOOD AND WOODY LITTER FORM

Job No.	Form Code	Mapsheet No.	Grid code	Lat	Long	Prsence of Dead Wood information
1 (3)	2 (2)	3(6)	4 (6)	**5 (8)**	**6 (8)**	**17(1)**
	10					

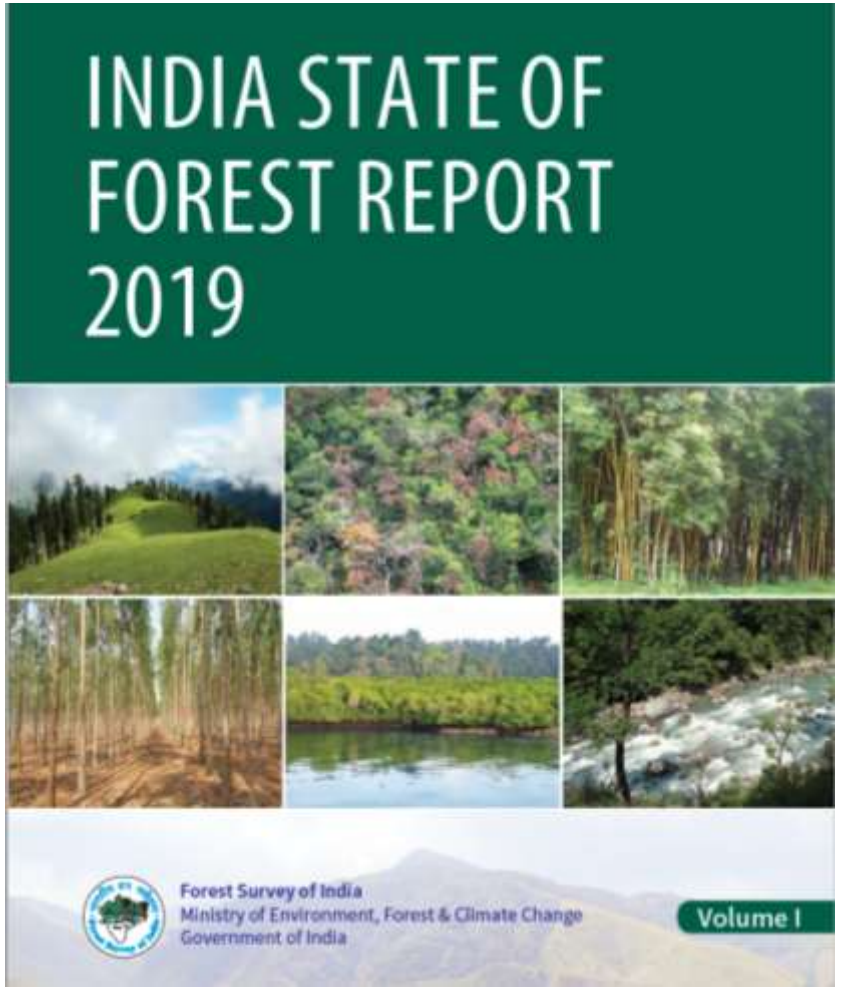
Stump and Dead wood: circular plot of size 2.8 m radius
Woody litter: circular plot of size 1.7 m radius

Sub-plot number	Stump Information				Dead wood information			Woody litter (branch less than 5 cm)	
	Species code	Status of stump (alive/ dead)	Dia in cm.	Height in cm.	Species code	Dbh/Dia (cm)	Length of the Log (cm)	**Sub-plot number**	**Weight (in kg upto two decimal places)**
7(1)	**8 (4)**	**9(1)**	**10(3)**	**11(3)**	**12 (4)**	**13(3)**	**14 (3)**	**15(1)**	**16(4)**
								1	
								2	
								3	
								4	

Date…… Signature of the Crew Leader……

Note:- i) First Number in the row below the field headings represents the column number and the number inside the bracket represents the column width

Outputs of NFI published in ISFR 2019



1. Tree cover
2. Growing stock of Forest & TOF
3. Carbon stock of Forest
4. Bamboo resource of the country
5. Major Invasive species
6. Important NTFP species
7. Major species in Trees Outside Forests (TOF)

OUTCOMES - Forest Resource Accounting (NFI)

Growing Stock

- Total Growing Stock is estimated to be 5,915.76 million cubic meters
- 55.69 cubic meters Average Growing Stock per ha in Forests
- Arunachal Pradesh with 458.00 million cubic meters ranks highest among states
- Followed by Uttarakhand 406.08, Chhattisgarh 358.96 & Himachal Pradesh 347.07 million cum.

Growing Stock	2017 assessment (million cum)	2019 assessment (million cum)	Change/Increase (million cum)	% increase
Forests	4,218	4,273	55	1.3
TOF	1,604	1,642	38	2.4
Total	5,822	**5,916**	**94**	**1.6**

Carbon stocks in different Carbon pools

Component	Carbon stock in forest in 2017 (million tones)	Carbon stock in forest in 2019 (million tones)	Net change in Carbon stock (million tones)	Annual increase in Carbon stock (million tones)
Above Ground Biomass	2237.5	2256.5	19	9.5
Below Ground Biomass	698.7	700.8	2.1	1.0
Dead wood	30.1	35.8	5.7	2.9
Litter	136.2	127.9	-8.3	-4.1
Soil Organic Carbon	3979.2	4003.6	24.1	12.1
Total	**7082.0**	**7124.6**	**42.6**	**21.3**

- Total carbon stock 7,125 million tonnes
- Increase of 43 million tonnes since last assessment

Bamboo Resources of the Country

- Total bamboo area -16.00 million ha
- Increase of 0.32 million ha since last assessment.
- Green Bamboo stock -278 million tonnes
- Increase of 89 million tonnes since last assessment.

Potential production of timber from TOF

- TOF plays an important role in production of timber and fuel wood.
- About 80% of people's demand of timber and fuel wood is met from TOF.
- As per the latest assessment, total annual production of timber from TOF is estimated as 85.16 m.cum.
- Annual increase of timber production has been observed as 1.0 m.cum as compared to last assessment in 2017.

FOREST RESOURCE ACCOUNTING AT FSI

India's Forests vis-à-vis Forest Resources in the World

- Globally, India is ranked 10th in Forest area(GFRA 2015).
- India is ranked 8th greatest annual gain in forest area and forest carbon stocks.
- India is ranked 11th in Growing Stock.

Information available with FSI

- Biennial reporting since 1987
- Forest Cover information of over 35 years.
- Forest Inventory of over 20 years.

Forest Inventory – Pre-requisities

0.Objectives

1.Past Records:-

-Working Plans having information (Growing Stock, Volume of wood, Tree species etc.)

- FSI Reports (ISFR, TIS)

2. Resources:-

-Manpower

-Finance

-Equipment (tools)

-Time-Line

3. Generation of Sample Size

4. Adequate Placing and Planning work

5. Analysis, Processing and Reporting of Results

Thank You

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