

FIELD MANUAL

FOR

FOREST INVENTORY



ANDHRA PRADESH FOREST DEPARTMENT

HYDERABAD

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1 Introduction

Forest is a renewable resource and needs to be managed on a scientific basis to provide goods and services to the people. The need for this is greater in our country and the state because of the growing population and limited resources. Information on growth rate and drain are necessary for efficient planning and management information about the quantity and quality of the forests, and this is provided by inventories.

Forest inventory has been defined by B. Husch as an attempt to describe the quantity and quality of forest trees and many of the characteristics of the land area upon which the trees are growing (FAO Forestry and Forest Products Studies No. 17). A complete forest inventory should include a description of the forested area, its ownership, estimates of volumes of the standing trees, and estimates of growth and drain.

The objectives of the inventory are to get information about the vegetation in the forest area. Inventory includes mapping, sampling and analysis. The present inventory will make use of a combination of Geomatics and field inventory data for assessment of growing stock and forest condition.

This manual is intended for the crews, inventory officer and data processing staff. It gives the procedure to execute the ground sampling work, right from planning to dispatch of completed data.

2 Objectives of the Field Inventory

The main objectives of the field inventory are as follows

- To collect qualitative and quantitative information, about the forest resources
- To prepare reports on potentiality and other forest based investigations
- To serve the data needs of development planning at state and district level.
- Estimate growing stock and its species-wise distribution
- To know the spatial distribution of NTFP and medicinal plants

3 Sampling strategy

Stratified random sampling technique is being used for locating sampling points for data collection. At the first stage, entire forest area is divided into seven ecological zones basing on the species composition. Subsequently in each ecological zone, stratification is carried out basing on forest type and canopy density. Existing field inventory data is overlaid on these strata to determine the points required to be inventoried to achieve a desirable precision of 80%. These points are then laid randomly on these strata and maps generated for field use.

4 Fieldwork

Each crew should complete inventory of two plots of 0.1 ha. on an average in every working day. Presuming the availability of 25 working days in a month the output should be about 50 plots per crew per month.

4.1 Field crew and its duties

The field inventory will be carried out by special crews constituted for the purpose and suitably trained. The inventory work will be under the control of the inventory officer of the Circle/Division. The crew strength will be as follows:

Team member	Number	Duties
Crew leader (Forest Section Officer trained in Forest Inventory)	1	Planning fieldwork in advance. Navigating to the plot and plot layout. Filling plot approach and description form, herbs, shrubs, climbers and regeneration form. Assigning duties to crew members.
Asst. Crew leaders	2	Navigating to the plot and plot layout. Filling tree enumeration form and bamboo form
Local forest staff	1	Navigating to the plot and plot layout. Arranging helpers and assisting in fieldwork.
Field Assistants	4	Assisting in fieldwork.

4.2 Field Equipments

The following equipment will be carried by each field party.

Equipment	No.	Use
GPS	1	For navigating to the plot and recording at plot center and corner.
Compass	1	Plot layout.
Measuring line	1	For plot layout.
Flags	5	For marking corners and centre.
Calipers	2	For measuring diameter of the trees.
Altimeters	1	For measuring height of the trees.
Tape	1	For plot layout.
Crow bar	1	For planting flags at corners. For collecting soil sample
Axe/ Bill hooks	2	For clearing bushes
Marking pens / paint	As per requirement	

Field forms and board, field manual, Maps/ imageries, Bag/haversack, Note book, pencil, ball pen, Scale, protractor, Sleeping bag, Torch Light	As per requirement
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4.3 Maps for fieldwork

The maps will be provided for each Forest Beat by the Geomatics Centre with the randomly generated inventory points overlaid on topographic maps of 50K scale. The crew leader should ensure that all the maps are returned back to the Division level Designated Officer after the completion of inventory.

4.4 Organizing fieldwork

The fieldwork will be carried out as per the movement plan prepared by the Divisional Forest Officer. The DFO should select their camping sites in such a manner that maximum number of sample plots can be covered from a camp with minimum travel time.

The Crew Leader should see that the day to day programme is so chalked out that they are not required to make wasteful journeys. They should ensure that their party is fully equipped with stores, camp and survey equipment, ration, medicines etc. before commencement of the field work. Any requirement should be informed to the DFO for fulfilment. They should also see that adequate field forms are carried in field, each member has understood the field manual and the work to be done. The duties of the crew have been stated in the duty-chart. The crew leader will distribute the work of inventory to the crew members and may make suitable modifications in the duty-chart if necessary.

As a general routine Crew Leaders should keep good liaison with the local forest staff and see that the camps are properly, neatly and systematically arranged and the staff maintains decorum and proper discipline in the camps.

4.5 Navigating to the plot

4.5.1 Required SETUP of GPS

It should be ensured that the GPS is SET to Indian Bangladesh Datum and HDD format. To do this proceed as follows.

- Switch on GPS
- Press PAGE button to reach the fifth screen with the Title MAIN MENU
- Use arrow to reach SETUP MENU
- Press ENTER
- Use arrow to scroll to NAVIGATION and press ENTER
- The Screen should look as given here \Rightarrow

NAV SETUP
POSITION FRMT: hddd.ddddd°
MAP DATUM: Indian Bngldsh
CDI: ± 0.25
UNITS: METRIC
HEADING: TRUE DEGREES

- In case your GPS SETUP does not look like this then immediately contact the Division level Nodal officer
(The detailed procedure is explained in Appendix 5.1)

4.5.2 To store a position of the waypoint

Switch the ON the instrument by pressing the red button on the instrument > Wait the till the position appears in the second screen > Press Mark Button > Change the label and symbol if required > Press Enter Button (DONE).

4.5.3 To create a way point

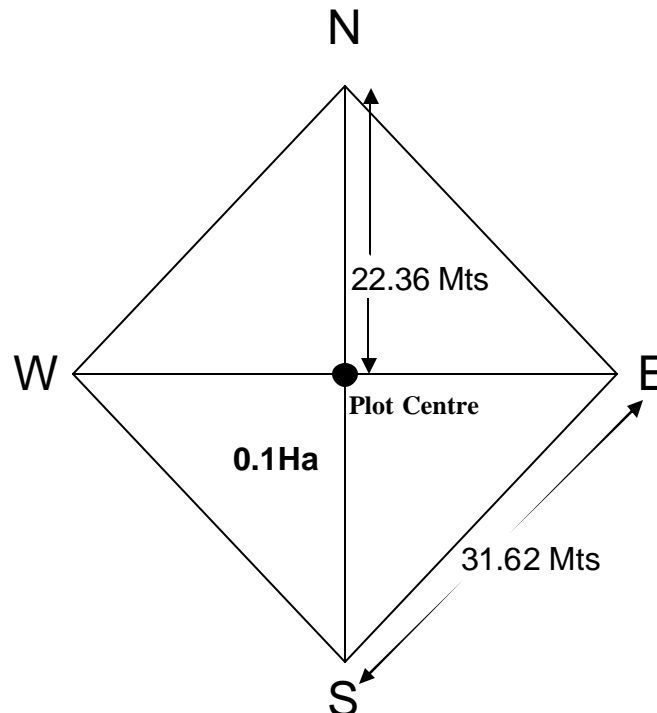
Goto Main Menu Page > Waypoint > New > Enter the position, number, label > Done.

4.5.4 To Navigate

Press GOTO Button > Select Waypoint from the list > Press Enter Button > It Displays the Compass with Bearing and Distance.

4.6 Layout of the main plot in the field

After reaching the plot centre fix a stout pole of 10 cm dia. and 1.5 m in height at the centre. The layout of the plot will be done as follows.



After fixing the plot centre fix the N, S, E and W corners of the plot by measuring 22.36 m, horizontal distance by tape/rope in all four directions. Stout pegs or bamboo of 1.5 m height should be fixed at each corner and a flag attached to it. Check the correctness of layout by measuring each side, which should be 31.62 m.

If possible ranging rods also can be used as corner posts. A red/orange/white colour cloth may be tied at the top end of these corner posts for getting clear visibility from different spots in the plot.

4.6.1 Layout of the plot for shrubs and regeneration

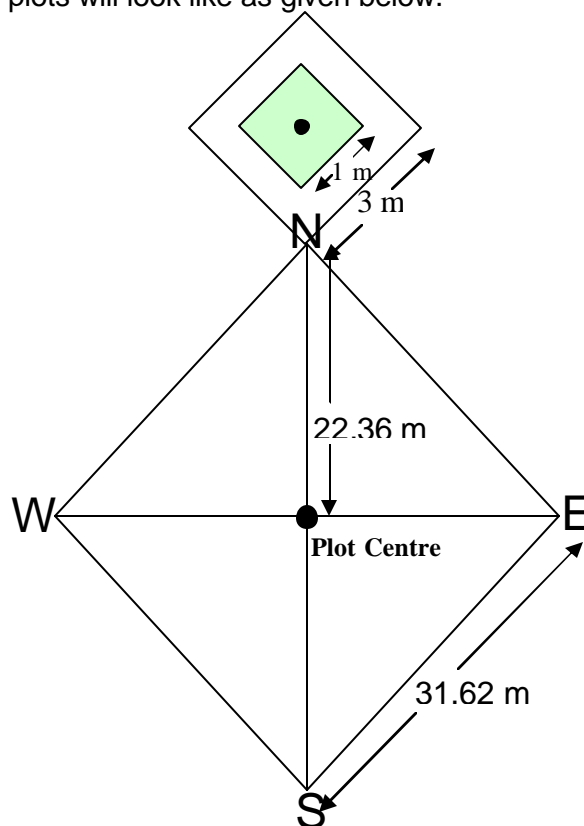
This plot will be laid after the data collection on the main plot is over. One plot of 3 m x 3 m will be laid. To lay the plot proceed as follows.

Proceed to the northern corner of the plot. From this corner measure **2.12 m** in the northern direction and mark the point. This will be the center of this plot. From this point mark three points at a distance of 2.12 m in each direction N, E and W. This will give four corners for the plot for shrubs and regeneration.

4.6.2 Layout of the plot for herbs

One plot of 1 m x 1 m will be laid for this purpose. The center of this plot will be the same as that of the plot of Shrubs and Regeneration as marked above. From this plot centre, mark **0.71 m** in the N, S, E and W directions.

After layout the plots will look like as given below.



4.6.3 Collection of Soil Data

Soil sample data shall be collected in the following manner.

See the various landcover available in the area e.g., bare soil, grassy patch, shrub or tree covered area and select four such areas for digging four small soil pits. The area from which the soil sample is to be taken should be cleared of vegetation with the help of bill hook or axe. Then with the help of crowbar/ spade dig a V-Shaped pit of 15 cm x 15 cm and 15 cm depth at each plot. The dug out soil from the pit should be removed and it should not be mixed with collected soil. Using a *Thapi*¹ scrape about 250 gm of soil sample from the sides. The soil so collected from all the subplots shall be mixed thoroughly and take a sample of 1 kg. A sample card bearing Name of Division, Range and Plot no. should be kept in the bag. This information should also be written on the plastic bag. If the samples are wet then care should be taken that the label should not be spoilt. This sample bag should be tied up with a rubber band and deposited at headquarter on regular intervals.

4.7 Data Collection

While the plot is being laid and data is being collected the Crew leader should complete the plot approach form and plot description form. The following precautions should be observed while collecting data.

- The forms should be filled in good legible writing.
- The code numbers should be correctly and neatly recorded.
- Overwriting should be avoided. If an entry is found to be wrong, it should be cut and correct entry made.
- If complete data of a plot cannot be accommodated in one sheet, a second sheet of the same form may be used clearly marking Page 1/2, 2/2 etc.

On completion of the work in a plot, the crew leader should scrutinize the forms if any information is missing or doubtful. All equipment should be collected. The crew should then proceed to the next plot and repeat the work. After completing all the crew should return back. Once in the camp the crew leader should again scrutinize the forms to ensure that no information is missing before sending it to the Designated Officer for Forest Inventory.

¹ *Thapi* is an equipment used by masons for cementing/plastering work.

4.8 Data collection and recording

Data has to be recorded in the prescribed forms, which are:

- Form 1 Plot Approach Form and Plot Description Form
- Form 2 Tree Enumeration Form
- Form 3 Herbs Form
- Form 4 Shrubs & Regeneration Form
- Form 5 and Climbers Form
- Form 6 Bamboo Enumeration Form

The field forms should be filled up using the correct codes which are explained here:

While filling this form the Crew Leaders should bear in mind that all information in this form is recorded in such a manner that it will help in relocating the plot during checking and re-inventory.

4.8.1 Plot Approach Form (Field Form No.1)

The latitude and longitude will be uploaded in GPS and will be used for navigating to the plot centre from nearest known feature. This form will give details such as mode of travel up to the plot. This form will also indicate the time taken in travel and measurements for time and work studies.

Col. No.	Field	Description
1.	Plot No.	This will be the code number/serial number given in the table in the plot map
2.	Name of Camping place	Place of previous night halt
3.	Time (Hrs. at which left the camp)	This will be 24 hr time e.g. 6 AM will be 06.00 and 4.30 PM will be 16.30
4.	Distance covered by vehicles in Km	
5.	Name of the Place up to which journey was performed	Name of the village, road junction near the point to which journey was performed in vehicle
6.	Time at which started on foot	This will be 24 hr time.
7.	Time of reaching the plot centre	This will be 24 hr time.
8.	Plot center Lat: (DD) Long: (DD)	This will be the actual Lat and Long as recorded by the field team at the plot center.
9.	Plot Northernmost point Lat: (DD) Long: (DD)	This will be the actual Lat and Long as recorded by the field team at the northernmost point of the plot. It should be recorded after layout of plot.
10.	Time of completing the plot	This will be 24 hr time.

All latitude and longitude values will be recorded in POSITION FRMT: hddd.ddddd°
and in MAP DATUM: Indian Bngldsh.

4.8.2 Plot Description Form (Field Form No. 1)

Col. No. 1: Zone Code

This is to be filled as per Zone code table given below

Zone Code	Districts
1	Adilabad, Nizamabad, Karimnagar, Warangal, Khammam (Except Bhadrachalam (S) Division)
2	Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Bhadrachalam (S) Division (of Khammam District)
3	Medak, Rangareddy, Hyderabad and Mahabubnagar Division (of Mahabubnagar district)
4	Kadapa, Nellore, Chittoor
5	Ananthpur, Kurnool Division (of Kurnool district)
6	Prakasham, Atmakur and Nandyal Divisions (of Kurnool district), Achampet Division (of Mahabubnagar district)
7	Nalgonda, Guntur, Krishna

Col. No. 2: Division Name

Write the name of the Forest Division where inventory work is being done.

Col. No. 3: Range Name

Write the name of the Forest Range where inventory work is being done.

SOIL DATA

Col. No. 4: Soil Depth

Soil depth can be seen in cuttings and stream banks, nalas, open wells and also by seeing luxuriance of vegetation.

Code	Class	Soil Depth (cm)
1.	Extremely shallow	Soil less than 10 cm depth
2.	Very shallow	10 – 25 cm
3.	Shallow	25 - 50 cm
4.	Moderately Shallow	50 – 75 cm
5.	Moderately Deep	75 – 100 cm
6.	Deep	100 – 150 cm
7.	Very Deep	Soil more than 150 cm depth

Col. No. 5: Humus

Humus is the decomposed organic matter which becomes the upper most soil layer. It should be clearly distinguished from un-decomposed leaf litter. The leaf litter should be removed and humus depth measured and categorized as:

Code	Class	Description
1.	No humus	No humus at all
2.	Very shallow	Humus less than 2 cm
3.	Shallow	Humus 2 - 5 cm
4.	Medium	Humus 5 - 10 cm
5.	Deep	Humus more than 10 cm

Col. No. 6: Stoniness

This refers to stone and boulders in the soil and the percentage of area covered by them.

Observe the <u>size of rock fragment</u> and classify as follows	Observe the <u>% of area occupied</u> by the dominant size class of rock fragment																
<table><tr><th>Size (in cm)</th><th>Class</th></tr><tr><td>Upto 8 cm</td><td>Gravel</td></tr><tr><td>8 – 60 cm</td><td>Stone</td></tr><tr><td>More than 60 cm</td><td>Boulder</td></tr></table>	Size (in cm)	Class	Upto 8 cm	Gravel	8 – 60 cm	Stone	More than 60 cm	Boulder	<table><tr><th>% of area occupied</th><th>Class</th></tr><tr><td>Less than 10%</td><td>No stones</td></tr><tr><td>10 – 50%</td><td>Very</td></tr><tr><td>More than 50%</td><td>Extremely</td></tr></table>	% of area occupied	Class	Less than 10%	No stones	10 – 50%	Very	More than 50%	Extremely
Size (in cm)	Class																
Upto 8 cm	Gravel																
8 – 60 cm	Stone																
More than 60 cm	Boulder																
% of area occupied	Class																
Less than 10%	No stones																
10 – 50%	Very																
More than 50%	Extremely																

Using the above two observations, classify as follows.

Code	Class	Description
1.	No stones	Where rock fragments occupy less than 10% of the ground
2.	Very Gravely	Where gravel occupies 10-50% of the ground
3.	Very Stony	Where stones occupy 10-50% of the ground
4.	Very Bouldery	Where boulders occupy 10-50% of the ground
5.	Extremely Gravely	Where gravel occupies more than 50% of the ground
6.	Extremely Stony	Where stones occupy more than 50% of the ground
7.	Extremely Bouldery	Where boulders occupy more than 50% of the ground

Col. No. 7: Erosion status

This may be classified as follows.

Code	Class	Description
1.	No erosion	
2.	Slight	Sheet erosion, Only surface erosion is seen.
3.	Moderate	Rills are seen
4.	Strong	Gullies are seen
5.	Severe	Gullies, ravines and landslips are seen.

CROP DATA

Crop data will be recorded only where land use is shown as Forest Land. This will be observed over an area of **about** 2 ha in and around the plots while navigating to the plot center.

Col. No. 8: Origin of stand

Code	Description
1.	Natural Forest of seed origin
2.	Forest of coppice origin
3.	Plantation
4.	Mixed, where seedling and coppice origin trees are mixed

Col. No. 9: Basal Area

Using the wedge prism, count the number of TALLY trees and multiply this number by the Basal Area Factor (BAF) to arrive at the Basal area in m²/ha

e.g. if the number of tally trees is 8 and BAF is 2 then the

Basal area in m²/ha = No. of TALLY trees X BAF = 8 X 2 = 16 m²/ha.

(The detailed procedure is explained in Appendix 5.4)

Col. No. 10: Number of storeys

See whether the forest is single storeyed, multi storeyed or mixed.

Code	Class	Description
1.	Single storey	All trees approximately of same height.
2.	Multi storey	Trees occupy two or three clearly distinguishable different levels

3.	Mixed	Trees of different heights occupying more than three levels or separate levels not distinguishable
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Col. No. 11: Seedling Regeneration

This should be taken from actual count of seedlings of **tree** species in the North-Eastern quadrant and classified as follows. Do not include regeneration of herbs and shrubs in this.

Code	Class	Description
1.	Profuse	More than 62 seedlings
2.	Adequate	31- 62 seedlings
3.	Inadequate	Less than 31 seedlings
4.	Absent	No regeneration

Col. No. 12: Coppice Regeneration

This should be taken from actual count of **stumps** having coppice shoots of **tree** species in the North-Eastern quadrant and classified as follows.

Code	Class	Description
1.	Profuse	More than 12 stumps
2.	Adequate	6-12 stumps
3.	Inadequate	Less than 6 stumps
4.	Absent	No stumps with coppice shoots

Col. No. 13: Bamboo Occurrence

If bamboo occurs in the plot, its occurrence should be classified as

Code	Class	Description
1.	Pure	200 or more clumps / ha
2.	Dense	100 - 200 clumps / ha
3.	Medium	50-100 clumps/ha
4.	Scattered	Less than 50 clumps / ha
5.	Absent	No bamboo

Col. No. 14: Bamboo flowering

Code	Class	Description
1.	Sporadic	When less than 10% of the clumps have flowered
2.	Gregarious	When majority of the clumps have flowered
3.	No flowering	

Col. No. 15: Bamboo Regeneration

Examine if natural regeneration of bamboo from seed is existing. Classify as:

Code	Class	Description
1.	Profuse	Area carpeted with regeneration i.e. More than 75% are covered with regeneration
2.	Adequate	50-75% area covered with regeneration
3.	Inadequate	Less than 50% area covered with regeneration
4.	Absent	

INCIDENCE DATA**Col. No. 16: Incidence of Weeds**

Look at the ground and estimate the surface area occupied by weeds and classify as

Code	Class	Description
1.	Dense	Where weeds occupy more than 50% of the area
2.	Medium	Where weeds occupy approximately 10-50% of the area
3.	Low	Where weeds occupied less than 10% of the area
4.	Absent	No weeds

Col. No. 17: Incidence of Grass

Look at the ground surface area occupied by grass within and 2 ha around the plot and classify into categories.

Code	Class	Description
1.	Dense	More than 50% of the area covered by grass
2.	Medium	10-50% of the area covered by grass
3.	Low	Less than 10% of the area covered by grass

4.	Absent	Grass totally absent
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Col. No. 18: Fire incidence

This can be judged by presence of ash, burnt twigs, charring (blackening) of under growth & trees, absence of dry leaf litter and young regeneration depending on the intensity & frequency of fire. This may be classified as

Code	Class	Description
1.	High	Stems are blackened, bark is burnt, crown is burnt and some trees dead. Undergrowth burnt. Soil is charred.
2.	Medium	Stems are blackened, bark is burnt, crown not burnt and trees not dead. Undergrowth burnt. Soil is charred. Bark may be slightly blackened (charred).
3.	Low	Undergrowth burnt. Burnt twigs found. Soil may be charred.
4.	Absent	Fire totally absent

Col. No. 19: Grazing

This can be judged by presence of cattle, cattle dung, hoof marks and signs of grass been eaten. Intensity of grazing can be judged as follows.

Code	Class	Description
1.	High	Cattle seen or fresh cow-dung seen and hoof-marks visible. Soil compacted due to trampling, plants also trampled. Grass eaten.
2.	Medium	Cow-dung seen at one or two places, hoof marks visible. Soil not compacted, grass also visible
3.	Low	Hoof marks and cow-dung not visible. Soil not compacted. Some signs of grazing however visible.
4.	Absent	No signs of grazing.

Col. No. 20: Felling

This is generally the unregulated felling by villagers. Trees or branches may be cut, pollarded or lopped.

Code	Class	Description
1.	High	Most of the trees are badly mutilated may be resulting in bushy growth
2.	Medium	Trees only partially damaged with the main stem in general intact
3.	Low	Signs same as above but on a sporadic scale

4.	Absent	No felling is noticed
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Col. No. 21: Pest damage

Due to pests like borers, defoliators etc. which can be seen by holes in stem, wood dust, defoliated & skeletonised leaves and presence of larvae. Fungal damage can be seen by presence of fruiting bodies.

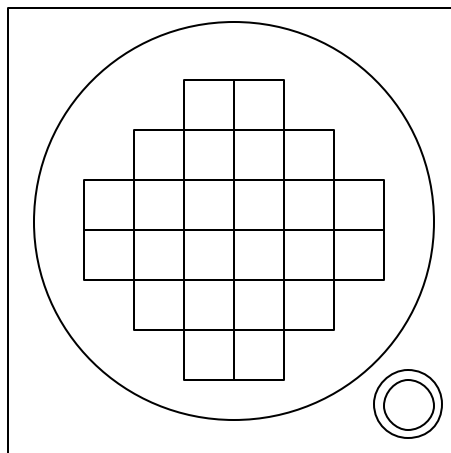
Code	Class	Description
1.	High	More than 50% of trees affected
2.	Medium	25-50% of trees affected
3.	Low	<25% trees affected
4.	Absent	No pest damage

CANOPY DENSITY

Col. No. 22 – Col. No. 26:

Use the densiometer to measure the canopy density and write its value.

The densiometer has a mirror on which 24 squares are marked as shown in the adjacent figure. Each square is mentally divided into 4 parts called 'dots'. Hold the equipment firmly on right palm, at waist-level about 10 inches above from body, such that the shadow of the observer does not fall on the mirror. Support the instrument by holding the right wrist with the left hand. First try to bring the air bubble in the spirit level at the center. Then focus on the image of tree canopy falling in the mirror and start counting the dots from the topmost square. Each square completely occupied by tree canopy is counted as 4 'dots'. Similarly a half filled square is counted as 2 dots and $3/4^{\text{th}}$ filled as 3 'dots' and $1/4^{\text{th}}$ filled as 1 'dot'. Count the total number of 'dots' occupied by tree canopy and enter in the table. This work has to be repeated at N, E, S, and W corners and center of the plot.



4.8.3 Tree Enumeration Form (Field Form no. 2)

In this form diameter and Height of trees will be recorded. In the North Eastern (NE) quadrant, diameter and height of the trees shall be measured. In the remaining part of the plot only DBH shall be measured. All trees will be given a serial number starting from the NE quadrant and this number shall be continued over the whole plot.

Trees below 10 cm diameter at breast height over bark and dead trees should not be enumerated. The tree numbers can be written by paint or marker pen **without** scraping the bark in the sample plot.

Tree enumeration form for each plot will be maintained separately. If a plot contains large number of trees that cannot be accommodated in one sheet, another sheet may be used, and total number of sheets should be written in the top right corner of the form.

Suppose if any plot requires 3 forms to enumerate the total number of trees in the plot

- First page will be written as 1/3
- Second page will be written as 2/3
- Third page will be written as 3/3 etc.

Regarding border line trees, the stems of which touch the north-western and north-eastern plot boundaries will be considered as “in trees” and counted. Stems of trees which touch the south-eastern and south-western southern boundaries of plot will be considered as “out trees” and will not be enumerated.

Enumeration will commence from the north-eastern quadrant and proceed in a clockwise direction. The diameter of trees will be measured at breast height (1.37 m from the ground level), measuring on the uphill side and will be recorded in centimeters. The axis of calipers i.e. the long arm will always be kept pointing to the plot centre while taking diameter measurement of trees. The tree height has to be measured using altimeter. Coding instructions are as follows. (Refer Appendices for Diameter and Height measurement).

Col. No. 1: Plot no.

This will be plot no.

Col. No. 2: Tree no.

As marked on the tree

Col. No. 3: Species code

Refer to the table for species code and enter it.

Col. No. 4: Species name/Local Name

Botanical name or Local vernacular name of the species may be written

Col. No. 5: DBH

Diameter at Breast Height **(DBH) in cm** in three digits. This will be measured using calipers, taking care that the long arm is pointing towards the plot centre.

Col. No. 6: Tree height

This will be the **Total height in meters** measured using RAVI altimeter. Tree height shall be measured In the North Eastern (NE) quadrant only. In the remaining part of the plot only DBH shall be measured. All trees will be given a serial number starting from the NE quadrant and this number shall be continued over the whole plot.

(The detailed procedure is explained in Appendix 5.2, 5.3)

(The species codes are given in Appendix 5.5)

4.8.4 Herbs Form (Field Form No. 3)

The data regarding herbs is to be collected from one square sub-plot of 1m x 1m laid within the Shrubs and Regeneration plot at the northern corner of the main plot.

Herbs are defined as plants usually not exceeding 1 m in height with soft stem.

Care may be taken that young regeneration of the tree species is not included in the categories of herbs & shrubs.

Col. No. 1: Plot no.

This will be plot no.

Col. No. 2: Herbs - Species name

Botanical name should be written.

Col. No. 3: Herbs - Local name

Local name should be written.

Col. No. 4: Herbs – Number of plants

Write the number of plants for this species found in the 1 x 1 m plot.

4.8.5 Shrubs & Regeneration Form (Field Form No. 4)

Similarly, the data regarding shrubs and regeneration is to be collected from a square plot of 3 m x 3 m laid out at the northern corner of main plot.

Shrubs are defined as plants usually not exceeding 3 m in height with woody stem.

Regeneration information should be collected only for tree species.

Col. No. 1: Plot no.

This will be plot no.

Col. No. 2: Shrubs - Species Name

Botanical name should be written.

Col. No. 3: Shrubs - Local Name

Local name should be written.

Col. No. 4: Shrubs - Number of plants

Write the number of plants for this species found in the 3 x 3 m plot.

Col. No. 5: Regeneration - Species name/Local Name

Botanical name or Local Name may be written

Col. No. 6: Regeneration - Species code

Refer to the table for species code and enter it.

Col. No. 7: Regeneration – Category

This will be filled as follows:

Code	Class	Description
1.	Established	Plants having height more than 2 m
2.	Un-established	Plants which having height less than 2 m but are more than one year old seedling. It will include whippy and sub-whippy plants.
3.	Recruit	Very small plants having 2-4 leaves but are current years seedling.

4.8.6 Climber Form (Field Form No. 5)

Climbers should be recorded only in the NE quadrant of the main plot.

Col. No. 1: Plot no.

This will be plot no.

Col. No. 2: Climber – Species Name

Botanical name should be written.

Col. No. 3: Climber – Local Name

Local name should be written.

Col. No. 4: Climber - Number of plants

Write the number of plants for this species found in the NE quadrant.

4.8.7 Bamboo Enumeration Form (Field Form No. 6)

All bamboo clumps will be serially numbered and its data recorded in this form. Each clump species and diameter will be recorded as in case of trees. Every fifth clump starting from first will be for detailed measurement in which culms by age will be recorded and the total number of dry including decayed, culms, and high cuts will also be recorded. The number of green culms in each diameter class and the average height will also be recorded.

Col. No. 1: Plot no.

This will be plot no.

Col. No. 2: Clump no.

As marked on the Bamboo clump.

Col. No. 3 Species name

Botanical name or local name may be written

Col. No. 4: Clump girth

Measure the clump girth and record in **m**.

Col. No. 5: Current culms

Count the number of green current year's culms. Culm will have whitish powder and sheath tightly intact.

Col. No. 6: 1-3 years culms

Count the number of green culms which are 1 & 2 year old. Culm will not have whitish powder and the sheath would have partly peeled off.

Col. No. 7: 3+ years

Count the mature culms which are 3 years old or more. Culm will not have any sheath.

Col. No. 8: Total

Total number of green sound culms (Sum of Col. 5, Col. 6 and Col. 7)

Col. No. 9: Dry and decayed culms

Count the number of dry and decayed culms

Col. No. 10: High cuts

Culms of which the upper portion has been cut and removed. They will generally be 0.5 to 1 meter height.

Col. No. 11: No. of culms

Total no. of culms in diameter class 2-5 cm.

Col. No. 12: Height average (m)

Average of height of 2-5 cm diameter class

Col. No. 13: No. of culms

Total no. of culms in diameter class 5-8 cm.

Col. No. 14: Average Height

Average height of diameter class 5-8 cm in meters.

Col. No. 15: No. of culms

Total no. of culms in above 8 cm dia class.

Col. No. 16: Average Height

Average height of diameter class above 8 cm.

5 Appendices

5.1 Appendix 1: Global Positioning System

GPS Stands for Global Positioning System. GPS system is developed by DOD (Department of Defense) of USA. It consists of 24 Satellites covering the globe in six planes. Each plane has a minimum of four satellites. These GPS Satellites are moving at an altitude of 20200 km to provide the coverage. GPS signals are free, available round the clock, anywhere on the globe and in all season. Line of sight is not necessary and there is no need to measure distances. Minimum four satellites must be tracked to get the X, Y, Z coordinates (latitude, longitude, altitude) and three Satellites for X, Y coordinates (latitude, longitude). Only Garmin GPS 12 Handheld GPS shall be used for navigation. The crews will be trained in this equipment. ***Please do not use any other Make or model to avoid confusion.***

5.1.1 Procedure for use of Garmin 12 Handheld GPS.

GPS Instrument will display the following Information:

TIME, Number of Satellites Tracked, Altitude, Lat/Long, Speed

The GARMIN GPS Hand Held Instrument consists of following Buttons:

GOTO	: Used for navigation
RED LIGHT	: This is ON/OFF Button
QUIT	: Goes back one screen
PAGE	: Goes one screen front (It contains 5 screens)
MARK	: To mark the location
ENTER	: To save the coordinates information.
BUTTON FOUR ARROWS	: Cursor movement
DISPLAY SCREEN	: Displays the page wise information

Press **red light** button to switch on the instrument. This Instrument contains Total Five Screens.

- First Screen gives the information about Satellites.
- Second Screen gives the information about Position of the Local features.
- Third Screen gives the information about Maps.
- Fourth Screen displays the Compass.
- Fifth Screen gives the information about the Main Menu.

5.1.2 First Screen

This screen gives the Number of Satellites Tracked i.e., Number of Satellites and their Position on hemisphere, North Direction, Status of Battery Charge.

5.1.3 Second Screen

This screen gives the Time, Position i.e., Northing and Easting (Latitudes and Longitudes), Altitude i.e., Height above the Mean Sea Level in Meters, Trip, Speed i.e., km/hour, Track, True North Bearing (Position information from true north).

5.1.4 Third Screen

It contains the information about the Map, Zooming Scale, Panning, Options.

5.1.5 Fourth Screen

Compass displays the direction of the compass, Distance, Bearing, Track, Speed, and ETA.

5.1.6 Fifth Screen

It contains the information about the Main Menu

- Waypoint an intermediate point - to create, rename, delete way points
- Waypoint list lists the waypoints
- Nearest Wpts lists the waypoints that are more nearest
- Proximity Wpts lists waypoints at a specified distance
- Routes stores waypoints in the form of a route
- Dist and Sun distance and bearing between two points.
- Messages to broadcast messages
- **Setup Menu** **to connect to computer, to change display formats, to set**
- alarm** **etc.**
- Waypoint: an intermediate point in the survey

It displays the information about the position of the feature on the surface of the earth, such as Northing and Easting position, Label of the position, Date and Time of the information acquisition, Reference etc.

- Dst : Distance in KM
- Rename : We can name the Way point (giving labels to way points)
- New : Creating the new way point
- Delete : Deleting the current Way point
- Done : Registering the information in the memory

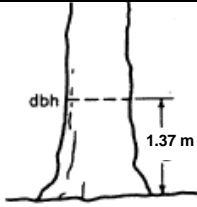
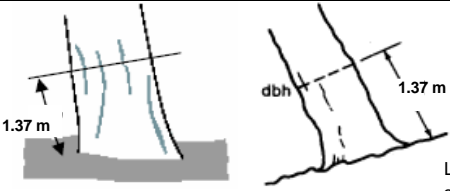
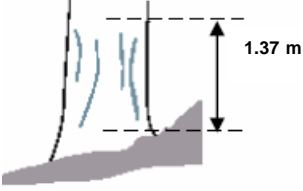
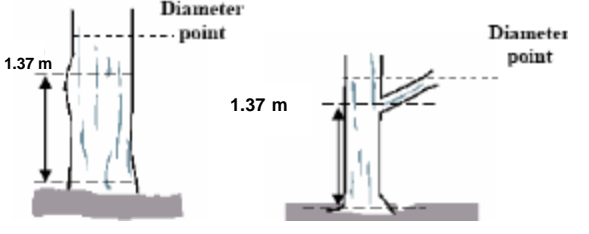
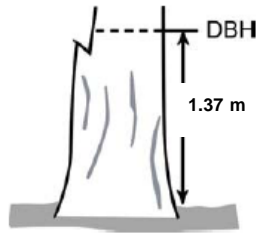
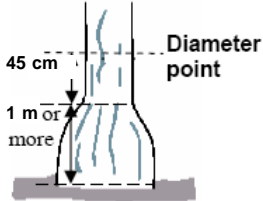
5.1.7 To Change the position format and datum:

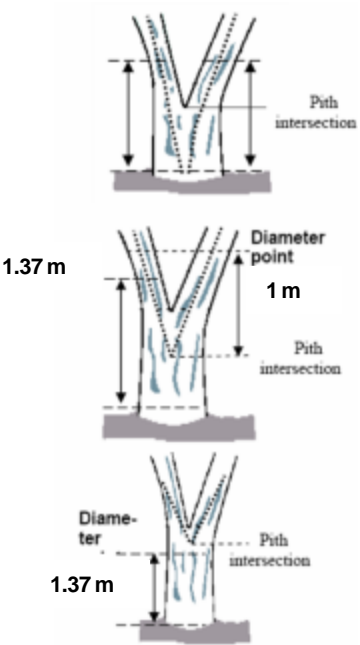
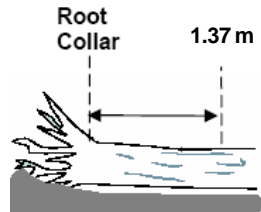
Press Page till Main Menu appears > Select Setup Menu > Select the Navigation > Position Format > Press Enter > Select the required format using UP and DOWN arrows > Similarly Change the datum

In case the field team is not able to reach any point, it should lay the plot at the point where it has reached and inform the matter to the Division level test-checking officer the same day itself. The Division level test-checking officer will then inform the Geomatics Centre through e-mail the same day. Please remember that this concession has to be used very rarely and in case of genuine problems only.

5.2 Appendix 2: Measurement of Tree Diameter

In forest inventory work, tree diameter has been traditionally measured at 1.37 meters above the ground or root of the crown if the root crown is exposed, a point defined as diameter at breast height (DBH). The exact position of DBH is also dependent of individual tree form and topography. For measurement of diameter calipers or tapes are used. The following situations may be encountered in measurement of tree diameter

<p>Diameter on flat ground: Measure DBH at 1.37 m above the ground.</p>	
<p>Leaning tree: Measure diameter at 1.37 m from the ground along the bole.</p>	 <p>Leaning tree on sloping ground</p>
<p>Tree on slope: Measure diameter at 1.37 m from the ground along the bole on the uphill side of the tree.</p>	
<p>Tree with irregularities at DBH: On trees with swellings, bumps, depressions, and branches at DBH, diameter will be measured immediately above the irregularity at the place it ceases to affect normal stem form.</p>	
<p>Missing wood or bark. Do not reconstruct the DBH of a tree that is missing wood or bark or at the point of measurement. Record the Diameter of the wood and bark that is still attached to the tree.</p>	
<p>Tree with butt-swell or bottleneck: Measure these trees 45 cm above the end of the swell or bottleneck if the swell or bottleneck extends 1.0 m or more above the ground.</p>	

<p>Forked tree:</p> <p>Trees forked below 1.37 m. Trees forked in this region are treated as distinctly separate trees. Distances and azimuths are measured individually to the center of each stem where it splits from the stump. DBH is measured for each stem at 1.37 m above the ground.</p> <p>Trees forked at or above 1.37 m Trees forked in this region count as one single tree. If a fork occurs at or immediately above 1.37 m, measure diameter below the fork just beneath any swelling that would inflate DBH.</p>	
<p>Live wind thrown tree: Measure from the top of the root collar along the length to 4.5 feet.</p>	

5.3 Appendix 3: Measurement of Tree Height

Height measurements are collected for every tree of each species encountered in the **North-Eastern quadrant of the whole plot**. For each “height” tree, measure total height, or the distance from the top of the crown to the ground. For this purpose *Ravi altimeter* will be used. The *Ravi altimeter* has five scales – two for the heights graduated to distances, one for the degrees, one for the slope correction and one for the slope percent.

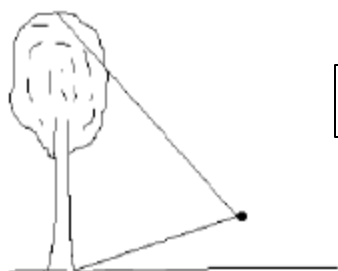
Tree height determination requires altimeter readings of both tree top and base levels. The values will be added if they have the opposite sign and subtracted from one another if they have the same sign.

The use and operation of Ravi altimeter is as follows

- Measure 20/30 m distance from the base of the tree in a direction such that top and bottom are visible.
- Hold the instrument firmly in one hand, support with other hand and sight the top/bottom of the tree through eye (the instrument holding side) with other eye closed.
- After the top/bottom is sighted, close sighting eye, open other eye and observe the needle to stabilize. Click the locking pin gradually without shaking the instrument.
- See the appropriate scale in the altimeter and note down the reading.

The following cases may be encountered while measuring tree height.

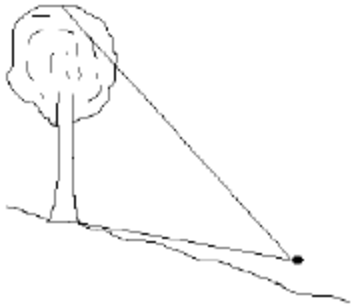
Case I - On a Flat ground: Record the top height and add the height of the eye level.



Total Height = Top Height + Height of the eye level.
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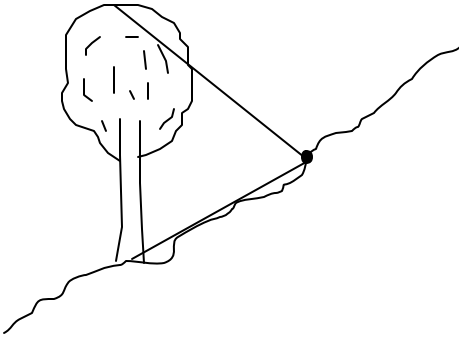
Case II - On a Sloping Ground: Height of the tree top and bottom has to be recorded.

- **Case II a:** If the observer is on the downhill side and below the base of the tree, the base value is subtracted from the top value.



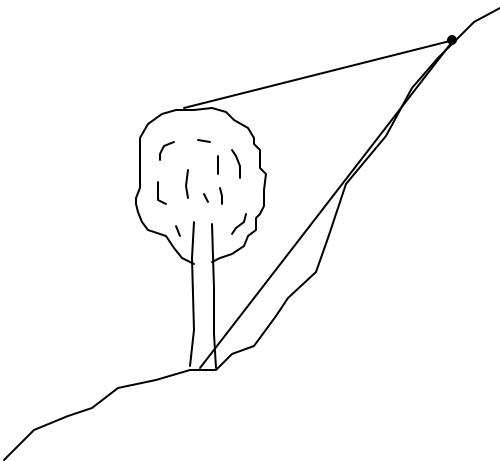
$$\text{Total Height} = \text{Top Height} - \text{Bottom Height.}$$

- **Case II b:** If the observer is on the downhill side and above the base of the tree, the base value is added to the top value.



$$\text{Total Height} = \text{Top Height} + \text{Bottom Height.}$$

- **Case II c:** If the observer is on the downhill side and above the base and top of the tree, the top value is subtracted from the base value.



$$\text{Total Height} = \text{Bottom Height} - \text{Top Height.}$$

5.4 Appendix 4: Measurement of Basal Area using wedge prism

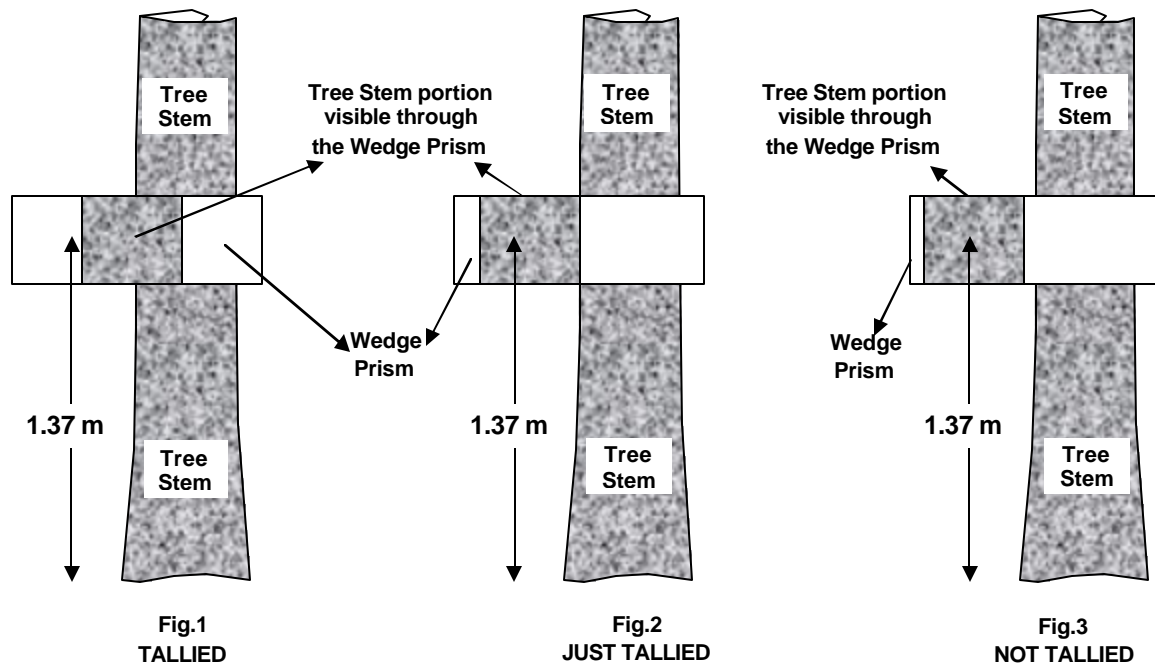
Basal Area is a way of explaining the crowdedness or density of a stand. The basal area of a tree can be thought of as the surface area of the top of the stump if the tree was cut at 1.37 meters above the ground. The total surface area of all the stump tops in a hectare is the basal area per hectare.

Basal area measurements are expressed in square meters per hectare. A wedge prism is used to measure basal area. Each wedge prism has a particular Basal Area Factor (BAF), like 0.5, 1, 2.0, 5, 10 square meters per hectare.

The use and operation of a wedge prism is very easy and is given below

- Place a 1.37 m tall stick at the plot center and place the wedge prism on it. In case the plot center has a stone carrion then place this stick as close to the carrion as possible.
- Look through the prism and observe the tree stem at breast height through it. Rotate the prism and move yourself in a complete circle while looking through it.
- The line of sight should be at right angles to the prism.
- You can begin with a tree in the northern direction or any other prominent tree.
- Observe the displacement of the stem portion seen through the Wedge Prism.
- If the displacement of the tree, as seen through the prism, is such that the displaced portion is within the limits of the tree stem, as shown in Fig.1, the tree is said to be '*TALLIED*' and it is counted.
- If the displacement coincides with the tree's edge, as shown in Fig.2, it is borderline tree (*JUST TALLIED*).
- If the displacement of the tree, as seen through the prism, is beyond that part of the tree not seen through the prism, as shown in Fig.3, the tree is '*NOT TALLIED*' and it is not counted.
- While counting, maintain the 1.37 m tall stick perpendicular to the ground; rotate the wedge prism on this stick itself and you should also move in a circle around this stick. *Do not move the stick from its place while making observation.*
- As you continue around your circle to the direction that you began, you total how many trees are counted.

- Total number of IN trees = Total number of TALLIED trees + $\frac{1}{2}$ (Total number of JUST TALLIED trees)
- Basal area = Total number of IN trees X Basal Area Factor



Correction for slope: The correction for the slope is applied, if the slope is more than 18 degrees.

- In sloping areas try to maintain the stick perpendicular to the ground, with the help of altimeter provided to you.
- Follow the procedure of calculating the basal area as in case of level ground
- With the help of altimeter, observe the slope in degrees.
- Multiply the basal area obtained with the multiplication factor using the Table given below.

Angle of Slope	Multiplication factor
20	1.064
25	1.103
30	1.155
35	1.221
40	1.305
45	1.414

Angle of Slope	Multiplication factor
50	1.558
55	1.743
60	2
65	2.366
70	2.924
75	3.864

5.5 Appendix 5: Species Names and Codes for Trees

Code	Local Name	Scientific Name
1	Usiri	<i>Emblica officinalis</i>
3	Revada, Dog Teak	<i>Dillenia pentagyna</i>
6	Tella sampenga, White Champak	<i>Michelia nilagirica</i>
8	Ramaphalam, Ramphal, Ramasetha	<i>Annona reticulata</i>
9	Setha phalam, Custard apple	<i>Annona squamosa</i>
11	Tiga sampangi, Manoranjitham	<i>Artabotrys hexapetalus</i>
14	Ashoka, Naramamidi, Devadaru	<i>Polyalthia longifolia</i>
26	Vutharasichettu	<i>Cadaba Fruticosa</i>
33	Konda Gogu, Adavi Goga, White silk cotton	<i>Cochlospermum religiosum</i>
42	Iron wood, Naga Kesara	<i>Mesua ferrea</i>
43	Tea, Theyaku	<i>Camellia thea</i>
46	Sal, Guggilam	<i>Shorea robusta</i>
69	Ganga Ravi, Umbrella Tree	<i>Thespesia populnea</i>
72	Buruga, Semal	<i>Bombax ceiba</i>
73	Buruga, White silk cotton Tree	<i>Ceiba pentandra</i>
74	Rudraksha	<i>Guazuma ulmifolia</i>
78	Tapsi, Konda Tamara, Tanuku	<i>Sterculia urens</i>
86	Jana	<i>Grewia rotundifolia</i>
88	Tada Chettu, Pedda Jana	<i>Grewia tiliaefolia</i>
93	Pagadamu Chettu, Bastard Sandal	<i>Erythroxylon monogynum</i>
100	Maredu	<i>Aegle marmelos</i>
103	Nimma, Sour Lime	<i>Citrus aurantifolia</i>
110	Velga, wood apple	<i>Limonia elephantum</i>
111	Karivepaku, Curry leaf plant	<i>Murraya koenigii</i>
121	Guggliam, Sasai	<i>Boswellia glabra</i>
124	Garugu	<i>Garuga pinnata</i>
126	Neem, vepa	<i>Azadirachta Indica</i>
127	Billudu, Satin Wood Tree	<i>Chloroxylon swietenia</i>
129	White cedar	<i>Dysoxylum malabaricum</i>
130	Turka Vepa, China Tree	<i>Melia azedarach</i>
131	Mohogany	<i>Swietenia mahogany</i>
132	Red cedar, Gali Manu	<i>Toona ciliata</i>
139	Danti	<i>Gymnosporia spinosa</i>
156	Regu	<i>Zizyphus mauritiana</i>
163	Bandam	<i>Dodonaea viscosa</i>
165	Kunkudu, Soap nut	<i>Sapindus emarginatus</i>
166	Kusum, Lac tree, Pulla kaya	<i>Schleichera oleosa</i>
167	Jidi mamidi, Cashew nut	<i>Anacardium occidentale</i>
169	Chirronji, Jaru mamidi, Sara pappu	<i>Buchanania lanzan</i>
170	Gumpena	<i>Lannea coromandelica</i>
171	Mamidi, Mango	<i>Mangifera indica</i>
172	Marking nut, Nalla jeedi,	<i>Semecarpus anacardium</i>
174	Adavi munaga	<i>Moringa concanensis</i>
175	Munaga chettu, Drumstick	<i>Moringa oleifera</i>
176	Gurivinda, Jequirity seeds	<i>Arbus precatorius</i>

183	Moduga chettu, Palas, Flame of the forest	<i>Butea monosperma</i>
184	Tiga moduga	<i>Butea superba</i>
195	Rose-Wood, Zitregi, Kala-Shisham	<i>Dalbergia latifolia</i>
196	Pachari, Porla-pachari, Choppera	<i>Dalbergia paniculata</i>
197	Sissoo	<i>Dalbergia sissoo</i>
198	Chillangi	<i>Dalbergia spinosa</i>
199	Gumidi-tiga, Gamlap-tiga	<i>Dalbergia volubilis</i>
200	Kanuga, Indian Beech Tree	<i>Pongamia pinnata</i>
229	Konda Tangedu Tige	<i>Milletia auriculata</i>
233	Vandanam, Tella-Modgu, Chikkudu	<i>Ougenia oojenensis</i>
240	Bija sal, Yegisa,	<i>Pterocarpus marsupium</i>
241	Red Sanders, Yerra-Chandanam	<i>Pterocarpus santalinus</i>
245	Dhencha, Ettejanga	<i>Sesbania bispinosa</i>
246	Avisi, Aushika, Tella-Suiminta	<i>Sesbania grandiflora</i>
247	Jeeluga, Rava-sing, Jayanti	<i>Sesbania sesban</i>
252	Tella vempalli, Tephrosia purpurea	<i>Tephrosia purpurea</i>
260	Devakanchanamu, Safed-kachnar, White Bauhi	<i>Bauhinia acuminata</i>
261	Deva-kasia, peddari, Camel's foot tree	<i>Bauhinia purpurea</i>
262	Adda Leaf	<i>Bauhinia vahlii</i>
263	Bauhinia retusa	<i>Bauhinia retusa</i>
264	Kanchini, Yellow Bauhinia St. Thomas tree	<i>Bauhinia tomentosa</i>
265	Deva Kanchana, Mandari	<i>Bauhinia variegata</i>
266	Gacha Kaya, Suka Jambuka	<i>Caesalpinia bonduc</i>
267	Divi-divi, American sumach	<i>Caesalpinia coriaria</i>
268	Tangedu, Peacock flower	<i>Caesalpinia pulcherrima</i>
273	Cassia alata	<i>Cassia alata</i>
274	Tangedu, Merka tangedu	<i>Cassia auriculata</i>
275	Rela, Golden-shower, Indian Laburnum	<i>Cassia fistula</i>
280	Kasinta, Pedda kasinvinda	<i>Cassia occidentalis</i>
281	Nalla jeeluga	<i>Cassia pumila</i>
282	Seema tangedu, Niala tangedu	<i>Cassia siamea</i>
285	Cassia tora	<i>Cassia tora</i>
286	Chittikesar, White gulmohar	<i>Delonix elata</i>
287	Gulmohar, Turayi	<i>Delonix regia</i>
288	Nara yepi, Anjan	<i>Hardwickia binata</i>
295	Asokamu, Ashok Tree	<i>Saraca asoca</i>
296	Chinta, Imli, tamarind tree	<i>Tamarindus Indica</i>
297	Acacia auriculiformis	<i>Acacia auriculiformis</i>
299	Sandra, khair cutch tree	<i>Acacia catechu</i>
300	Sandra, Red cutch	<i>Acacia chundra</i>
302	Acacia ferruginea	<i>Acacia ferruginea</i>
303	Budda jala, paki tumma, robber thorn	<i>Acacia latronum</i>
305	Tella Tumma, panicted acasia	<i>Acacia leucophloea</i>
306	Babul, Nalla Tumma	<i>Acacia nilotica</i>
307	Korintha, Guba korintha	<i>Acacia pennata</i>
308	Godugu-tumma, umbrella thorn	<i>Acacia planifrons</i>
310	Tellachandra, White barked acacia	<i>Acacia suma</i>
313	Narlingi, chikreni	<i>Albizia amara</i>

314	Bandi Chinduga, Nalla regi	<i>Albizia chinensis</i>
315	Pedda dirisinam, sirisamu, lebbeck tree	<i>Albizia lebbeck</i>
316	Chinduga, Ganara,Ceylon Rosewood	<i>Albizia odoratissima</i>
317	Pasar ganni, pachardu, white siris	<i>Albizia procera</i>
321	Subabul	<i>Leucaena leucocephala</i>
326	Nidrakanti,peda nidrakani,Humble plant	<i>Mimosa pudica</i>
328	Sima chinta, karka-palli,Manilla tamarin	<i>Pithacolibium dulce</i>
330	Jammi,chani,sarcar thumma	<i>Prosopis cineraria</i>
331	Rain tree, Nidra ganneru, mokey pod	<i>Samanea saman</i>
349	Pasi chettu	<i>Anogeissus acuminata</i>
350	Tiruman,Axle wood	<i>Anogeissus latifolia</i>
351	Adavi jama,Bandimurugudu	<i>Calycopteris floribunda</i>
358	Nalla maddi, inna maddi	<i>Terminalia tomentosa</i>
359	Tella maddi, vagumaddii,Arjun	<i>Terminalia arjuna</i>
360	Tani, thandra,Behere, Belleric Myrobalan	<i>Terminalia bellerica</i>
361	Badamu, Natu badami, Indian almond tree	<i>Terminalia catappa</i>
362	Karaka,Gall nut	<i>Terminalia chebula</i>
363	Tani	<i>Terminalia coriacea</i>
364	Terminalia crenulata	<i>Terminalia crenulata</i>
365	Tella karaka,White gallnut	<i>Terminalia pallida</i>
366	Nerali,Chirimanu,Kindal	<i>Terminalia paniculata</i>
367	Red Gum, Eucalyptus camaldulensis	<i>Eucalyptus camaldulensis</i>
368	Lemon scented Eucalyptus citriodora	<i>Eucalyptus citriodora</i>
369	Blue gum, E.globulus	<i>Eucalyptus globulus</i>
370	Neelagiri,Eucalyptus teriticornis	<i>Eucalyptus tereticornis</i>
373	Jama,Guava	<i>Psidium guajava</i>
376	Neredu, Jamun,Jinna,Black plum	<i>Syzygium cumini</i>
379	Kurpa, kadmi, kanapa, tarepu, ijal	<i>Barringtonia acutangula</i>
380	Kumbhi,dudippa,kamba,Patasna oak	<i>Careya arborea</i>
386	Chinnagoranta,Crepemyrtle, Bonnet flower	<i>Lagerstroemia indica</i>
387	Chennangi,Ven-teku,Ben-teak	<i>Lagerstroemia lanceolata</i>
388	Chennangi, gullakaraka,sida,Nandi	<i>Lagerstroemia parviflora</i>
397	Boppai,Paringi,Papaya	<i>Carica papaya</i>
424	Begonia malabarica	<i>Begonia malabarica</i>
426	Naga jemudu,prickly pear-orange flowered	<i>Opuntia spinosissima</i>
444	Bandaru, Rudra-genapu,Haldu,Turmericwood	<i>Adina cordifolia</i>
445	Kadamba,Kadam,Parvaty's tree	<i>Anthocephalus cadamba</i>
452	Coffee plant, Arabian Coffee	<i>Coffea arabica</i>
453	Bikki,Chitta-mitta,Dikamalli, Manchi-Bik	<i>Gardenia gummifera</i>
454	Pedda bikki, adavi bikki, papura,	<i>Gardenia latifolia</i>
463	Ixora, Kollangi,putta pala, torch tree	<i>Ixora pavetta</i>
465	Botruga, battaganapu	<i>Mitragyna parvifolia</i>
473	Randia, Konda manga	<i>Randia candolleana</i>
480	Macha patri, davanamu,indian worm wood	<i>Artemesia vulgaris</i>
493	Congresspoolu,parthenium	<i>Parthenium hysterophorus</i>
511	Madhuca longifolia	<i>Madhuca longifolia</i>
513	Sapota, chikku,Sapota, sapotilla plum	<i>Achras sapota</i>
519	Pala, Indian gutta percha tree	<i>Palaquium ellipticum</i>

522	Beedi aku, Thellagada,	<i>Diospyros melanoxylon</i>
546	Kalivi, pedda-vakakaya,Karanda	<i>Carissa carandas</i>
549	Palavareni, pala chettu, easter tree	<i>Holarrhena antidysenterica</i>
554	Sarpa gandhi, Patala garidi, Serpentine	<i>Rauvolfia serpentina</i>
560	Jilledu, Akund, swallow-wort	<i>Calotropis procera</i>
570	Mushti, mushini, visha mushini	<i>Strychnos nuxvomica</i>
574	Rabbaru chettu	<i>Cryptostegia grandiflora</i>
577	Sugandhipal	<i>Hemidesmus indicus</i>
592	Ipomea,Thutu kada	<i>Ipomoea carnea</i>
618	Sambrani chettu, Brahmi	<i>Bacopa monnieri</i>
624	Jacaranda	<i>Jacaranda mimosaefolia</i>
626	Akasa malli, punnaga malli	<i>Millingtonia hortensis</i>
629	Suvarna ganneru, swarna ganneru	<i>Tecoma stans</i>
633	Adda saramu, adda sarap, malabar nut	<i>Adhatoda zeylanica</i>
654	saraswaty's leaf,Konda-thakali, bakkuda	<i>Clorodendron viscosum</i>
655	Gummadi-teku	<i>Gmelina arborea</i>
657	Lantana	<i>Lantana camara</i>
668	Vavili, Vayala	<i>Vitex negundo</i>
670	Tella mada	<i>Avicennia marina</i>
685	Tulasi, krishna tulasi,holy basil	<i>Ocimum sanctum</i>
691	Kagitapu puvvulu, brazillan hogweed	<i>Bougainvillea glabra</i>
695	Uttareni, antisa	<i>Achyranthes aspera</i>
723	Nalla eshwari, Serpent root plant	<i>Aristolochia indica</i>
729	Pepper,Paluka, mirilyalu	<i>Piper nigrum</i>
741	Silver oak,Parana, perane, silk oak,	<i>Grevillea robusta</i>
750	Sandalwood, Tella chandanam	<i>Santalum album</i>
760	Kora maddi, mulu maddi, putta karaka	<i>Bridella retusa</i>
763	Kodisa, vodisa, discous feather foil	<i>Cleistanthus collinus</i>
784	Jemudu,pedda jemudu	<i>Euphorbia tortilis</i>
787	Poniki,Konda ponaku,	<i>Givotia rottleriformis</i>
795	Jatropha,Nepalamu, adavi amudamau	<i>Jatropha curcas</i>
800	Mallotus phillippensis	<i>Mallotus phillippensis</i>
802	Konda-kunkumu	<i>Mallotus rhamnifolius</i>
821	Nemali, pulari, pedda nevii,Kanju	<i>Holoptelea integrifolia</i>
826	Panasa, veru panasa	<i>Artocarpus hirsutus</i>
832	Marri, pedda marri, banyan tree	<i>Ficus benghalensis</i>
837	Ficus heterophylla	<i>Ficus heterophylla</i>
838	Bommudu, kaki medi, boma-medi	<i>Ficus hispida</i>
841	Juvvi, kal-juvi,Kallu-goli	<i>Ficus mollis</i>
844	Medi, atti, haritaksha,Sacrificial flg	<i>Ficus racemosa</i>
845	Ravi, Ashvatham, Bodhy	<i>Ficus religiosa</i>
849	Indian mulberry, silk worm,Putika,	<i>Morus australis</i>
853	Sarugudu,Sarvi, chavuka, beefwood tree	<i>Casuarina equisetifolia</i>
875	Karrapendalam	<i>Dioscorea anguina</i>
884	Nabhi, Potti nabhi, agni sikha	<i>Gloriosa superba</i>
890	Gurrapu dekka, budaga tamara	<i>Eichhornia crassipes</i>
891	Chager-matta, saga-nara, sanga	<i>Agave americana</i>
898	Thadi,Karatalamu, tati, bras tree	<i>Borassus flabellifer</i>

904	Coconut,Kobbari, tenkai	<i>Cocos nucifera</i>
910	Eetha chettu, indian wine palm	<i>Phoenix sylvestris</i>
930	Mollem, Thorny Bamboo	<i>Bambusa arundinacea</i>
939	Vasana gaddi, chippa gaddi, nimma gaddi	<i>Cymbopogon citratus</i>
940	Adavi kanchi, seetha kasi-gaddi	<i>Cymbopogon gidarba</i>
941	Nimma gaddi, kasha gaddi	<i>Cymbopogon martinii</i>
943	Gariki-gaddi, gurka-hariali	<i>Cynodon dactylon</i>
944	Bamboo, Gatti veduru, sanna veduru	<i>Dendrocalamus strictus</i>
964	Darbha Gaddi, Balbajamu, Thatch Grass.	<i>Imperata cylindrica.</i>
978	Nendra Gaddi,Sehima	<i>Schima nervosum</i>
985	Konda Cheepuru Gaddi	<i>Thysanolaena maxima.</i>
988	Vatti Veru,Wuttee, Wuttay Gaddi.	<i>Vetiveria zizanioides</i>
999	Teak, Sagwan	<i>Tectona grandis</i>
1003	Tippa Teega, Jivanitika, Kora Patta Tiga	<i>Tinospora cordifolia</i>
1005	Jaffra,Jabaru Kaya	<i>Bixa orellana</i>
1008	Ponna, Punna	<i>Calophyllum inophyllum</i>
1012	Mandara, Dasanipu, Dasanamu	<i>Hibiscus rosa-sinensis</i>
1019	Pedda Manu,Ailanthus excelsa	<i>Ailanthus excelsa</i>
1021	Somi, Somitha, Rohan	<i>Soymida febrifuga</i>
1023	Stylosanthes hamata	<i>Stylosanthes hamata</i>
1025	Bakapu, Bakam	<i>Caesalpinia sappan</i>
1026	Cassia angustifolia	<i>Cassia angustifolia</i>
1027	Cassia nodosa	<i>Cassia nodosa</i>
1032	Ippa, Mahwa, Mowa, Gul-Mohwa	<i>Madhuca Indica</i>
1035	Billa Ganneru	<i>Catharanthus roseus</i>
1036	Aku Pala, Doddi Pala, Kala Inderjau	<i>Wrightia tinctoria</i>
1040	Ashwagandha, Punir, Dommadolu	<i>Whithania somnifera</i>
1048	Anjan grass, Raiba	<i>Cenchrus ciliaris</i>
1049	Pacha sunkesula, Konda chinta	<i>Peltophorum pterocarpum</i>
1061	Pala,Manchipala	<i>Manilkara hexandra</i>
1065	Nalla mada	<i>Avicennia officinalis</i>
1066	Kandriga, Tree mangrove	<i>Bruguiera gymnorrhiza</i>
1067	Uppu ponna	<i>Rhizophora mucronata</i>
1068	Gatharu, Gedera	<i>Ceriops decandra</i>
1069	Excoecaria	<i>Excoecaria agallocha</i>
9001	Metha mamidi	<i>Balsamodendroncandatum</i>
9002	Veluthuru	<i>Diehrostachys cinerea</i>
9003	Tellapulu	<i>Antidesmagmahaesemilla</i>
9004	Erracheeki	<i>Pterolobium Hexapetalum</i>
9005	Pulivelaga,Bandedu	<i>Flacourtia indica</i>
9006	Gara	<i>Balanitisaegyptiaca</i>
9007	Goti	<i>Zizyphuszlabrata</i>
9008	Mirapa kandra	<i>Toddalia asiatica</i>
9009	Kukka-Alli	<i>Memecylon umbellatum</i>
9010	Pedda Malle	<i>Jasminum-rigidum</i>
9011	Perita	<i>Cycas beddomel</i>
9012	Narava	<i>Premna tomentosa</i>
9013	Bamdari	<i>Adena cordifolia</i>

9014	Nallabalusu	<i>Plectronia didymus</i>
9015	Kommi	<i>Tarenna asiatica</i>
9016	Beera	<i>Luffa acutangula</i>
9017	Dirisinal , Bagi	<i>albezzia Lebbeck</i>
9018	Erraturai	<i>Delonix ragia</i>
9019	Athi	<i>Ficus glomerata</i>
9020	Balusu	<i>Plectronia parviflora</i>
9021	Pariki	<i>Pterolobium indioum</i>
9022	Gotti	<i>Zizyphus xylopyrus</i>
9023	Kalivi	<i>Carissa spinarum</i>
9024	Adavinabhi	<i>Glorios as uperaba</i>
9030	chinna vullinda	<i>Diospyros chloroxylon</i>
9031	Alli	<i>Memoxylon edule</i>
9033	ooduga	<i>Elangium sanifolium</i>
9034	Devadari	<i>Guattria longifolia</i>
9035	Needuddi	<i>Dolichandran cripse</i>
9036	Reni	<i>Zyzapus zyzuba</i>
9037	Balara	<i>Shorea torula</i>
9038	Balusa	<i>Psydrax decoccos</i>
9039	Elaka	<i>Pheronia Elephantium</i>
9040	velama	<i>Anogli</i>
9041	Manga	<i>Randia spinosa</i>
9042	Ooda gaddi	<i>Echlnochloa colona</i>
9043	Velturu	<i>Dichrostachys cinerea</i>
9044	Jemudu	<i>Euphorvia nivulia</i>
9045	sinduramu	<i>Mallaotus philippensis</i>
9046	Chinna ulinja	<i>Diospyros ferrea</i>
9047	Nooru varahalu	<i>Ixora coccinea</i>
9049	Rellu Gaddi	<i>Saccharum spontaneum</i>
9051	Palateega	<i>Ichnocarpus frutescens</i>
9053	Elikajamudu	<i>Merremia aegyptica</i>
9054	Neeruddi	<i>Dolichandrone crispa</i>
9055	Gotika	<i>Zizyphus horrida</i>
9056	Sandra	<i>Mimosa prainiana</i>
9057	Palligi	<i>Tamarix troupli</i>
9058	Pulasara	<i>Phyllanthus reticulatus</i>
9059	Nemali Adugu	<i>Vitex pinnata</i>
9060	Jalari	<i>Shorea roxburghil</i>
9061	Gaara	<i>Balanitis aegyptiaca</i>
9062	Givvi	<i>Ficus Indica</i>
9063	Nagadali	<i>Opuntia stricta</i>
9064	Gutti	<i>Polyalthia cerasoides</i>
9066	Ullinda	<i>Diospyros chroloxylon</i>
9068	Nallabalasa	<i>Canthium dicocum</i>
9069	Papata	<i>Thespesia lampas</i>
9070	Adavinimma	<i>Pamburus missionnis</i>
9072	Karaka	<i>Monordica charantia</i>
9073	Enamaddi	<i>Terminalia arjuna</i>

9074	Aare	<i>Bahinivia viraigala</i>
9075	Edithiri	<i>Dichrostachys cineara</i>
9079	Vullinja	<i>Vullinja</i>
9080	Dunga	<i>Dunga</i>
9081	Adavi tangedu	<i>Adavitangedu</i>
9082	Jagada kandriga	<i>Jagada kandriga</i>
9083	Pesalu	<i>Pesalu</i>
9084	Karpuramu	<i>Cinnamomum camphora</i>
9085	Kanuga	<i>Derris Pinnata</i>
9086	Tagara	<i>Stereospermum personatum</i>
9088	Thumma	<i>Camphora</i>
9090	Siki	<i>Plerolobium hexapetalum</i>

5.6 Appendix 6: Species Names and Codes for Herbs

5.7 Appendix 7: Species Names and Codes for Shrubs

5.8 Appendix 8: Species Names and Codes for Climbers

AP Forest Inventory 2006

Plot Approach Form

Date (dd/mm/yyyy):

1. Plot No.....
2. Name of Camping place.....
3. Time (hrs. at which left the camp).....
4. Distance covered by vehicle (Km.).....
5. Name of the place up to which journey was performed by vehicle (village name etc.)
6. Time at which started on foot (hrs.).....
7. Time of reaching the plot centre
8. Plot **Center** Lat: (DD) Long: (DD).....
9. Plot **Northern** point Lat: (DD) Long: (DD).....
10. Time of completing the plot

Plot Description Form

Zone Code (Col. No. 1)	Division Name (Col. No. 2)	Range Name (Col. No. 3)
Write Code	Write Name of Forest Division	Write Name of Forest Range

SOIL DATA		
4	Soil depth	Write Code
5	Humus	Write Code
6	Stoniness	Write Code
7	Erosion status	Write Code

INCIDENCE DATA		
16	Weeds	Write Code
17	Grass	Write Code
18	Fire	Write Code
19	Grazing	Write Code
20	Felling	Write Code
21	Pest	Write Code

CROP DATA		
8	Origin of stand	Write Code
9	Basal area (use wedge prism) = No. of tally trees x BAF	Calculate and Write
10	No. of storeys	Write Code
11	Seedling regeneration	Write Code
12	Coppice regeneration	Write Code
13	Bamboo occurrence	Write Code
14	Bamboo flowering	Write Code
15	Bamboo regeneration	Write Code

CANOPY DENSITY (using densiometer)		
	Location	No. of dots
22	Plot center	
23	Northern corner of plot	
24	Eastern corner of plot	
25	Southern corner of plot	
26	Western corner of plot	

Name of Crew leader

Signature of Crew Leader

AP Forest Inventory 2006 – Herbs Form

1. Plot No.

Date (dd/mm/yyyy):

[illegible]

Name of Crew Leader

Signature of Crew leader

AP Forest Inventory 2006 – Shrubs & Regeneration³ Form

1. Plot No.

Date (dd/mm/yyyy):

[illegible][illegible]

Name of Crew Leader

Signature of Crew leader

³ Regeneration of tree species only should be seen.

Field Form No: 5

Date (dd/mm/yyyy):

[illegible]

Signature of Crew leader

Field Form No: 6

AP Forest Inventory 2006 – Bamboo Enumeration Form

1. Plot No.

Date (dd/mm/yyyy):

Clu mp No	Species Name	Clump Girth (m)	Number of Culms in Clump						Number and Height of Culms in Dia. Class					
			Curr ent	1-2 Yrs.	3+	Total 5+6+7	Dry & Dec ay	High Cuts	2-5 cm		5-8 cm		Above 8 cm	
									No of Culms	Height avg. m	No of Culms	Height avg. m	No of Culms	Height avg. m
2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														

Name of Crew Leader

Signature of Crew leader

Clump No	Species Name	Clump Girth (m)	Number of Culms in Clump						Number and Height of Culms in Dia. Class					
			Current	1-2 Yrs.	3+	Total 5+6+7	Dry & Decay	High Cuts	2-5 cm		5-8 cm		Above 8 cm	
									No of Culms	Height avg. m	No of Culms	Height avg. m	No of Culms	Height avg. m
2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
16														
17														
18														
19														
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Name of Crew Leader

Signature of Crew leader