



FIELD MANUAL

National Forest Inventory of Bhutan

FOREWORD

Forests are our national resource and heritage. They play vital role in lives and livelihood of Bhutanese people, aside from contributing greatly to our economy and maintaining ecological balance. For ages, Bhutanese have been depending on our forests for their basic requirement on a day-to-day basis and we continue to do so. Because of the fact that we have sound environmental policies and legislations framed and implemented under the dynamic leadership of Monarchs, today, we have our forests largely intact.

However, in the more recent past, with growth in population coupled with increased rates of developmental works taking place, the Department of Forests and Park Services (DoFPS) is put under tremendous pressure. While we are required to provide and fulfill increasing demand for forest produces especially timber, we are required to protect and conserve forest, given Bhutan's location in a very fragile and ecologically sensitive region where impacts of climate change are projected to hit the most.

Whereas we claim and take pride in being able to maintain more than 72% of our geographical area under forest cover, we have realized that it is time that we undertake National Forest Inventory (NFI) to monitor the changes. The current NFI will be more robust and will gather wider array of data. Even the method of data collection, use of equipment and scope of inventory has changed

over time and evolved to become holistic and will provide most of the information required such as extent, quality and health of our forests.

I am very sure that as we complete field work of the current NFI, we would have in place answers to most of our questions. Besides, being able to contribute and frame sound national policies and programs for forestry sector, we will also be able to participate in international fora and accrue benefit from relevant initiatives of international fora such as United Nations initiative on Reducing Emission from Deforestation and forest Degradation (UN REDD/REDD+).

I am sure this manual will be useful to my field colleagues to be able to collect and gather quality data, which this exercise ultimately aims at.

I also take this opportunity to congratulate my colleagues in FRMD and other colleagues in DoFPS who have been involved and contributed to NFI thus far and urge all field crews involved to continue working hard.

Good luck and Tashi Delek



Chencho Norbu
DIRECTOR

ACKNOWLEDGEMENT

More than two and half years have been devoted to the development of this manual. The effort to develop it commenced concurrently in 2009 with other activities of National Forest Inventory (NFI). The manual is the result of combined effort and sincere dedication of many people.

The manual is very essential from documentation perspective. Further, such a document is imperative as it will provide step-wise guidance for data collection which will ultimately assure quality data and information collection within NFI.

Initially it was Dr. Maung Moe Myint, a Research Scientist of Yale University, who was involved as a consultant through SNV, worked on the manual and gave the skeletal framework to this document, for which Forest Resources Management Division (FRMD) acknowledges his effort and expertise.

The first draft has been revised and reworked a number of times incorporating several changes and improvement, in design and parameters of data collection and the contents of the document, following the field experiences gained from the field works in Paro and a number of trainings carried out over the last two years. This manual is an outcome of hard work of the Inventory and Data Section team (Ms. Kezang Yangden, Forestry Officer, Mr. Younten Phuntsho, Forestry Officer, Mr. Santosh Katwal, Forestry Officer and Ms. Kunzang Lham, Sr. Forester) guided and supported by Mr. Kinley Tshering, Chief Forestry Officer, FRMD.

Professor Tim of Yale University needs a special mention here for providing much needed expert comments and for reviewing the manual as requested.

FRMD also thanks the Bhutan Trust Fund for Environmental Conservation (BT FEC), with whose support the Preparatory phase of NFI has been completed. Had it not been for the support of BT FEC, even this document would not have been developed.

This manual comprehensively deals with the history of forest inventory in Bhutan, objectives and expected outcomes of current NFI; and more importantly it gives a step-wise guidance as to how NFI field works will be carried out. This NFI manual is intended mainly for National Forest Inventory crews. However, it may benefit other users interested in understanding the NFI data collection methods.

This field manual document shall be a dynamic document that will evolve over time with change in data collection parameters and scope of the forest inventories as defined by the Department of Forests and Park Services.

Forest Resources Management Division
November, 2012

ACRONYMS AND ABBREVIATIONS

| | |
|---------|--|
| RGoB | Royal Government of Bhutan |
| MoAF | Ministry of Agriculture and Forests |
| DoFPS | Department of Forests and Park Services |
| FRMD | Forest Resources Management Division |
| WCD | Wildlife Conservation Division |
| SFED | Social Forestry and Extension Division |
| WMD | Watershed Management Division |
| BTFEC | Bhutan Trust Fund for Environmental Conservation |
| UNDP | United Nations Development Programme |
| FAO | Food and Agriculture Organization |
| ICBN | International Code of Botanical Nomenclature |
| USDA-FS | United States Department of Agriculture-Forest Service |
| FMU(s) | Forest Management Unit (s) |
| LUPP | Land Use Planning Project |
| NFI | National Forest Inventory |
| PIS | Pre Investment Survey |
| CL | Crew Leader |
| CP | Cluster Plot |
| CWD | Coarse Woody Debris |
| DBH | Diameter at Breast Height |
| Dz | Dzongkha |
| GI | Galvanised Iron |
| GPS | Global Positioning System |
| GRF | Government Reserved Forest |
| HD | Horizontal Distance |
| Lh | Lhotshamkha |
| NWFP | Non Wood Forest Produce |
| Plot ID | Plot Identity |
| QAQC | Quality Assurance and Quality Control |
| RP | Reference Point |
| SD | Slope Distance |
| SI | International System of Units |
| Ts | Tshanglhakha |

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Overview of Forest Inventory in Bhutan

1.1 Evolution of Forest Inventory in Bhutan

The Department of Forests and Park Services (then referred to as the Department of Forestry) was established in the year 1952. Till the early 1980s, the department was manned by Indian Foresters on deputation along with Bhutanese counter-parts, given the limited national capacity at that point of time.

Then, the extent of forest area and the wealth of the forest resources were not quantified and therefore, no definite figures were available to understand the forest. It was however acknowledged that “three fourth of the country was under forests, alpine pastures, exposed rocks and barren slopes” (*PIS-North western Vol.I, Preface*). Further, forest resources then did not have much economic value and it wasn’t till 1960s that the forests were valued economically when the valleys were opened up by roads and economic development began to trickle and expand.

As the importance of forests grew with the realization of its potential to contribute to the economy of the country, the Royal Government of Bhutan began inviting experts from countries like Sweden, Japan and India to appraise and ascertain the worthiness of our forest resources and all experts pointed out the need for a detailed forest survey.

This need was thus pursued as part of the Third Five Year Plan (1971-76), whereby the Pre-Investment Survey of Forest Resources of India (now referred to as the Forest Survey of India), under Ministry of Agriculture and Irrigation of the Government of India was requested by the Royal Government of Bhutan to assist Bhutan in surveying the forest resources of Bhutan.

The field work for Pre-Investment Survey (PIS) began in the year 1974 and continued till the December of 1979, covering a total area of 29,176.4 square kilometer. The survey was focused more towards “*assessing the availability of raw materials for wood based industries*”. The PIS generated estimates for number of stems/ha, volume table, volume per hectare, total growing stock, regeneration status and increment. The report of the PIS proposed the potential availability of wood resources for setting up wood based industries in Bhutan based on the information gathered. Volume equations for 28 major timber species were also determined from the PIS effort along with Forest type maps at 1: 50,000 scale for the country.

While PIS was being carried out, the department was also pursuing technical capacity building in timber management planning with the assistance of UNDP, FAO. Harry J. McCarty, a forest management consultant was engaged to develop the forest management inventory designs, document and build the national capacity.

In essence PIS was the first National Forest Inventory in Bhutan which was followed by a number of assessments using the remote sensing technologies but no field inventory has been done since then, owing to various reasons such as lack of financial and technical capacities. The assessments based on remote sensing technologies provided forest extent and coverage but lacked the capacity to make quantitative assessments of the rich forest resources.

Besides forest cover, it is very important to understand the state of forest resources quantitatively so that it is managed sustainably

to meet the demands of the human population without losing its restorative abilities necessary for a viable ecosystem. It is very important that periodic inventory and assessments are done to monitor the changes and trends in changes over time.

The current National Forest Inventory will thus be an exhaustive and holistic inventory of forests in the country.

1.2 Current National Forest Inventory of Bhutan

National Forest Inventory is the systematic collection of data and forest information for assessment and analysis. The design for the National Forest Inventory was determined through two technical exercises. Exercise I was the remote sensing exercise, wherein classification of land into forests and non-forests was done using Land Cover Map of Bhutan (LUPP, 1995). The forests were then classified into homogenous categories of forest types.

In Exercise II, the data of forest resource inventory plots (approximately 4500 plots of 0.05 ha) from 13 Forest Management Units (FMUs) were referred for determining the sampling intensity required for achieving 15% Margin of Error at 90% confidence level. The sampling intensity was thus used to estimate the total number of cluster plots, which came to be 26935 Cluster plots at 1.2 Km systematic spacing. However, in consideration of human resource and financial limitations, it was decided on 4km by 4km grid as NFI framework, following numerous consultations with experts from within the Department of Forests and Park Services (DoFPS), the School of Forestry and Environmental Studies of Yale University and the US Department of Agriculture-Forest Service. This framework allows one sample location for every 160 hectares and comes to 2424 Cluster plots covering all land cover classes as decided by the stakeholders during the Data User Consultation Workshop held in January, 2009. This framework will provide reliable estimates at 15% Margin of

Error for basal area at 90% confidence level at dzongkhag and greater precision at the national level.

The data to be collected were also discussed during the Data User Stakeholder Consultation Workshop (January, 2009), wherein, it was decided that National Forest Inventory will collect data and information not limited to timber but also capture wide ranging information on Non-Wood Forest Produce (NWFP), shrubs, herbs, biomass, wildlife, biodiversity, forest health and disturbance.

1.3 Results of Current National Forest Inventory

The main purpose of the National Forest Inventory is to continuously provide information about the state of forests.

The targeted outputs of the National Forest Inventory are as listed:

- i. Stems per hectare and total number of stems
- ii. Basal area per hectare and total Basal area
- iii. Volume per hectare and total volume
- iv. Biomass per hectare and total biomass
- v. Carbon per hectare and total above ground carbon
- vi. Increment and growth
- vii. Regeneration
- viii. Forest stand structure
- ix. Distribution of plant species
- x. Biological diversity (using indicators like species richness indices, species diversity indices, ecological similarity/dissimilarity indices)
- xi. Coarse woody debris (CWD) per hectare and total CWD
- xii. Cover percent of identified Non-Wood Forest Produce
- xiii. Cover percent of bamboos

- xiv. Geo referenced locations of bamboo populations
- xv. Distribution of wildlife
- xvi. Extent and types of forest disturbance
- xvii. Land use information
- xviii. Health of forests (pests and diseases)
- xix. A soil map
- xx. Tree Canopy Cover percent Map, Forest Cover Map, Forest Type Map

These data will be referred for monitoring the trends of change in forests over time.

The data collected can answer questions about the status and trend of forest ecosystems, distribution of plant species and their relationship to the environment, changes in forest structure and productivity resulting from disturbance, and improved prediction of forest growth and development on different sites and in response to management.

Such information and data will assist the government and policy makers in developing appropriate policy-decisions aimed at managing the forest resources sustainably. It can be used by natural resource managers and organizations for developing strategic implementation plans. Scientific community, researchers, and academia will also benefit from such data and information.

1.4 Units of measurement

The National Forest Inventory of Bhutan will use Metric System of units for measurements and estimation.

1.5 Sampling Design

The National Forest Inventory will use a systematic sampling design and will have total of 2424 sampling plot clusters laid at 4km by 4km grid. The sampling plots are not limited to forest area but will cover the whole country. Therefore, it will constitute a land inventory with specific concentration on forestry but also have considerable information

about agricultural allied parameters. This is also to allow monitoring of changes over time.

This design yields sampling intensity of 0.003 % at 15 percent Margin of Error at 90 percent Confidence Interval.

1.6 Inventory Plot Design

Each inventory plot consisting of a cluster of 3 circular plots on an L-shaped transect spaced at 50 meter apart will be laid systematically at 4x4km grid. These circular plots will be referred to as Elbow plot, North plot and East plot as shown in the diagram. (Plate No.1)

Each circular plot will be of 12.62m radius with an area 0.05 hectare for collecting Tree data. The Elbow plot will have an additional circular plot of 3.57m radius within it, for collecting Regeneration data, whereas circular plot of 0.57m (1 meter square) radius will be laid in North and East plot for collecting Herb data.

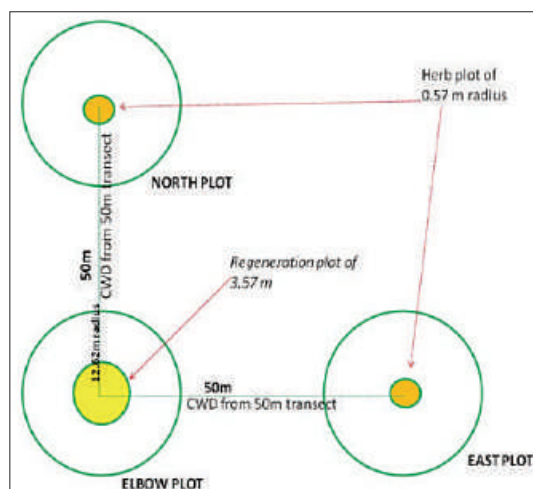


Plate 1: Diagram depicting a Cluster Plot

1.7 Quality Assurance and Quality Control.

The Forest Resources Management Division (FRMD) will ensure that the data collected are scientifically sound and reliable by adopting standard collection methodology and data recording protocols.

FRMD will train the National Forest Inventory (NFI) field crews on interpretation and application of field protocols, proper use of field equipments and data recording to ensure quality data. Continuous technical backstopping will be provided to the NFI crews to improve the quality of data. FRMD will also carry out cross checking of 5 percent of the total sample plots enumerated by the field crews. Cross checking

will ensure uniform and consistent interpretation and application of field instructions among the field crews.

The Forest Resources Management Division (FRMD) will continuously improve the inventory process by identifying and documenting errors and source of the variability that could be detrimental to the quality of inventory results.

Preparing for Field Work

2.1 Planning and Preparation-General preparedness

It will be the responsibility of Forest Resources Management Division (FRMD) to coordinate and over see the overall activities of National Forest Inventory. FRMD will decide, when and where to carry out the enumeration works; and accordingly assign target areas and target plots to be inventoried by NFI Crews within a given period of time.

Once the area to be inventoried is assigned to the Inventory Crews, the Crew Leader (CL) must plan and prepare well with the objective to complete the field work on time without compromising the quality of data collection process and the quality of data collected. Safety of the crew should also be the top consideration while planning for field work.

First and foremost, the Crew Leader must acquire the relevant topo maps and digital shape files of the target areas. Locate the villages and human habitation that could serve as base camp sites. Identify the plots that can be reached from the villages. Identify all the approach points like roads and foot paths to the village and from the village to the target plots. Locate potential water sources, streams and rivers and mark it on the map for easy reference in the field.

Then draw a travel itinerary or day-wise program, indicating the base-camp sites, the plots to be reached from each camp and the routes to be taken. This travel itinerary must be submitted to the respective Regional Office and to FRMD. It is very important that both the offices are informed of the start dates and expected date of return.

The Crew Leaders must select (in consultation with crew members) their camping sites in such a manner that maximum number of sample plots can be covered from that particular camp site so

chosen. The Crew Leader must also ensure that his crew members are fully equipped with camp and field equipments, field gears, stores and rations, and any other necessary items which might be required in the field.

Additionally, the Crew Leader is entrusted with the responsibility to ensure that any confidential documents or maps being provided by FRMD should be kept under his personal custody. He must ensure that these items are not passed on or shown to any un-authorized person.

Other important component of planning like logistic arrangements, safety measures, etc are discussed separately as sub-topics.

2.1.1 Logistic Arrangements

Logistic arrangement forms an important aspect of NFI field work. While it is the responsibility of FRMD to coordinate and oversee NFI field work, it is the responsibility of NFI crew to arrange for porters and ponies required during camp shifting. However, vehicles required for transportation will be arranged by FRMD. The travel itinerary and day-to day program will assist FRMD in deciding the number of vehicles to be hired and the duration of hire.

FRMD will also provide tents, camping equipments and cooking utensils but the food items and rations will have to be managed by the crew themselves.

2.1.2 Safety Measures

Safety of the Crew must be ensured at all times and most of the preparation and planning components discussed earlier should be observed diligently not just for avoiding wasteful journeys but also as safety measures. The Inventory Crew must also observe the listed measures for ensuring personal safety and safety of the crew:

- The Inventory Crew, specifically the Crew Leader will always report to FRMD contact point, of their whereabouts during the field work.
- For facilitating communication, the Inventory Crew will carry personal cell phones. Change in phone numbers must be conveyed to FRMD for record and access whenever necessary.
- The Inventory Crew will also be provided with walkie-talkie sets for facilitating communication. Crews are advised to avoid any unnecessary and trivial discussion over the walkie-talkie.
- All Inventory Crews will carry the National Forest Inventory Crew Information booklet for easy access to phone numbers, in times of emergency or to enquire on field-work related queries.
- For the purpose of National Forest Inventory, the Inventory Crew will observe the command of the crew leaders and perform the assigned responsibilities.
- The Inventory Crew will at all time walk in groups while they are in the field.
- While moving into the field from the base camp, each individual must carry the following items of survival kit to prepare for any emergency situation:
 - i. Water bottle/water
 - ii. Match box or lighter
 - iii. Headlamp
 - iv. Knife/Patang
 - v. Emergency sleeping bag
 - vi. Walkie-Talkie sets (2 sets per team)
 - vii. First aid kits
 - viii. Any other item that will help surviving during emergency situation (e.g packaged food items).

It is to be noted that though it is the responsibility of the Crew Leaders to ensure that their crew members maintain decorum in the camp, every individual is expected to carry themselves in a manner appropriate of a civil servant.

2.1.3 Inspection of equipments

It is very important that the Inventory Crew inspect and check the equipments for faults beforehand. The first inspection should be done prior to moving to the field. Should they find any faults, they must rectify and correct the equipment or have it replaced from FRMD before moving to field.

Once in the field, the crew must ensure that their equipments which required power supply are fully charged (especially GPS, Hypsometer and Walkie-talkie) to avoid any possible disruption of works in the field. Charging of equipments should be done preferably a day-before or the night before plot visit. All extra batteries should be fully charged. Final inspection of equipments should be done in the morning ensuring that all the necessary equipments are being carried and all the equipments are in working conditions.

Failure to check and rectify faulty equipments will lead to undesirable disruption of work, which otherwise could be avoided.

The Crew Leader must ensure that the equipments are properly stored away from excessive heat (from sun, fire etc), rain, water and other liquid items and from damage by trampling or crushing.

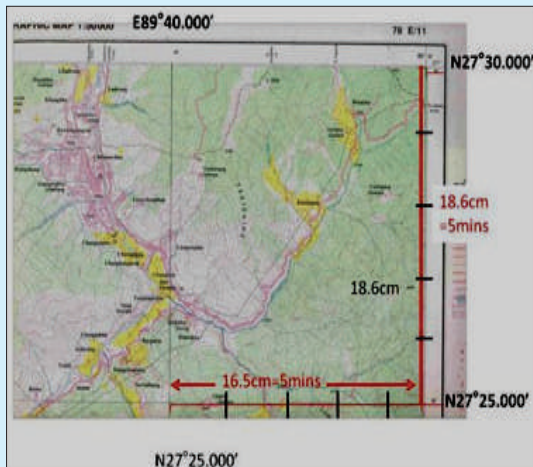
Locating Your Position on a Map

Although for NFI field work, GPS will be used to navigate to the plots, it is a must-know for every NFI crew members to know how to read map and locate their own position on the map. For map reading, two simple fundamentals are involved;

1. Converting minutes (graticules) of topo maps into distance units (cm)
2. Plotting the minutes of GPS onto the map by converting minutes into distance units (cm)

Steps for locating your position in map:

1. Switch on GPS to find out your location coordinates i.e latitude and longitude of your current position in GPS.
(Open Terrasync>status >coordinates)



Note: If Coordinates are not displayed > goto Set-Up > Coordinate system > for "Display USNG ", select "Off" > ok > go back to "Status"

2. Take out the relevant topomap of the locality
3. Measure the length (cm) between two 5 minutes graticule of latitude and then longitude.

Eg: For Longitude (E): 5min=16.5cm

For Latitude (N): 5min=18.6cm

4. Divide length by 5 to calculate the distance of one minute

One minute For Longitude (E):

$$16.5/5=3.3\text{cm}$$

For Latitude (N):

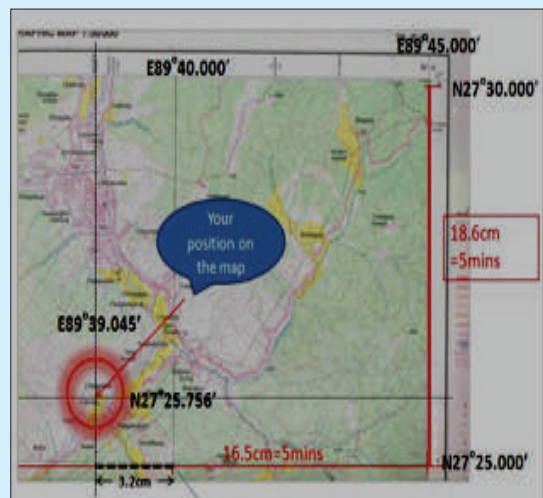
$$18.6/5=3.7\text{cm}.$$

5. If the GPS reads your position as **N27°25.756'** and **E89°39.045'** and to plot this position in map:

For Latitude N27°25.756' = 0.756' x 3.7 = 2.79 = 2.8cm >> Now measure 2.8 cm from N27°25.000' graticule towards North and mark a point on the map. Then draw a line parallel to N27°25.000' graticule passes through this point

For longitude E89°39.045' = 0.955 x 3.3 = 3.15 = 3.2cm >> Then measure 3.2cm from E89°40.000' graticule towards West and draw a line parallel to E89°40.000' passing through this point.

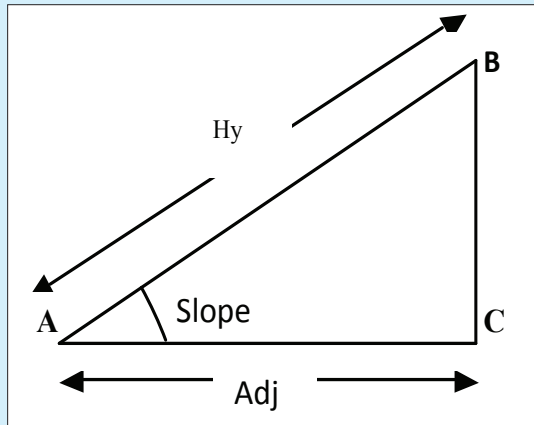
6. The point of intersection of above two lines is your position on map as shown below.



Slope Correction for horizontal distances on slope.

Slope distances are always greater than horizontal distances, which means for laying the 50m transect from Elbow to North and Elbow to East on a sloping ground, the distances have to be corrected for slope (gradient).

The relation between slope (in degrees) and the horizontal distance is;



$$\text{Cosine of Slope} = \frac{\text{Adjacent (Adj)}}{\text{Hypotenuse (Hy)}} = \frac{\text{Horizontal Distance}}{\text{Slope Distance}}$$

But, before applying Cosine function, the degrees of slope has to be converted to radians and to convert degrees to radians, simply multiply the degrees (of slope) by factor $\pi/180$. This has been applied to develop the slope correction table for slope in degrees since the clinometers (DP6Global) to be used for NFI provides slope reading in degrees and not as “slope percent”.

To get slope distance, divide the Horizontal Distance (HD) by Cosine value of the slope (in radians).

For instance, if an area has a slope of 20° and the horizontal distance that we require is 12.62m, then the Slope Distance (SD) we have to travel is 13.41m. This can be obtained from slope correction table. To read SD from slope correction table, take the reading/value under particular HD column that corresponds to particular slope (in degrees).

| Slope | | Horizontal distance (m) | | | |
|-------|--------|-------------------------|-------|-------|-------|
| Deg | factor | 5.64 | 12.62 | 10.00 | 20.00 |
| 0 | 1.000 | 5.64 | 12.62 | 10.00 | 20.00 |
| 1 | 1.000 | 5.64 | 12.62 | 10.00 | 20.00 |
| 2 | 1.001 | 5.65 | 12.63 | 10.01 | 20.02 |
| 3 | 1.001 | 5.65 | 12.63 | 10.01 | 20.02 |
| 4 | 1.002 | 5.66 | 12.65 | 10.02 | 20.05 |
| 5 | 1.004 | 5.66 | 12.67 | 10.04 | 20.08 |
| 6 | 1.005 | 5.67 | 12.68 | 10.05 | 20.10 |
| 7 | 1.007 | 5.68 | 12.71 | 10.07 | 20.14 |
| 8 | 1.010 | 5.70 | 12.74 | 10.10 | 20.20 |
| 9 | 1.013 | 5.71 | 12.78 | 10.13 | 20.25 |
| 10 | 1.016 | 5.73 | 12.82 | 10.16 | 20.32 |
| 11 | 1.018 | 5.74 | 12.84 | 10.18 | 20.36 |
| 12 | 1.022 | 5.76 | 12.89 | 10.22 | 20.44 |
| 13 | 1.026 | 5.79 | 12.95 | 10.26 | 20.52 |
| 14 | 1.031 | 5.82 | 13.00 | 10.31 | 20.62 |
| 15 | 1.036 | 5.84 | 13.07 | 10.36 | 20.72 |
| 16 | 1.041 | 5.87 | 13.14 | 10.41 | 20.82 |
| 17 | 1.047 | 5.91 | 13.21 | 10.47 | 20.94 |
| 18 | 1.050 | 5.92 | 13.25 | 10.50 | 21.00 |
| 19 | 1.056 | 5.96 | 13.32 | 10.56 | 21.12 |
| 20 | 1.063 | 6.00 | 13.41 | 10.63 | 21.26 |
| 21 | 1.070 | 6.04 | 13.50 | 10.70 | 21.40 |

Although reading slope value on a clinometer is fairly easy, it is very important to ensure that clinometers and measuring tapes are held correctly as illustrated in below.

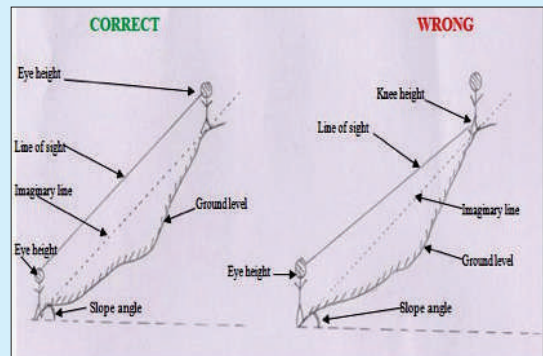


Plate 2: Aiming at “eye-height” for correct slope measurement

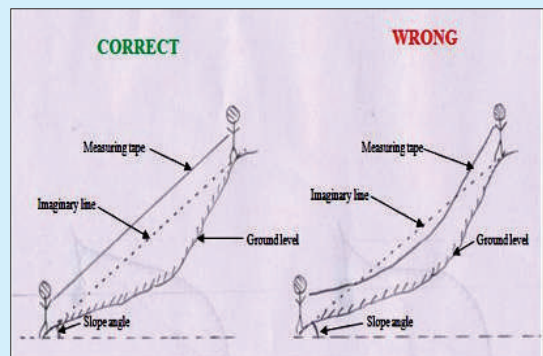


Plate 3: The measuring tape should be straight and parallel to the slope, without sagging or twisting

2.2 Navigating to Cluster Plots

With general preparation for field work completed and having decided on which cluster plots to be inventoried, the crew will use Trimble Juno GPS to navigate to the targeted cluster plots.

Each cluster plot will have a unique pre-assigned Plot ID (eg.CP0001) and coordinates (latitude and longitude) using which crew can navigate and locate the cluster plots.

FRMD will have uploaded these coordinates in to the GPS and will be provided to crews, who in turn will use the GPS to navigate to the cluster plots to carryout field works. The use of Trimble Juno SC GPS is provided as a separate instruction.

Crew must navigate to the Elbow plot first, complete all the necessary data collection in Elbow, and then move to North plot. For moving to North Plot, use compass for direction and traverse 50m towards North with slope correction.

Upon completing the North plot, go back to Elbow plot and then traverse towards East plot, as done for North plot. If the transect between the Elbow and any of the two plots (North and East) cannot be laid because of rocky cliff or water bodies, Trimble Juno GPS may be used to navigate to these plots. In such cases, Coarse Woody Debris (CWD) data cannot be collected.

2.3 Monumenting and Referencing of Plot Centre

As soon as the inventory crew reaches the plot centres, drive the 20cm Galvanized Iron (GI) pipe at the plot centre leaving about 2cm of the stake visible above the ground till completion of data collection. Once completed, drive the stake completely underground. These metal stakes can be relocated using a metal detector in future for periodic inventory and monitoring. Plot centres are to be monumented for all three plots.

For plot centres, that cannot be monumented using the GI pipes, Reference Points will be used for future navigation. Reference Points (RPs) for

the plot centre will be noted for all three plots of cluster. Using RP we can navigate to the plot centre in future even if the plot stakes (GI pipes) are lost. The following features may be identified and used as RPs for plots centres;

1. Permanent man-made structures (Boundary pillars, Bridges, Road, Buildings etc)
2. Natural features (Rivers/streams, Ponds, Lakes etc)
3. Prominent topographical features such as cliff, hillock, plateau etc.
4. Any other permanent features which can help us navigate to plot centres in future.

After identifying the Reference Points (RPs), the distance to the RP and direction of RP from the plot centres are taken, using which plot centre will be located in future. Additionally any other descriptions of RPs that might help us easily locate the plot centre should be recorded.

2.4 Plot Establishment

After monumenting the plot centre, establish a circular plot of 12.62 m radius around the plot centre. The edge of the circular plot may be identified using the Laser Ace Hypsometer. Stand at the plot centre and using the hypsometer or measuring tape, determine the edge of 12.62 m radius circle boundary. The plot boundary should be marked by moving in a clockwise manner.

Where the vegetation is too dense to use hypsometer to determine the edge/boundary of the circular plot, measuring tape will be used to determine the boundary of the circular plot. If measuring tapes are used, then slope correction must be done for the distance measured.

Within Elbow plot, establish a sub-plot having 3.57m radius for regeneration with Elbow plot centre as the plot centre for this sub-plot. Regeneration data should be collected prior to collection of other data to avoid trampling of regeneration. Similarly, Herb data (within 0.57 m radius around plot centre) must be collected immediately upon monumenting the plot centres of North and East plot, for the same reason.

Data Collection Protocol

3.1 Order of Data Collection and Recording

After establishing plot, the inventory crew will start collecting data for **Regeneration** first. Once regeneration data collection is completed, the crew will collect other data parameters.

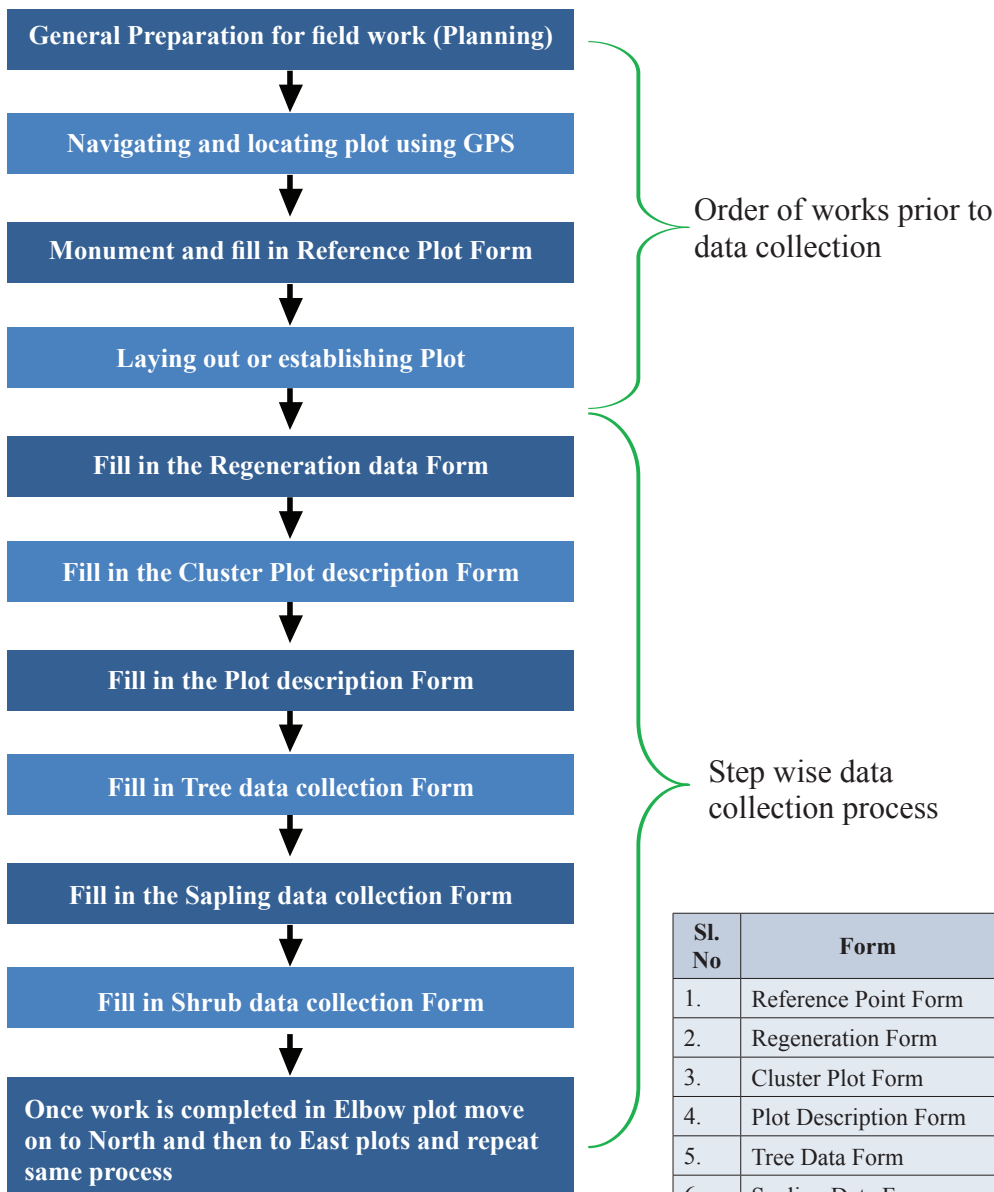
Data collection will start with Elbow plot, prior to that of North and East plots. The data recording will be done on the Trimble Juno GPS, which will have the electronic field forms loaded on to it.

In case, the Trimble Juno GPS does not function and cannot be used for data collection, the inventory crew will record the measurements/data collected on the paper data form with a pencil. The Crew Leaders will ensure that writing is clear, neat and legible. Over-writing is to be avoided at any cost. Instead, the data recorder should cancel any wrong entry with single stroke /line and corrected entry written at the side.

The Inventory crews are to follow the following order of data collection and recording in the Plot of any cluster:

1. Once the Plot centre is located, the Inventory Crew will identify the Reference Points (RP) and complete the **'Reference Point'** form.
2. In the Elbow plot, start the data recording for **'Regeneration data'** first and in North and East, start with **'Herb data'** form.
3. Then crew will fill in and complete **Cluster Plot** form (only in Elbow)
4. Then fill in the **Plot Description** form
5. While Plot Description Form is being completed, others can start establishing the plot and measuring and recording the **Tree data** on a notepad.
6. Upon completing the **'Tree data form'**, complete the **'Sapling Data form'** followed by **'Shrub Data Form'**.
7. Then collect data on **Wildlife** (mammal, birds and reptiles) within the 25m radius.
8. Once all the data collection from Elbow Plot is completed, traverse to North plot (50 m away from the Elbow Plot centre). 50m transect should be slope corrected horizontal distance. On this 50m transect to North Plot, collect and record data for **Coarse Woody Debris (CWD)**. CWD shall be collected for 50m transect to East Plot as well.
9. Upon completion or parallel to these data collection, two individuals will collect data on above ground carbon, which will be described in a separate manual to this one.

Flow chart illustrating the process of NFI field work



Note: In North and East plots, no Regeneration plot will be laid. However, Herb data will be collected in these two plots within 0.57m circular plot (1m²).

There are 12 field forms that need to be completed. Each of these data forms are assigned with form numbers. Form numbers will not be visible on the electronic data form.

| Sl. No | Form | Form Number |
|--------|-----------------------|-------------|
| 1. | Reference Point Form | F1/12 |
| 2. | Regeneration Form | F2/12 |
| 3. | Cluster Plot Form | F3/12 |
| 4. | Plot Description Form | F4/12 |
| 5. | Tree Data Form | F5/12 |
| 6. | Sapling Data Form | F6/12 |
| 7. | Shrub Data Form | F7/12 |
| 8. | Herb Data Form | F8/12 |
| 9. | Mammal Data Form | F9/12 |
| 10. | Bird Data Form | F10/12 |
| 11. | Reptile Data Form | F11/12 |
| 12. | Coarse Woody Debris | F12/12 |

Copies of the Field Forms are provided as Annexures

3.2 Instruction on Data Collection and recording of data in the Field Forms (Electronic and paper)

3.2.1 Reference Point Data

| S.N | Data Item | Description/Definition | Instructions |
|-----|------------------------------|---|---|
| 1. | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the field form. Note: <i>Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2. | For Plot | Refers to one of the three plots (Elbow, East or North Plot) of cluster plot | In the electronic field form, select the correct plot name from the drop down list provided. If paper field forms have to be used, tick the relevant plot from the three options provided. |
| 3. | Prominent Structure No. | Refers to the order of recording. The first prominent structure taken as Reference Point (RP) will be taken as 1, the second as 2 and the third as 3. | In case of paper field form, the numbering will already be done. |
| 4. | Prominent Structure | Refers to name of any feature that has been chosen as a Reference Point . (For instance Bridge, Road, Tree etc) | Provide the name of any objects or features chosen as a Reference Point for a particular plot. At least three Prominent structures are to be taken as Reference points. |
| 5. | Distance to Plot centre | This is the horizontal distance measured between the plot centre and the Prominent structure taken as reference point. | The horizontal distance will be measured using either the Hypsometer or the measuring tape, as convenient. Record the horizontal distance in meters (m). |
| 6. | Azimuth from the plot centre | The angle from North at which the RP is located. | The Azimuth of a Prominent Structure should be measured using compass by standing at the centre of the plot. Record the azimuth in degrees. |
| 7. | Description 1 | Any statement/description that describes the Prominent Structure | Any descriptions that crew might want to mention which can provide additional information on RP |
| 8. | Description 2 | Any statement/description that describes the Prominent Structure | Any descriptions that crew might want to mention which can provide additional information on RP |

3.2.2 Regeneration Data

Regeneration data will be collected only from the Elbow plot, where 3.57 meter radius circular plot will be laid around the plot centre. For current NFI, all tree species with DBH less than 5cm and falling within 3.57cm plot will be enumerated as regeneration.

| SN | Parameters | Description/ Definition | Instructions or how to fill in Data Dictionary |
|----|------------|--|--|
| 1. | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No. is entered in the data dictionary or the field form. Note: <i>Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2. | Plot Name | Refers to one of the three plots (Elbow, East or North Plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic forms are used. If paper field forms have to be used, tick the relevant plot from the three options provided. |

| | | | |
|----|---------------------------------------|--|--|
| 3. | Scientific Name | Refers to formal scientific name which conforms to the <i>International Code of Botanical Nomenclature (ICBN)</i> | Choose appropriate Botanical Name from drop down list. |
| 4. | Common Name/ Local Name | <p>“Common name” herein is referred to the commonly used name of a tree in English.</p> <p>“Local name” means name of tree in local dialect.</p> <p>For NFI, the Local Names in following dialects will be used; Dzongkha (Dz), Tshanglha Kha (Ts), Lhotsham kha (Lh), Bumthangp (Bum), Khengkha (Kh), Trongsap (Tr) and Kurtoep (Kr).</p> | <p>The Crew may note either the common name or the local name of the plant.</p> <p>In case of local name, Crew must specify dialect in which the local name has been given. (For <i>Quercus griffithi</i>, it is Baenangshing in Tshanglha kha, therefore, local name must be written as Baenangshing(Ts), Ts indicates it is in Tshanglha kha)</p> |
| 6. | Number of established regeneration | Established seedlings are plants having height more than 2m | Count the number of plants having DBH less than 5cm and of height more than 2meters within 3.57 m sub-plot and record the number. |
| 7. | Number of un-established regeneration | Un-established regeneration refers to plants which are less than 2meters height and are more than one year old | Count the number of plants having DBH less than 5cm and of height less than 2meters within 3.57 m sub-plot and record the number. |
| 8. | Number of recruits | Recruits are very small plants having 2-4 leaves but are current years seedling | Count the number of recruits and record the number |
| 9. | Remarks | | The Crew leader or the data recorder may add any additional information that may help in assessing regeneration status in the plot |

NOTE: If the plants cannot be identified by either Scientific name or local name or common name, then the plant will be recorded as “UNKNOWN 1,2,3,4.....” for that concerned plot. A picture of the plant must be taken and in bracket record the photograph number (e.g. UNKNOWN 1(DSC423)). This will be done for trees, shrubs, herbs and saplings.

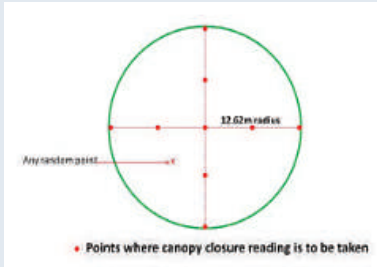
3.2.3 Cluster Plot Data

| SN | Data Item | Definition/Description | Instructions |
|----|-----------|---|---|
| 1. | CPNo | This is the unique identification number given to Cluster Plot. Eg. CP0001. | <p>Ensure that the correct CP No. is entered in the data dictionary or the field form.</p> <p>Note: Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</p> |
| 2. | Date | Is the date of data collection | Record the date on which the data is being collected. |
| 3. | Weather | Refers to the state of atmospheric conditions at that particular time when NFI crew carries out field work. | <p>Based on weather conditions prevailing at that particular moment, the crew must mention whether it is;</p> <ol style="list-style-type: none"> 1. Sunny 2. Rainy 3. Cloudy 4. Windy |

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|-----|------------------|---|--|
| 4. | Altitude | Refers to the elevation from mean sea level at which the cluster plot is located. | The altitude of particular cluster plot will appear in GPS, crew must mention elevation appropriately as it appears in GPS. |
| 5. | Crew Leader Name | Refers to name of the Crew Leader of NFI crew carrying out field work | Names of all 12 crew leaders will be provided as drop down list. Choose appropriately from the list as it appears. If paper field forms are used, write down the name of CL. |
| 6. | Crew Leader ID | This is a unique identity number assigned to each NFI crew and Crew Leader | Choose appropriately from the drop down list. If paper field forms are used, write down the name of crew ID. |
| 7. | Gewog | Refers to the Gewog within which the Cluster Plot is located. | Gewog list will appear as drop down list; crew must choose appropriately. If paper field forms are used, write down the gewog name. |
| 8. | Dzongkhag | Refers to the Dzongkhag within which the Cluster Plot is located. | Dzongkhag list will appear as drop down list; crew must choose appropriately. If paper field forms are used, write down the dzongkhag name. |
| 9. | CP Description | Any additional plot description may be provided here by the Crew leader. | |
| 10. | Remarks | Any other additional information that crew might want to give. | Additional information relevant to the cluster plot. |

3.2.4 Plot Description Data

| SN | Data Item | Description/Definition | Instructions |
|----|----------------------|--|---|
| 1. | CPNo | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the electronic field form. <i>Note: Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2. | Plot name | Refers to one of the three plots (Elbow, East or North Plot) of Cluster Plot. | In the Electronic field form, select the correct plot name from the drop down list. If paper field forms have been used, tick the relevant plot from the three options provided. |
| 3. | Topographic position | Refers to the position of the plot in reference to the topography and the slope. Topographic position will be classified as: 1. Ridge top : is when plot is located on a ridge top 2. Upper hill side : is when the plot is located in the upper one-third of the hill 2. Middle hill side : is when the plot is located on the middle one third of the hill 3. Lower hill side : is when the plot is located in the lower one third of the hill 4. Flat land : is when the plot is on valley beds or vast stretch of flat area. 5. River bed : is when the plot falls on a river(dry or otherwise) 6. River banks : is when the plot falls on the banks of river or stream. 7. Gorge/ravine : is when the plot falls on very steep ravines. | Classify the position of the plot topographically by referring to the definitions provided and record the classification by selecting from the drop-down list in the data dictionary (if electronic field form is used). In case of paper field form, tick the appropriate topographic position. |

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| 4. | Aspect | <p>Refers to the direction of the slope and is classified as:</p> <ol style="list-style-type: none"> 1. Northern: When the slope is facing North 2. North-Eastern: When the slope is facing North East 3. Eastern: When the slope is facing East 4. South-eastern: When the slope is facing South-East 5. Southern: When the slope is facing South 6. South-western: When the slope is facing South -West 7. North-western: When the slope is facing North West 8. No aspect: When the plot falls on a flat area | <p>Use a compass to determine the direction to which the slope is facing and record the aspect on the data dictionary. The aspect classes are provided in the drop down list in the electronic field form and as check list in the paper field form.</p> |
| 5. | Slope up | <p>Slope Up describes the gradient, inclination of the up-hill slope from the plot centre.</p> <p>Note: <i>Slope reading for our purpose will be done in degrees.</i></p> | <ol style="list-style-type: none"> 1. For measuring the Slope up, walk one of the crew members towards the steepest part of the up-hill side and position the member on the edge of the 12.62m plot. 2. Take a clinometers reading to his eye height from the plot centre. 3. Record the reading |
| 6. | Slope down | <p>Slope down describes the gradient, inclination of the down-hill slope from the plot centre</p> | <ol style="list-style-type: none"> 1. For measuring the Slope down, walk one of the crew members towards the steepest part of the down-hill side and position the member on the edge of the 12.62m plot. 2. Take a clinometers reading to his eye height from the plot centre. |
| 7. | Stand height | <p>Arithmetic mean of the height of five tallest trees in the plot</p> | <ol style="list-style-type: none"> 1. Identify five tallest trees having DBH above 10cm which fall within 12.62m radius plot. 2. Measure the heights of the identified trees using Laser Ace Hypsometer or clinometers. 3. Start from North and move in clockwise direction to measure heights all five identified trees falling within the plot. 4. Once the measurement of height is completed for all five trees, add the height and divide the sum by 5. The result is the stand height. Record the result to the nearest two decimal points. |
| 8. | Canopy cover percent | <p>Refers to the cover percent of tree canopy.</p>  <p>Plate 4: Points of measurement on circular plot</p> | <ol style="list-style-type: none"> 1. Divide the plot into four quarters using or with imaginary lines running through North-South intersecting with East-West line. 2. Using the Crown Densitometer, estimate the canopy cover percent from the following ten positions: <ul style="list-style-type: none"> -Plot centre, -Four mid-points of the lines joining plot centre and four directions (North, East, South and West) (Illustrated in Plate 4) -Four points on the edges of the plot boundary (Northern, Southern, Eastern and Western edges) -and one from any random point within the plot. <p>In total, take 10 points readings for canopy per cent calculation.</p> <p>Note: <i>Use of Crown Densitometer & calculation is given separately.</i></p> 3. Record the canopy percent. |

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| 9. | Land Ownership | <p>Refers to the ownership status of the land on which the plot is located. This is classified into the following categories:</p> <ol style="list-style-type: none"> 1. Government Reserve Forest (GRF) 2. GRF-Protected area 3. GRF-FMU 4. GRF-Community Forests 5. GRF-leased 6. Private 7. Thromde 8. Don't Know | Refer the legal definition for assessing the Land ownership status of the plot and record accordingly. |
| 10. | Land Ownership note | Any other information related to land ownership. | Mention any additional relevant information on land ownership |
| 11. | Land Cover Classification | <p>Land Cover classification is as per the LUPP, 1996 and is classified under the following categories:</p> <ol style="list-style-type: none"> 1. Coniferous forests 2. Broadleaf forests 3. Coniferous plantation 4. Broadleaf plantation 5. Scrub forests 6. Meadow 7. Chuzhing 8. Kamzhing 9. Mixed agriculture 10. Apple orchard 11. Citrus orchard 12. Areca nut 13. Cardamom Plantation 14. Other horticulture 15. Urban 16. Rural 17. Industrial 18. Impervious surface 19. Snow/glacier 20. Rocky outcrop 21. Scree 22. Lake 23. Reservoir 24. Marshy area 25. Landslide 26. Gully 27. Ravine 28. Others. <p>For Land Use definitions, refer Annexure III.</p> | <p>The technical definition provided in Annexure III will be used for identifying the Land Cover classification, which will then be recorded accordingly in the data dictionary or electronic field forms.</p> <p>Land Cover Classification Code as provided in the Annexure III may be used, if paper field forms have to be used.</p> |

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| 12. | Vegetation composition | <p>This refers to the dominating composition of vegetation and often described by predominant tree species.</p> <p>The types prepared for FMU Inventory will be used for describing the vegetation composition.</p> <p>The Vegetation Composition types are provided in Annexure IV.</p> | <ol style="list-style-type: none"> 1. Study the vegetation within 25 m radius of the plot for majority species. 2. Run through the Vegetation Composition list and select the most appropriate type 3. Record |
| 13. | Forest type | <p>Forest type classification is based on the classification established by the Flora of Bhutan. The characteristic feature of the different forest types are provided in Annexure V.</p> | <p>Select the appropriate forest type from the drop down list in case of electronic field form and in case of paper field forms, record the Forest type Code as provided in the Annexure V.</p> |
| 14. | Forest Stand Structure | <p>Defined as the “physical and temporal distribution of trees in a stand (Oliver and Larson,1990)</p> <p>And classified as:</p> <ol style="list-style-type: none"> 1. Open 2. Stand Initiation 3. Stand Exclusion 4. Stand reinitiation 5. Old growth <p>Refer illustration in Annexure XIII.</p> | <p>Study the stand structure within 12.62m and record appropriately.</p> |
| 15. | Main Understorey type | <p>Refers to the dominant understorey type growing within the plot. The understorey type is categorized as:</p> <ol style="list-style-type: none"> 1. Moss 2. Grass 3. Herbs 4. Bamboos 5. Shrubs 6. Others | <p>Record the appropriate undergrowth type.</p> |
| 16. | Understorey percent | <p>The Understorey cover percent is classified as:</p> <ol style="list-style-type: none"> 1. None 2. <2% 3. 2-5% 4. 10-40% 5. >40% | <p>Record the cover percent of the dominant understorey type that is recorded.</p> |

| Forest Resources | | | |
|------------------|--------------------------------|--|--|
| 17. | Non Wood Forest Produce (NWFP) | <p>Non Wood Forest Produce (NWFP) for the purpose of NFI will refer to only the living plant species whose plant parts(flowers,seeds,bulbs, roots,fruits,leaves,barks , any other vegetative part or the whole plant) or its produce such as resin,katha,kutch has medicinal properties or is edible or has some utility to people as tangible goods, or has economic value . NWFP may include trees, shrubs, herbs, bamboos, grasses, creepers, reeds, orchids, canes and fungi.</p> <p>(This working definition is guided by Forest and Nature Conservation Rules of Bhutan,2006 definition of NWFP)</p> <p>Options for listing five NWFPs are provided in the data forms along with the cover percent of each, within the 12.62m radius area.</p> | Assess the plot and record the NWFPs found in the 12.62m radius plot. NWFP may be recorded by its botanical name, common name or local name or by any two nomenclatures. Annexure XI provides the list of important NWFPs in Bhutan. However, identification of NWFP should not be limited to the list provided. Field references and field guides and local knowledge should be used to identify NWFPs. |
| 18. | Cover Percent | Refers to the cover percent of the NWFP found within the plot. | Record the cover percent of the identified NWFP. |
| 19. | Bamboo | | If bamboos are observed within the 12.62 m radius plot, record as “Yes”, otherwise “No”. |
| 20. | Bamboo Scientific Name | | <p>Record the botanical name of the bamboo observed within the plot.</p> <p>The botanical names of the bamboos found in Bhutan are provided as drop-down list in the electronic field form.</p> <p>If paper field form is used, record appropriately from the list of Bamboo provided.</p> |
| 21. | Bamboo cover percent | <p>The status of bamboo cover within the 12.62 m radius plot is categorized as:</p> <ol style="list-style-type: none"> 1. None 2. <10% 3. 10-20% 4. 20-50% 5. >50% | Assess the plot for bamboo cover and accordingly record the appropriate category. |
| 22. | Bamboo Regeneration | <p>The status of bamboo regeneration within the 12.62 m radius plot is categorized as:</p> <ol style="list-style-type: none"> 1. None 2. <10% 3. 10-20% 4. 20-50% 5. >50% | Assess the plot for bamboo regeneration and accordingly record the appropriate category. |
| 23. | Cane Cover Percent | <p>The status of cane cover within the 12.62m radius plot is categorized as:</p> <ol style="list-style-type: none"> 1. None 2. <2% 3. >2% | Select the appropriate category of cane status in the plot. |

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| 24. | Cane DBH | <p>The DBH class of mature cane is categorized as:</p> <ol style="list-style-type: none"> 1. Unspecified: when no cane are observed within the plot 2. <2 % 3. >=2% | Record appropriately. |
| 25. | Daphne Cover | <p>The status of Daphne cover within the 12.62m radius plot is categorized as:</p> <ol style="list-style-type: none"> 1. None 2. <2% 3. >2% | Select the appropriate category of Daphne status in the plot. |
| 26. | Snag | <p>Dead standing tree will be referred to as Snag. Such trees will not have any living part at or above the DBH.</p> <p>The number of snags will be recorded as one of the following ranges:</p> <ol style="list-style-type: none"> 1. 1-5 snags 2. 5-10 snags 3. More than 10 4. No, snags | If snag trees are found within the 12.62 m radius plot, the recorder will count the number of snags and select the range from the drop down list and record accordingly. |
| 27. | Fallen trees | <p>The number of dead fallen trees (of more than 1.37 m length) within the 12.62 m radius will be counted and recorded as one of the following:</p> <ol style="list-style-type: none"> 1. 1-5 fallen trees 2. 5-10 fallen trees 3. More than 10 4. No fallen trees | Count the number of fallen trees and record the appropriate category, within which it falls. |

Disturbance

| | | | |
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| 28. | Forest Fire Extent | <p>Refers to the extent of forest fire damage and will be classified in one of the following categories:</p> <ol style="list-style-type: none"> 1. Heavy: Where more than 50% of the area/crop is affected by fire 2. Moderate: Where 10-50% of the area/crop is affected by fire 3. Light: Where less than 10% of the area/crop is affected by fire 4. No Fire | Assess the area ocularly for fire incidence evidence and extent of forest fire damage. |
| 29. | Forest Fire Type | <p>Will be classified be in one of the following categories:</p> <ol style="list-style-type: none"> 1. Underground fire: fire spreading under the surface through roots or any other underground means 2. Surface fire: Fire spreading through ground cover, vegetation and litters without reaching the tree canopies 3. Crown fire: Fire spreading through the canopies of woody vegetation 4. Not Sure/not known: If the nature of forest fire cannot be ascertained 5. Not applicable: When no fire incidence is evident | If forest fire incidences are visible, then classify the type of forest fire that had affected the area. |

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|----------------------|--------------------|--|--|
| 30. | Grazing Evidence | Will be classified as: 1. Yes: When there are signs of grazing, presence of livestock or sighting of cattle ,dung etc 2. No grazing 3. Not sure | Record your observation |
| 31. | Grazing Extent | Will be classified as: 1. Slight 2. Moderate 3. Severe 4. None | Record your observation |
| 32. | Timber Extraction | Indicates evidence of timber extraction at the plot area and will be categorized in one of the following: 1. Clear felling: Felling of all trees in the area 2. Selective felling: Felling of trees selectively/ few trees felled 3. Group felling: Felling of trees in group/patch 4. Others 5. No felling | Record your observation by selecting appropriately from drop down list. |
| 33. | Mining | Indicates evidence of Mining in the area and will be categorized as: 1. Yes, surface collection 2. Yes, quarry 3. None | If you observe mining activities within the plot or within 25 m from the plot centre, record as “Yes”, else “No” |
| 34. | Transmission lines | Refers to the transmission wires running over-head and/or existence of transmission poles. | 1. If the transmission line runs over the plot, then it will be recorded as “Yes”. 2. Existence of electric poles within the plot or boundary of the plot will be recorded as “Yes” |
| 35. | Garbage | Will be categorized as: 1. Food wrappers and PET bottle etc 2. Construction wastes 3. Biodegradable wastes 4. All 5. None | Evidence of any garbage/wastes in the plot area will be recorded under any one of the relevant category. |
| Forest Health | | | |
| 36. | Mistle Toe | Mistletoe is a obligate hemi parasitic plant that grows attached to and penetrating within branches of trees. Can be identified on trees by the presence of “witches broom” | If mistletoes are observed on the plot itself or within 25 m from the plot centre, record as “Yes, mistletoe”, otherwise as “No” |

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| 37. | Dieback Fir | <p>Fir dieback is a condition observed in Fir, where the following symptoms are observed:</p> <ol style="list-style-type: none"> 1. Top-dying/shedding of needles 2. Thinning crown | If fir dieback is observed on the plot itself or within 25 m from the plot centre, record as “Yes”, otherwise “No”. |
| 38. | Bark Beetle | <p>Refers to occurrence of Bark Beetle infection in the forest stand. The visible symptoms of bark beetle infections are:</p> <ol style="list-style-type: none"> 1. Discoloration of needles from green to yellow and eventually from red to brown 2. Tiny holes in the bark of the infected trees | If you observe the symptoms of Bark Beetle infection in the area, record as “Yes”, else “No”. |
| 39. | Others | | If other pest and diseases are observed, record as observed. |
| Litter, Humus and Fuel bed | | | |
| 40. | Litter Depth Value | <p>Refers to the depth of litter on the forest floor, measured in centimeters.</p> <p>Litter can be defined as the surface layer of the forest floor consisting of freshly fallen leaves, needles, twigs, stems, bark, and fruits. The decomposition would have just begun in this layer.</p> | <p>Measure the Litter depth at three random points in the plot, using a measuring scale.</p> <p>Record the average value to the nearest decimal in centimeters.</p> |
| 41. | Humus depth Value | <p>Humus is the layer just below the litter and comprises of highly decomposed organic matter. There will be no discernible plant parts.</p> | <p>Measure the Humus depth at three random points in the plot, using a measuring scale.</p> <p>Record the average value to the nearest decimal in centimeters.</p> |
| 42. | Fuel bed Depth Value | <p>The accumulated mass of dead, woody material on the surface of the forest floor.</p> <p>It begins at the top of the duff/humus layer, and includes litter, fine and coarse wood debris and dead woody shrubs.</p> | <p>Measure the fuel depth at three random points in the plot.</p> <p>Record the average value to the nearest decimal in centimeters.</p> |
| 43. | Litter Cover percent | <p>The coverage of the litter measured as a percentage of the total area of the plot.</p> | Record the cover percent of litter in the 12.62m radius plot. |
| 44. | Bare soil cover percent | <p>The extent of plot area that is not covered by litter and indicated as the percentage of total area.</p> | Record the bare soil cover percent in the 12.62m radius plot. |
| Soil | | | |
| 45. | Stoniness | <p>Refers to cover percent of stones in the 12.62 m radius plot area. The stoniness of the plot area may be classified as:</p> <ol style="list-style-type: none"> 1. None 2. Rare >10 percent 3. Few 10-20 percent 4. Common 20-30 percent 5. Many 30-60 percent 6. Abundant >60 percent | <p>Walk around the plot and assess the area for stoniness and record your observations by selecting the most appropriate from the drop down list, incase of electronic form and ticking incase of paper field forms.</p> |

| | | | |
|-----|-----------------------|--|---|
| 46. | Soil drainage | <p>The drainage capacity of the soil is observed and classified as under:</p> <ol style="list-style-type: none"> 1. Poorly drained: Water removed slowly; soil remains wet with water table near the surface for considerable part of the time. 2. Moderately drained: Water removed somewhat slowly and soil remains wet for small part of the time. Mottles observed below 75cm. 3. Well drained: Water removed rapidly. No mottles | <p>Select the most appropriate from the list incase of electronic field forms.</p> <p>Tick appropriately incase of paper field forms.</p> |
| 47. | Top soil moisture | <p>Refers to the moisture content of the top soil at the time of data collection and classified as:</p> <ol style="list-style-type: none"> 1. Dry 2. Slightly moist 3. Moist 4. Wet 5. Water-logged. | <p>Select the most appropriate from the list incase of electronic field forms.</p> <p>Tick appropriately incase of paper field forms.</p> |
| 48. | Top soil colour | <p>Refers to the colour of the soil and classified as:</p> <ol style="list-style-type: none"> 1. Dark 2. Reddish 3. Yellowish 4. Others | <p>Select the most appropriate from the list incase of electronic field forms.</p> <p>Tick appropriately incase of paper field forms.</p> |
| 49. | Top soil colour chart | <p>Here, use the Munsell Soil chart and find the soil colour on the chart that matches with soil colour in the plot.</p> <p>Each soil type (by colour) is coded.</p> | <p>Record the Soil code of the soil colour that matches with that of the plot.</p> |
| 50. | Top soil texture | <p>Is the assessment of the soil texture, which will be classified as:</p> <ol style="list-style-type: none"> 1. Sand 2. Sandy loam 3. Loam 4. Silty Loam 5. Silt 6. Clay loam 7. Clay <p>Refer to the Rough guide provided in Annexure XIV to determine the soil texture</p> | <p>Feel the soil particles and assess the texture as instructed in the field guide provided in Annexure XIV</p> <p>Record your observation.</p> |
| 51. | Soil sample | <p>Determines whether soil sample from the plot is being collected or not.</p> | <p>If soil sample are collected, record “Yes” else “No”</p> |
| 52. | Gully Evidence | <p>Gullies are vast gaps, crevices created by erosion of soil on hillside by running waters.</p> | <p>If gullies are observed within the plot or 25m around the plot, record as ‘Yes’, otherwise, ‘No’</p> |
| 53. | Erosion Evidence | | <p>Check for evidence of erosion and record.</p> |

| Water Bodies | | | |
|--------------|------------------------|--|---|
| 54. | Stream / River | Refers to any flow of water in a channel or bed, as a brook, rivulet or small river. | If there is a stream/river within the plot or 25m around the plot, record as “Yes”, otherwise “No”. |
| 55. | Wetland/ Marshy Areas | Refers to any inundated /waterlogged area or areas with ponds. | If the plot area or area within 25m radius from the plot centre, shows waterlogged/swampy conditions, then record as “Yes” else “No” |
| 56. | Lakes | <p>A lake is a body of relatively still fresh or salt water of considerable size, localized in a basin, which is surrounded by land apart from a river, stream, or other form of moving water that serves to feed or drain the lake.</p> <p>(Source:en.wikipedia.org/wiki/Lake).</p> <p>Lakes can be Alpine lake, Sub-alpine lakes, Glacier lakes, Supra Glacial lake, Supra snow lake or Tsho.</p> | Presence of lake (irrespective of the category) within the plot or within 25m radius from the plot centre will be recorded as “Yes” else “No”. |
| 57. | Glacier | <p>A glacier is a large persistent body of ice that forms where the accumulation of snow exceeds its ablation (melting and sublimation) over many years, often centuries.</p> <p>(At least 0.1 km² in area and 50 m thick)</p> <p>(Source:http://en.wikipedia.org/wiki/Glacier)</p> <p>This will be relevant for Cluster plots falling in the high altitudes only.</p> | Record “Yes” or “No” |
| Site Value | | | |
| 58. | Natural Trail facility | Refers to any approach path (footpath, road) to the plot, within the plot or within 25 m radius from the plot centre. | Record “Yes” or “No” |
| 59. | Scenic | Refers to aesthetic value of the site. | Record “Yes” or “No” based on your own observation/judgment. |
| 60. | Visitor Evidence | <p>Any evidence of human visiting the area in and around 25m of the plot.</p> <p>For this consult with the local guide accompanying the crew.</p> | <p>Record as:</p> <ol style="list-style-type: none"> 1. Yes, Local 2. Yes, Foreigner 3. Yes, Religious 4. None evident 5. Don't know |
| 61. | Site value | <p>Refers to any value attached to the location by people and will be classified as:</p> <ol style="list-style-type: none"> 1. Yes, cultural 2. Yes, historical 3. Yes, religious 4. None 5. Don't know | <p>Select the most appropriate from the list incase of electronic field forms.</p> <p>Tick appropriately incase of paper field forms.</p> |
| 62. | Site name | Name of the site | Record the name of the site, if it has one. |

3.2.5 Tree Data

Tree is a woody perennial with a single main stem, or, in the case of coppice, with several stems, having a more or less definite crown (FAO, 2005). Tree data is collected from all three plots of the cluster; Elbow, North and East plots. For NFI, any woody perennial that meet the above definition of tree and has DBH of above 10cm (both live and dead); and falls within 12.62m are considered tree, for which data should be collected.

Note: *The same tree data collection Form is used for all three plots; Elbow, North and East.*

| SN | Parameters | Description/ Definition | Instructions or how to fill in Data Dictionary |
|----|---------------------------|---|--|
| 1 | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the field form. Note: <i>Paper Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2 | Plot Name | Refers to one of the three plots (Elbow, East or North Plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic form is used. If paper forms have been used, tick the relevant plot from the three options provided. |
| 3 | Scientific Name | Refers to formal scientific name which conforms to the <i>International Code of Botanical Nomenclature (ICBN)</i> | Choose appropriate Botanical Name from the drop down list. If the name of the plant is not in the list, then provision for typing the botanical name is also provided. If Paper forms have been used, record appropriately. |
| 5 | Common Name/Local Name | “Common name” herein is referred to the commonly used name of a tree in English. “Local name” means name of tree in local dialect. For NFI, the Local Names in following dialects will be used; Dzongkha (Dz), Tshanglha Kha (Ts), Lhotsham kha (Lh), Bumthangp (Bum), Khengkha (Kh), Trongsap (Tr) and Kurtoep (Kr). | The crew may note either the common name or the local name of the plant. In case of local name, crew must specify dialect in which the local name has been given. (For <i>Quercus griffithii</i> , it is Baenangshing in Tshanglha Kha , therefore, local name must be written as Baenangshing (Ts) , Ts indicates it is in Tshanglha Kha) |
| 7 | Distance from Plot Centre | The distance of the tree from the centre of the plot | The distance of the tree from the plot centre should be measured using Laser Ace Hypsometer. In dense forest where use of Hypsometer is not possible, distance must be measured using tape. |
| 8 | Azimuth | The angle from North at which the tree is located. | The Azimuth of a tree should be measured using compass by standing at the centre of the plot. The Azimuth should be in Degrees. |
| 9 | DBH | DBH refers to Diameter at Breast Height. It is defined as a method of dendrometric measurements wherein the Diameter is measured at Breast Height which is 1.37m above ground. | Standard Rules for measuring Diameter at Breast Height (DBH) is given as Annexure XV. |
| 10 | Height of tree | The height of a tree is the length of tree from Ground till Tip. | The height of tree will be measured using Laser Ace Hypsometer. The measurement should be taken by standing on uphill side of the tree on a slope and reading will be rounded up to the nearest meter. The use of Laser Ace Hypsometer will be given separately. |

| | | | |
|----|-------------------|--|---|
| 11 | Bole Height | The distance between ground level and crown point (<i>the position of the first crown forming living or dead branch</i>) is defined as Bole Height. For the purpose of NFI, the Bole height will be referred to the distance between ground level to the point on the bole having approximately 10cm diameter. | The Bole Height will be measured using Laser Ace Hypsometer. The measurement should be taken by standing on uphill side of the tree on a slope and reading will be rounded up to the nearest meter. |
| 12 | Crown Length | The vertical measurement of crown from the tip of the crown to the point, half way between lowest green branch forming green crown all around and the lowest green branch on the bole is Crown Length. | The crown length of tree will be measured using Laser Ace Hypsometer. The measurement should be taken by standing on uphill side of the tree on a slope and reading will be rounded up to the nearest meter. |
| 13 | Crown Position | This refers to the position of crown of a tree in relation to the adjacent trees | <p>The crown position of a tree will be determined ocularly by Inventory Crew and then select the options given as dropdown list. Accordingly it will recorded as Dominant, Dominated, Suppressed, Solitary, Abnormal and Damaged Trees or Dead Trees.</p> <ol style="list-style-type: none"> Dominant Trees: Trees which form the upper most leaf canopy and have their leading shoots free. These trees are called best trees. Dominated Trees: Trees which do not form part of the upper most leaf canopy but leading shoots of which are definitely not over-topped by neighboring trees. Their height is about 3/4 of the tallest tree which falls within the plot. Suppressed Trees: Trees which reach only about 1/2 to 5/8 of the height of the best trees, with their shoots over-topped by the neighbouring trees. Solitary Trees: Trees which stand scattered or stand individually. |
| 14 | Condition of Tree | <p>The condition of the tree will be categorized as:</p> <ol style="list-style-type: none"> Healthy Diseased: Trees which are infected with pests and diseases Abnormal and Damaged: Trees which are moribund, damaged or hollowed etc. Dead: Will not have any living part at or above DBH. | Record appropriately. |
| 15 | Bark Thickness | The outer sheath of the tree is called Bark and Bark Thickness refers to the amount of bark around a tree from outside surface till cambium/ wood of a tree. | <p>The Bark Thickness will be measured using Bark Gauge.</p> <ol style="list-style-type: none"> Press Bark Gauge against bark until wood is reached and read the scale to determine bark thickness. Measurement should be taken at Breast Height (at 1.37m above ground, where DBH is taken) |
| 16 | Core Taken | <p>Tree Cores will be used for estimating the age of the tree and understanding the growth of trees.</p> <p>Once the trees in the circular plot of 12.62 m have been measured for its DBH, segregate the trees into dia-class of 10cm interval (eg.10-20, 20-30...). Select one tree from each of the dia-class for coring.</p> <p>However, if a plot has less than 5 trees, all trees may be cored.</p> | If the tree is selected for coring and the tree core is taken, record as “Yes” otherwise “No”. |

| | | | |
|----|--------------------|--|--|
| 17 | Core 1 | From each tree, two cores should be taken from side perpendicular to each other at breast height. The first core taken will be referred to as Core 1. | Using the Increment Borer bore the equipment to the pith of the tree. The carefully extract the core of the tree. (Use of Increment Borer is given as separate instructions.) Two key points to remember and implement while coring is to make sure that tree core is obtained at breast height (1.37m) and that Increment borer passes through the pith. |
| 18 | Core1N | Refers to Total number of rings in core number 1. | Extract the Core of a tree and count the total number of rings of the core taken (For instance Core1N=100) |
| 19 | Core 1nn | Refers to the number of rings in the inner 5.08 centimeter of the core number 1. | Count the number of rings in the inner 5.08 centimeter of the core closest to the centre of the tree (For instance Core1nn=10) |
| 20 | Core 1L | Refers to the length of the core in inches with bark. | Measure the length of core in centimeter without removing the bark (For instance Core1L=15cm) |
| 21 | 10 Years Increment | Refers to the growth that has taken place in last ten years | Use same core extracted to determine age. Count back 10 growth rings from cambium end of the core. Measure the length of the segment to the core to get the radial increment. Record the reading in centimeter. |
| 22 | 5 Years Increment | | Use same core extracted to determine age. Count back 5 growth rings from cambium end of the core. Measure the length of the segment to the core to get the radial increment. Record the reading in centimeter. |
| 23 | Core 2N | The second core taken from the same tree will be referred to as Core2 and the total number of rings will be referred as Core 2N. | Extract the Core of a tree and count the total number of rings of the core taken (For instance Core1N=100) |
| 24 | Core 2nn | Is the number of rings in the inner 5.08 centimeter of Core 2. | Count the number of rings in the inner 5.08 centimeter of the core and record the measurement. |
| 25 | Core 2L | Is the total length of the second core, Core 2. | Measure the length of the core in inches and record the measurement. |
| 26 | 10 Years Increment | Refers to the growth that has taken place in last ten years | Count back 10 growth rings from cambium end of the core on the second core. Measure the length of the segment to the core to get the radial increment. Record the reading in centimeter. |
| 27 | 5 Years Increment | Refers to the growth that has taken place in last five years. | Count back 5 growth rings from cambium end of the second core. Measure the length of the segment to the core to get the radial increment. Record the reading in centimeter. |

Note: Not all trees falling within the plots will be cored. Only one tree per diameter class will be cored and diameter classes will be 10-20, 20-30 and so on.

3.2.6 Sapling Data

All tree species having DBH above 5cm but less than 10 cm will be identified as Sapling. Sapling data will be collected from 12.62m radius plot of all three plots (Elbow, North and East).

| SN | Data Items | Description/Definition | Instructions |
|----|------------------------|---|--|
| 1 | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the field form. Note: <i>Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2 | Plot Name | Refers to one of the three plots (Elbow, East or North Plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic field form is used. If paper field forms have been used, tick the relevant plot from the three options provided. |
| 4 | Scientific Name | Refers to formal scientific name which conforms to the <i>International Code of Botanical Nomenclature (ICBN)</i> | Choose appropriate Botanical Name from the drop down list. If the name of the plant is not in the list, then provision for typing the botanical name is also provided. If Paper field forms have been used, record appropriately. |
| 5 | Common Name/Local Name | “Common name” herein is referred to the commonly used name of a tree in English. “Local name” means name of tree in local dialect. For NFI, the Local Names in following dialects will be used; Dzongkha (Dz), Tshanglha Kha (Ts), Lhotsham kha (Lh), Bumthangp (Bum), Khengkha (Kh), Trongsap (Tr) and Kurtoep (Kr). | The crew may note either the common name or the local name of the plant or both (are known). In case of local name, crew must specify dialect in which the local name has been given. (For <i>Quercus griffithi</i> , it is Baenangshing in Tshanglha Kha , therefore, local name must be written as Baenangshing (Ts) , Ts indicates it is in Tshanglha Kha) |
| 6 | No. of individuals | Refers to the number of saplings of particular species found within a plot. | Count the number of saplings of one species and record the observation. If there are more than one species, open same field form (electronic form) and fill it up as being done for first species. For paper field forms, write the species name and record the number accordingly. |
| 7 | Layer height | The predominant height of the saplings in meters | Record the predominant height of the saplings in meters |
| 8 | Cover percent | Cover percent of sapling within 12.62 m radius plot. | Ocularly estimate as to the extent of coverage of sapling within 12.62m plot and express it in terms of percentage. |

3.2.7 Shrub Data

Shrub is a single or multi-stem woody perennial plant, generally more than 0.5m and less than 5m high at maturity without a definite crown. For NFI, shrub data will be collected from all three 12.62m plots; Elbow, North and East.

Note: Same data collection form will be used for all three plots

| SN | Data Items | Description/Definition | Instructions |
|----|-------------------------|---|--|
| 1 | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the electronic field form. Note: Paper Field Forms are to be used only if the Trimble Juno does not function in the field. |
| 2 | Plot Name | Refers to one of the three plots (Elbow, East or North Plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic field form is used. If paper field forms have been used, tick the relevant plot from the three options provided. |
| 3 | Condition | Whether the shrub is dead or alive. | Mention “Alive” for live shrub, else “Dead” |
| 4 | Scientific Name | Refers to formal scientific name which conforms to the <i>International Code of Botanical Nomenclature (ICBN)</i> | Choose appropriate Botanical Name from the drop down list. If the name of the plant is not in the list, then provision for typing the botanical name is also provided. If Paper field forms have been used, record appropriately. |
| 5 | Common Name/ Local Name | “Common name” herein is referred to the commonly used name of a tree in English. “Local name” means name of tree in local dialect. For NFI, the Local Names in following dialects will be used; Dzongkha (Dz), Tshanglha Kha (Ts), Lhotsham kha (Lh), Bumthangp (Bum), Khengkha (Kh), Trongsap (Tr) and Kurtoep (Kr). | The crew may note either the common name or the local name of the plant. In case of local name, crew must specify dialect in which the local name has been given. (For <i>Berberis aristata</i> , it is Kerpa zoo in Tshanglha Kha , therefore, local name must be written as Kerpa zoo (Ts) , Ts indicates it is in Tshanglha Kha) |
| 6 | Layer height | The predominant height of the shrubs in meters | Record the predominant height of the shrubs in meters |
| 7 | Cover percent | Cover percent of shrub within 12.62 m radius plot. | Occularly estimate as to the extent of coverage of shrub within 12.62m plot and express it in terms of percentage. |

3.2.8 Herb Data

For NFI, Herb is any soft-stemmed plant with height equal to or less than 1 meter. The herb data will be collected from 1m² plot (radius 0.57m) which will be laid in North and East plots. Inventory crew must first collect herb data (like regeneration data in Elbow plot) in North and East plots to avoid trampling of herbs.

| SN | Data Items | Description/Definition | Instructions |
|----|----------------------------|---|---|
| 1 | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the electronic field form. <i>Note: Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2 | Plot Name | Refers to one of the two plots (East or North Plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic field form is used. If paper field forms have been used, tick the relevant plot from the two options provided. |
| 3 | Scientific Name | Refers to formal scientific name which conforms to the <i>International Code of Botanical Nomenclature (ICBN)</i> | Choose appropriate Botanical Name from the drop down list. If the name of the plant is not in the list, then provision for typing the botanical name is also provided. If Paper field forms have been used, record appropriately. |
| 4 | Common Name/ Local Name | “Common name” herein is referred to the commonly used name of a tree in English. “Local name” means name of tree in local dialect. For NFI, the Local Names in following dialects will be used; Dzongkha (Dz), Tshanglha Kha (Ts), Lhotsham kha (Lh), Bumthangp (Bum), Khengkha (Kh), Trongsap (Tr) and Kurtoep (Kr). | The crew may note either the common name or the local name of the plant. In case of local name, crew must specify dialect in which the local name has been given. (For <i>Houttuynia cordata</i> , it is Mombaring in Tshanglha Kha , therefore, local name must be written as Mombaring (Ts) , Ts indicates it is in Tshanglha Kha) |
| 5 | Layer height | The predominant height of the herbs in meters | Record the predominant height of the herbs in meters |
| 6 | Cover percent | Cover percent of herb within 0.57 m radius plot. | Ocularly estimate as to the extent of coverage of herb within 0.57m plot and express it in terms of percentage. |
| 7 | Number of individuals | Refers to the total number of individual of the identified species | Count the number of individuals within the sub-plot of 1m ² and record the number. |
| 8 | Remarks | | The Crew Leader or the data recorder may add any additional information on herbs found within the plot. |

3.2.9 Wildlife Data

The National Forest Inventory will also collect some information on wildlife from the three plots: Elbow, North and East plot. Wildlife field forms will collect data on Mammals, Birds and Reptiles separately as described.

Mammal data:

| SN | Data Item | Definition/Description | Instruction |
|----|------------------|--|---|
| 1 | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the electronic field form. Note: <i>Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2 | Plot name | Refers to one of the three plots (Elbow, East or North plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic field form is used. If paper field forms have been used, tick the relevant plot from the three options provided. |
| 3 | Mammal number | Refers to the order of sighting. It can be 0,1,2,3 and so on depending on the number of sighting or observations. | Record as “0” when no mammals are sighted, observed (from indirect evidence) in within 25m radius. Record as “1” for the first sighting/observation, “2” for second sighting observation, and “3” for the third and so on. Remember to open a new field form for every observation or sighting, if electronic form is used. |
| 3 | Mammal sighted | What is the mammal that has been sighted or identified? The list of mammals will be provided in Annexure XIII | Select from the drop down list and record the mammal sighted or identified from the evidences. Select “None” if no mammal is observed. |
| 4 | Species identity | Refers to the confidence in the identification and can be categorized as: 1. Certain: when one is very sure that the identification is correct 2. Doubtful: When one is not very confident about the identification 3. Not relevant | Depending on the level of confidence in the identification, choose from the list if electronic field forms are used. Tick appropriately if paper field forms are used. |
| 5 | Evidence Type | Refers to the type of evidence by which the identification of mammal was done. The categories are: 1. Direct sighting 2. Sound/calls 3. Dung/Pellets/Scats 4. Skeleton/Cadaver 5. Horns/Antlers 6. Footprints/pugmarks 7. Tracks/Paths 8. Burrow/Den 9. Browsing 10. Debarking 11. Fraying 12. Digging 13. Not relevant | Select the appropriate evidence type and record. “Not relevant” should be selected when there are no mammals sighted or observed in the 25m radius. |
| 6 | Gender | Refers to the gender of the mammal sighted | If gender can be determined, record as determined. If gender cannot be determined, then record as “Not known”. |
| 7 | Group size | Refers to the number of individuals of the same species sighted or observed. | Record the number of individuals of same species sighted (as identified from direct sighting) It may not be possible to determine the number from indirect evidences. |
| 8 | Remarks | | The Crew Leader or the data recorder may add any additional information on mammal |

Bird Data:

| SN | Data Item | Definition/Description | Instruction |
|----|------------------|---|---|
| 1 | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP NO is entered in the data dictionary or the field form. Note: <i>Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2 | Plot name | Refers to one of the three plots (Elbow, East or North Plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic form is used. If paper forms have been used, tick the relevant plot from the three options provided. |
| 3 | Bird number | Refers to the order of sighting. It can be 0,1,2,3 and so on depending on the number of sighting or observations. | Record as “0” when no birds are sighted, observed (from indirect evidence) in within 25m radius. Record as “1” for the first sighting/observation, “2” for second sighting observation, “3” for the third and so on. Remember to open a new field form for every observation or sighting, if electronic form is used. |
| 3 | Bird sighted | What is the bird that has been sighted or identified? | Select from the drop down list and record the bird sighted or identified from the evidences. Select “None” if no bird is observed. |
| 4 | Species identity | Refers to the confidence in the identification and can be categorized as: 1. Certain: when one is very sure that the identification is correct 2. Doubtful: When one is not very confident about the identification 3. Not relevant: When no birds have been sighted | Depending on the level of confidence in the identification, choose from the list if electronic field forms are used. Tick appropriately if paper field forms are used. |
| 5 | Evidence Type | Refers to the type of evidence by which the identification of bird was done. The categories are: 1. Direct sighting 2. Sound/calls 3. Droppings 4. Eggs 5. Skeleton/Cadaver 6. Feathers 7. Footprints 8. Tracks/Paths 9. Nests/Burrows 10. Not relevant | Select the appropriate evidence type and record. “Not relevant” should be selected when there are no birds are sighted or observed in the 25m radius. |
| 6 | Gender | Refers to the gender of the bird sighted | If gender can be determined, record as determined. If gender cannot be determined, then record as “Not known”. |
| 7 | Group size | Refers to the number of individuals of the same species sighted or observed. | Record the number of individuals of same species sighted(as identified from direct sighting) It may not be possible to determine the number from indirect evidences. |
| 8 | Remarks | | The Crew Leader or the data recorder may add any additional information on birds. |

Reptile Data:

| SN | Data Item | Definition/Description | Instruction |
|----|------------------|---|--|
| 1 | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the electronic field form. Note: <i>If Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2 | Plot name | Refers to one of the three plots (Elbow, East or North Plot) of cluster plot | Choose appropriate plot name from the drop down list, if electronic field form is used. If paper field forms have been used, tick the relevant plot from the three options provided. |
| 3 | Reptiles number | Refers to the order of sighting. It can be 0,1,2,3 and so on depending on the number of sighting or observations. | Record as “0” when no reptiles are sighted, observed (from indirect evidence) in within 25m radius. Record as “1” for the first sighting/observation, “2” for second sighting observation, and “3” for the third and so on. Remember to open a new field form for every observation or sighting, if electronic field form is used. |
| 3 | Reptiles sighted | What is the reptile that has been sighted or identified? The list of reptiles will be provided in Annexure | Select from the drop down list (if electronic form is used) and record the bird sighted or identified from the evidences (if paper form is used). Select “None” if no reptile is observed. |
| 4 | Species identity | Refers to the confidence in the identification and can be categorized as: 1. Certain: when one is very sure that the identification is correct 2. Doubtful: When one is not very confident about the identification 3. Not relevant | Depending on the level of confidence in the identification, choose from the list if electronic field forms are used. Tick appropriately if paper field forms are used. |
| 5 | Evidence Type | Refers to the type of evidence by which the identification of reptile was done. The categories are: 1. Direct sighting 2. Sound/calls 3. Eggs 4. Skeleton 5. Skin 6. Tracks/Paths 7. Nests/Burrow 8. Den 9. Not relevant | Select the appropriate evidence type and record. “Not relevant” should be selected when there are no reptiles are sighted or observed within the 25m radius. |
| 6 | Gender | Refers to the gender of the reptile sighted | If gender can be determined, record as determined. If gender cannot be determined, then record as “Not known” . |
| 7 | Group size | Refers to the number of individuals of the same species sighted or observed. | Record the number of individuals of same species sighted (as identified from direct sighting) It may not be possible to determine the number from indirect evidences. |
| 8 | Remarks | | The Crew Leader or the data recorder may add any additional information on reptiles |

3.2.10 Coarse Woody Debris Data

Once data collection from Elbow plot is completed, the Crew will move to North plot making a transect of 50m to collect data from North plot. Similarly, upon completion of the data collection in the North plot, the Crew will move back to Elbow plot and from the Elbow plot make a 50 m transect to East plot.

Coarse Woody Debris data will be collected from these two 50 m transects (Elbow to North and Elbow to East).

All down and dead tree bole, large branches and other woody pieces that are severed from their original source of growth will be considered as Coarse Woody Debris (CWD). **CWD will not include standing dead trees, stumps, separated barks, non woody pieces, roots or the part of the bole below the root collar** (Waddell, 2002). Woody debris of more than 10cm diameter at the point of intersection with transect will be sampled. Not all CWD will be measured but only those, which meet the following criteria will be tallied for measurement:

- The central longitudinal axis of CWD must intersect with transect
- Must have minimum 10 cm diameter at point of intersect with transect
- Piece length is at least 1m or greater than 1meter.
- Piece is not decayed to the point of having no structural integrity

If a woody debris of 10cm minimum diameter is found along the transect but does not intersect with the transect, the CWD will be ignored. Any CWD less than 1m will also be ignored even if it intersects the transect (Refer to Plate 5) In case of CWD, where the main bole as well as the branches intersect with the transect and if the intersecting segments has more than 10cm at the point of intersection, then the segments will be considered as separate pieces (Refer to Plate 6)

In case of forked trees, the forked segment with largest diameter will be considered as the main bole and therefore the length will be measured from tip of the fork to the end of the log. For the smaller segment (having smaller diameter), will be recorded as the second piece and the length will be measured from the fork tip to the point where this piece separates as a fork.

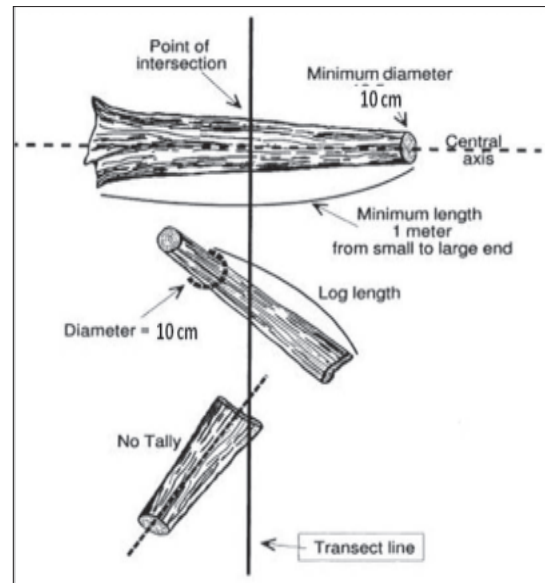


Plate 5: Conditions for tally of CWD for measurement

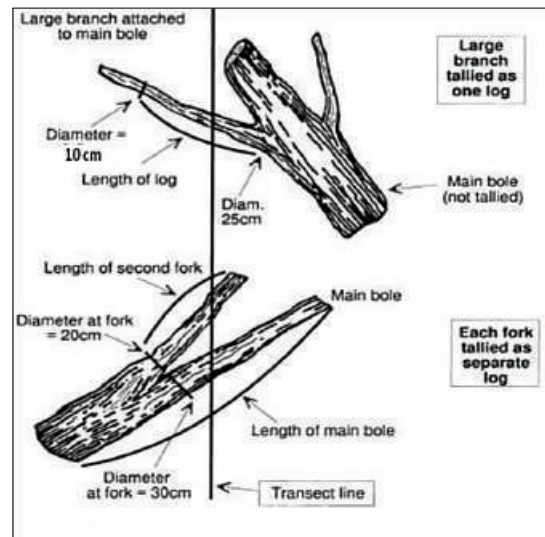


Plate 6: Measurement of forked and branched CWD

For every tallied CWD piece and segments, the following data and measurements will be recorded:

| SN | Data Item | Definition/Description | Instruction |
|----|------------------------|--|---|
| 1. | CP No | This is the unique identification number given to Cluster Plot. Eg. CP0001 | Ensure that the correct CP No is entered in the data dictionary or the electronic field form. Note: <i>If Paper Field Forms are to be used only if the Trimble Juno does not function in the field.</i> |
| 2. | To Plot Name | Refers to one of the two plots (East or North Plot) of cluster plot to which transect is moving. | Choose appropriate plot name as it appears against it as drop down list, if electronic field form is used. If paper field form is used, tick accordingly from the options given. |
| 3. | CWD Scientific name | | If the CWD can be identified, record the botanical name of the tallied piece or else record it by common name or local name. |
| 4. | Diameter large end | Is the diameter of the CWD at large end. | Record the measurement in centimeters to nearest two decimal points. |
| 5. | Diameter intersection | Is the diameter of the CWD at point of intersection with transect. | Record the measurement in centimeters to nearest two decimal points |
| 6. | Diameter small end | Is the diameter of the CWD at small end. | Record the measurement in centimeters to nearest two decimal points. |
| 7. | Length of intersection | Is the length of CWD from the small end side to the point of intersection | Record the measurement in meters to nearest two decimal points |
| 7 | CWD length | Total length of the CWD | Record the measurement in meters to nearest two decimal points. |
| 8 | CWD width | May be defined as the perpendicular distance covered by the CWD to transect. Refer Plate 7 for guidance. | Record the measurement in meters to nearest two decimal points. |

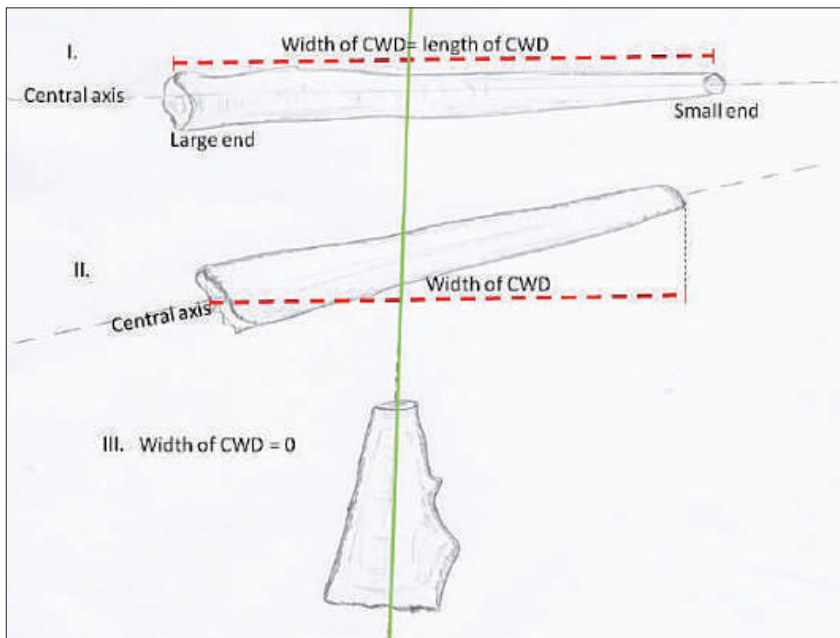


Plate 7 : Measuring the Width of CWD

Chapter 4

Data Management

The job of an inventory crew is not confined to collection of data from the sample plots. Data management also very much an important part of the inventory crew's responsibilities.

Data management will involve

- i. Transfer of data from GPS to laptop and storage devices
- ii. Transfer of the stored data by inventory crews to Regional Office and FRMD.

4.1 Transferring Data from Trimble Juno GPS to Laptop

For transferring the collected data from GPS to laptop, the laptops need to be installed with the following two software applications:

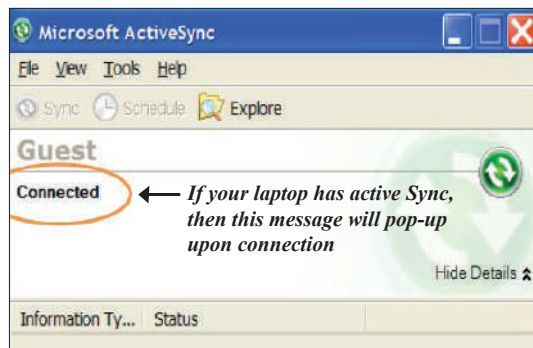
1. Pathfinder Office Software: used for data creating data dictionary, managing geo spatial data and transferring data.
2. Windows Mobile or Active Sync: is the intermediate program that helps communicate between TERRASYNC and Pathfinder

Both these applications will be made available by FRMD and installed in Crew Leaders laptops. inventory crews will use these applications solely for creating data folders and transferring data to Regional Office and FRMD.

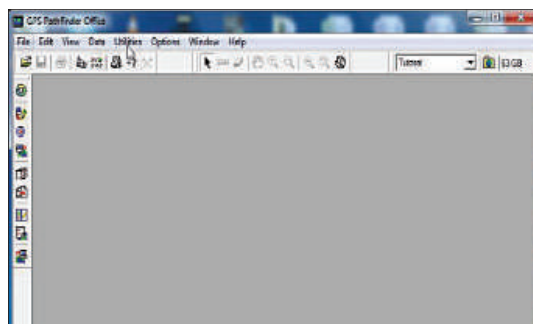
For transferring the data from the GPS, follow the instructions as prescribed:

1. Connect Trimble Juno with laptop using the USB cable (put on the Trimble Juno)
2. Your computer will indicate that driver software is getting installed and will

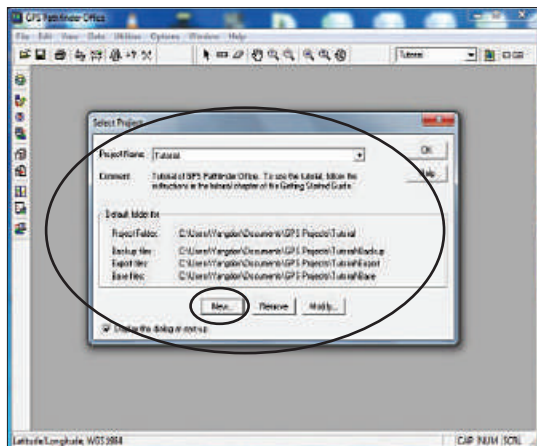
connect with Windows mobile or Active sync automatically.



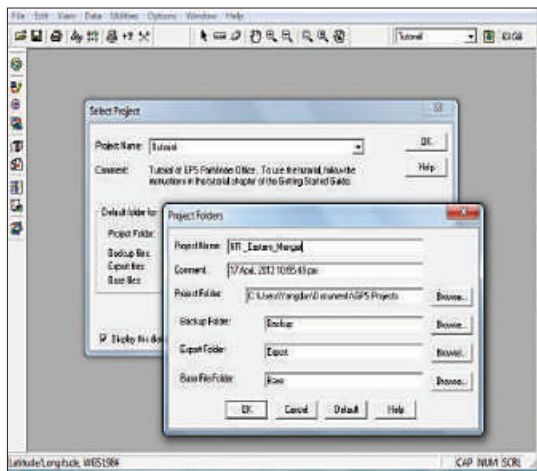
3. Once connected, open Pathfinder Office (Double click on the Pathfinder icon on the desktop). Below is the screenshot of Pathfinder Office.



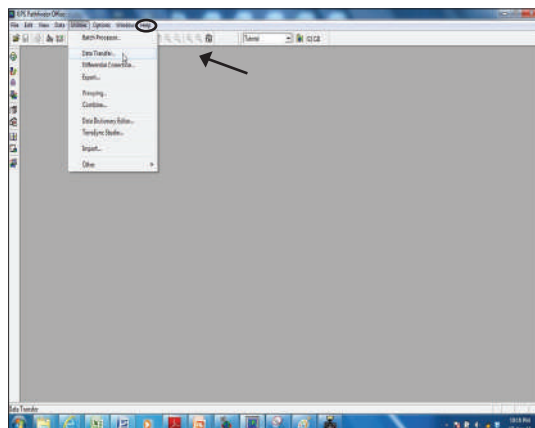
4. Immediately you will get Pop-up box to select Project folder. Click on <New> the first time you transfer data.



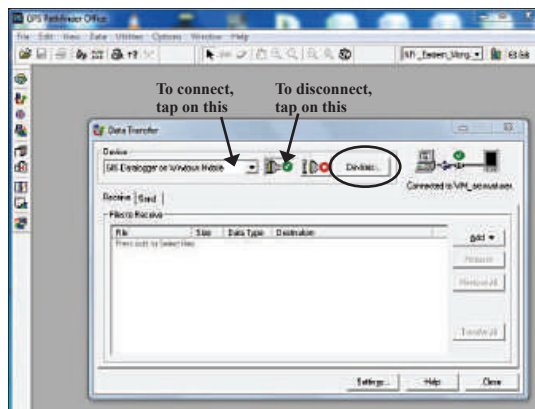
5. When you click on New, a pop up box appears where you are required to give Project Name. Give Project name as *NFI_your region_Dzongkhag* (eg. NFI_Eastern_Mongar).
6. Then for Project Folder, specify location and create folder name (e.g C:\Users\Younten\NFI) (**Note:** here “Younten” is name of the folder created within the folder “Users” in the drive C. NFI is another folder created within Younten).
7. Then Click <OK>



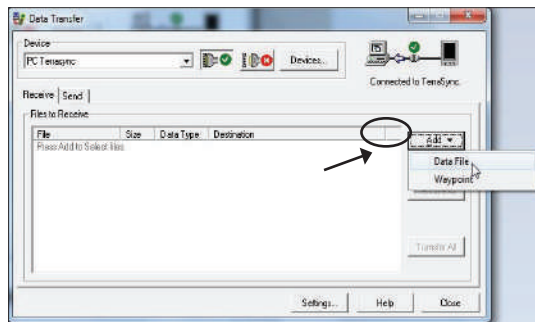
8. Next click on <Utilities> and select <Data transfer> from the drop down list.



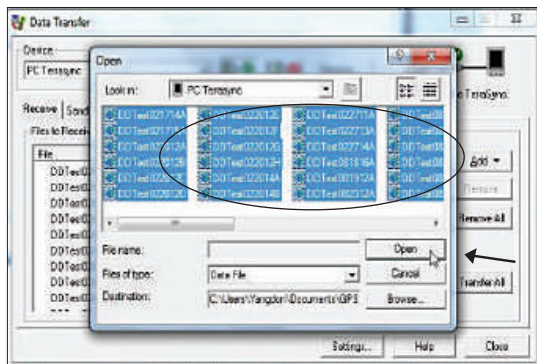
9. Data Transfer page opens, where you can see that Pathfinder is connected to Terrasync



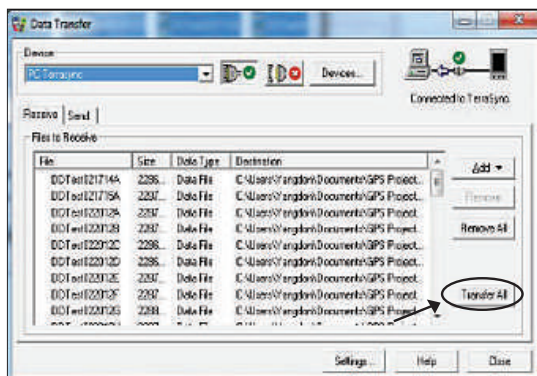
10. Then first tap on <Receive button>. Then, tap on the <Add > drop down button. From the drop down menu, select <data file>



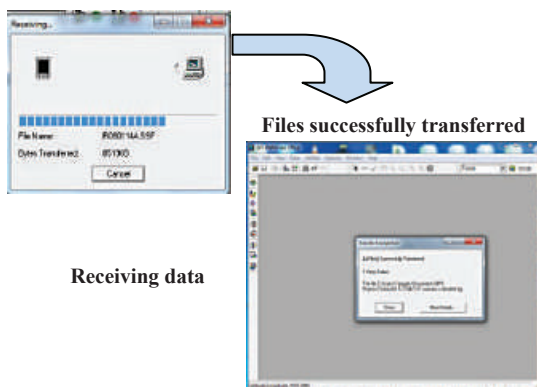
- Clicking on Data file will open Data Files, from which select the relevant files for transfer. After selecting the data files for transfer, click<open>



- All the data files will get added to this Data transfer page. Tap on <Transfer All> button.



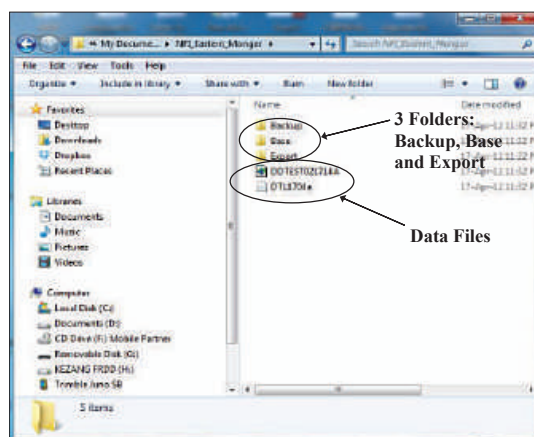
- Then the data will get transferred. That is the end transfer of data from GPS to Laptop.



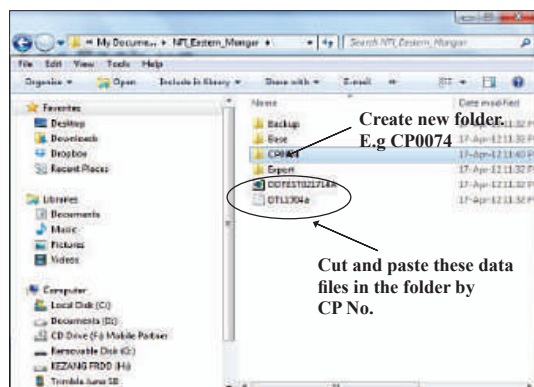
4.2 Saving transferred data in appropriate folders

Once data is successfully transferred from GPS to Laptop, the next important task is to save the data in appropriate folders. Now,

- Go to the location where you have created the project folder “NFI_Eastern_Dzongkhag”
- When you open the folder, you will see three folders inside
 - Back-up
 - Base
 - Export and then the data files you have just transferred.



- Create a new folder by your Cluster plot number. For example CP0074
- Select your files, cut, and paste it in the folder created. For example CP0074



Note: *You are to transfer your data the same day of collection! (After reaching the base camp)*

4.3 Creating Back-Up data

Once the data has been transferred to laptop and then stored in desired location with assigned folder name, the next task is to create BACK UP data and store the data in your portable storage devices (External Hard drive). This is being done to avoid loss of data in the event your laptop/PC breaks down. Even if the laptop breaks down, the back-up data saved in the storage device will prevent loss of data collected.

In event of loss of data due to laptop breakdown, and no back-up made, the Crew will have to visit the same plot and recollect all the data. Repeat of such tedious task will not be pleasing to the Crew and will be waste of precious time, resources and energy and thus to be prevented at all cost.

In case of paper data forms, the inventory crews are advised to check the data forms for completeness and then store all forms with one person. Care should be taken not to lose any page of the data forms.

4.4 Transferring data to the main database

FRMD will host the main database for the National Forest Inventory where the data will be processed, analyzed and stored.

At the end of every month, after the commencement of inventory in the assigned area, the inventory crew will submit the collected data to the Regional Focal Office. The Regional Focal Office will submit the collated data to FRMD. This is done to create three level of data back-up: one with NFI Crew, one at Regional Office and collated data with FRMD.

The inventory crew may submit the data through internet where ever possible, for which FRMD will develop appropriate protocol along with general Data Submission Protocol (Standard submission and receiving procedures).

The data will be carried in the storage devices and transferred to Regional Office. The regional Office will save the data in a folder by its CP number and then submit the collated data to FRMD.

In case of data that would have been recorded on paper data forms, the forms will be submitted to FRMD directly.

ANNEXURE

ANNEXURE I: FIELD FORMS

Checklist of Field Forms

| Sl.No | Form | Form Number |
|-------|-----------------------|-------------|
| 1. | Reference Point Form | F1/12 |
| 2. | Regeneration Form | F2/12 |
| 3. | Cluster Plot Form | F3/12 |
| 4. | Plot Description Form | F4/12 |
| 5. | Tree Data Form | F5/12 |
| 6. | Sapling Data Form | F6/12 |
| 7. | Shrub Data Form | F7/12 |
| 8. | Herb Data Form | F8/12 |
| 9. | Mammal Data Form | F9/12 |
| 10. | Bird Data Form | F10/12 |
| 11. | Reptile Data Form | F11/12 |
| 12. | Coarse Woody Debris | F12/12 |



Department of Forests and Park Services
Forest Resources Management Division

NATIONAL FOREST INVENTORY FIELD FORM

Reference Point Form

F1/12

| | | | | | | | |
|---------------------------|----------------------|----------------------|----------------------|--------------------------|----------------------|------------------------|----------------------|
| 1. CP No | C | P | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | |
| 2. For Plot: | Elbow | <input type="text"/> | North | <input type="text"/> | East | <input type="text"/> | |
| 3. Prominent Structure 1: | <input type="text"/> | | | Distance to Plot Centre: | | <input type="text"/> m | <input type="text"/> |
| 4. Prominent Structure 2: | <input type="text"/> | | | Distance to Plot Centre: | | <input type="text"/> m | <input type="text"/> |
| 5. Prominent Structure 3: | <input type="text"/> | | | Distance to Plot Centre: | | <input type="text"/> m | <input type="text"/> |
| 6. Description-1 | | | | | | | |
| 7. Description-2 | | | | | | | |



Department of Forests and Park Services
Forest Resources Management Division

NATIONAL FOREST INVENTORY FIELD FORM
Regeneration Form (Within r=3.57 m)

1. CP No. CP East

2. Plot Name: (Tick the appropriate) Elbow ☐ North ☐ East ☐

3. Date / / 4. Time Hrs

Regeneration(frees less than 5cm dbh)

| SN | Scientific name | Local Name | No. of Established | No. of Un-Established | No. of Recruits | Remarks |
|----|-----------------|------------|--------------------|-----------------------|-----------------|---------|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
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| 7 | | | | | | |
| 8 | | | | | | |
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| 10 | | | | | | |
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| 12 | | | | | | |
| 13 | | | | | | |
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| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |



NATIONAL FOREST INVENTORY FIELD FORMS

Cluster Plot Form

Department of Forests and Park Services Cluster Plot Form
Forest Resources Management Division

F3/12

1. CP No. CP

2. Date

 / /

3. Time

 / Hrs

4. Weather

 Sunny Rainy Cloudy Windy

5. Altitude (m)

6. Crew Leader Name

7. Crew ID

(Region Crew No.:eg. Western Crew 1)

8. Gewog

9. Dzongkhag

10. CP Description

11. Remarks



1. CP No. CP

2. Plot Name Elbow North East

(Tick the appropriate)

3. Date / / 4. Time Hrs /

Plot Description Form

1. Topographic position (Tick the appropriate)

a. Ridge Top b. Upper Side Hill c. Middle Side Hill d. Lower Side Hill

e. Flat Land g. River Bed i. Gorge/Ravine

2. Aspect

a. Northern b. North-Eastern c. Eastern d. South-Eastern

e. Southern f. South-Western g. Western h. North-Western

i. No aspect

3. Slope (Inst. Mention slope in degrees)

a. Slope Up b. Slope Down

4. STAND DESCRIPTION (in meters)

a. Stand Height b. Canopy Cover %

c. Land Ownership

i. GRF ii. GRF-Protected iii. GRF-FMU iv. GRF-CF v. GRF-Leased

vi. Private vii. Throne viii. Don't know

d. Land ownership Note

.....
.....

e. Land Cover Code

(Inst. Enter appropriate code for land cover)

f. Vegetation Composition

(Inst. Enter appropriate code for vegetation composition)

g. Forest Type*(Inst. Enter appropriate code for Forest Type)***h. Forest Stand Structure**

a. Open

b. Stand Initiation

c. Stand Exclusion

d. Understorey Remitiate

e. Complex Old Growth

f. Others

i. Main Understorey Type*(Inst. Tick appropriately)*

a. Moss

b. Grass

c. Herbs

d. Bamboo

e. Shrubs

f. Others

j. Understorey Percent*(Inst. Tick appropriately)*

i. None

ii. <2%

iii. 2-5%

iv. 10-40%

v. >40%

FOREST RESOURCES**1. Non-Wood Forest Products (NWFP)****NWFP1***(Inst. Mention name of NWFP)*

Cover Percent:

NWFP2 :*(Inst. Mention name of NWFP)*

Cover Percent:

NWFP 3:*(Inst. Mention name of NWFP)*

Cover Percent:

NWFP 4:*(Inst. Mention name of NWFP)*

Cover Percent:

NWFP 5:*(Inst. Mention name of NWFP)*

Cover Percent:

2. Bamboo

Yes

No

(Tick against Yes, if Bamboo is found and vice-versa)

Bamboo Scientific Name

(If Bamboo is found)

| | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Bamboo cover percent | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| a. None | | b. >10% | | c. 10-20% | | d. 20-50% | e. >50% |
| Bamboo Regeneration | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| a. None | | b. >10% | | c. 10-20% | | d. 20-50% | e. >50% |

3. Cane Cover Percent

| | | | | | |
|---------|----------------------|----------------------|----------------------|----------------------|----------------------|
| a. None | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. <2% | | | | | |

Cane DBH

| | | | | |
|----------------|----------------------|----------------------|----------------------|----------------------|
| a. Unspecified | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. <2cm | | | | |

4. Daphne Cover

| | | | | |
|---------|----------------------|----------------------|----------------------|----------------------|
| a. None | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. <2% | | | | |

5. Snag

| | | | | | |
|---------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| a. 1-5 snags | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. 5-10 snags | | | | | d. No Snags |

6. Fallen Tree

| | | | | | |
|---------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| a. 1-5 Trees | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. 5-10 Trees | | | | | d. No Fallen Tree |

DISTURBANCE

1. Forest Fire Extent

| | | | | | |
|------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| a. Heavy Fire | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. Moderate Fire | | | | | d. No Fire |

Fire Type

| | | | | | | |
|----------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| a. Underground | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. Surface | | | | | c. Crown | d. Not Applicable |

2 Grazing Evidence:

| | | | | | |
|--------|----------------------|----------------------|----------------------|----------------------|----------------------|
| a. Yes | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. No | | | | | |

Grazing Incidence:

| | | | | | |
|-------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| a. Slight | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. Moderate | | | | | d. None |

3. Timber Extraction

| | | | | | | |
|---------------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|----------------------|
| a. Yes, Clear Cutting | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
| b. Yes, Selective Felling | | | | | c. Yes, Group Felling | d. Others |
| | | | | | | e. No Felling |

4. Mining:a. Yes, Surface Collection b. Yes Quarry c. No **5. Transmission Lines:**a. Yes b. No **6. Garbage**a. Food Wrappers b. Pet Bottles c. Construction Dumps d. All e. None **FOREST HEALTH**

1. Pest and Disease Evidence Yes No
2. Mistle Toe Yes No
3. Dieback Fir Yes No
4. Bark Beetle Yes No
5. Others Yes No

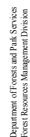
UFF, LITTER AND FUELBED

1. Litter depth value (in cm)
2. Humus depth value (in cm)
3. Fuelbed depth value (in cm)
4. Litter cover percent (in %)
5. Bare soil cover percent (in %)

OIL**1. Stoniness**a. None b. Rare <10% c. Few, 10-20% d. Common, 20-30% e. Many, 30-60% f. Abundant, >60% **2. Soil Drainage**a. Poorly Drained b. Moderately Drained c. Well Drained **3. Top Soil Moisture**a. Dry b. Slightly Moist c. Moist d. Wet e. Water-logged

4. Top Soil Coloura. Dark b. Reddish c. Yellowish d. Others **5. Top Soil Colour Chart****6. Top Soil Texture**a. Sand f. Clay b. Sandy loam c. Loam d. Silty loam e. Silt f. Clay loam **7. Soil Sample Collected**a. Yes b. No **8. Evidence Gully**a. Yes b. No **9. Evidence Erosion**a. Yes b. No **WATER BODIES****1. Stream/River**a. Yes b. No **2. Wetland/Marshy area**a. Yes b. No **3. Lake**a. Yes b. No **4. Glacier**a. Yes b. No **5. Pond**a. Yes b. No **WTE VALUE****1. Natural Trail Facility:**a. Yes b. No **2. Scenic:**a. Yes b. No **3. Visitor Evidence**a. Yes, Local b. Foreign Tourist c. Yes, Both d. Yes, Religious e. None evident **4. Site Value**a. Yes, Cultural b. Yes, Historical c. Yes, Religious d. None e. Don't Know **5. Site Name :****6. Remarks:**

.....



2_Plot Name

Elbow*

 α

from

1

1

5

A T

NATIONAL FOREST INVENTORY FIELD FORMS
TREE FORM
Plot Identification

**FOREST INVENTORY
TREE FORM**
Plot Identification

3512

(with in $r = 12.62$ m)

| S.N o | Scientific name | Local Name |
|----------|-----------------|------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
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| 10 | | |
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| 21 | | |
| 22 | | |

| USN o | Scientific name | Local Name | Native Area Provenance | Latin (author) | Billion | Height (m) | Bd. (cm) | Crown (m) | Campy Position | Condition of tree | | Bd. A deflection | Core | | Core (N) | Core (lat) | Core (L) | Core increment | Try increment | Core (R) | Core (lat) | Core (L) | Core increment | Try increment |
|----------|-----------------|------------|---------------------------|--------------------|---------|------------|----------|-----------|----------------|-------------------|------|---------------------|------|---|----------|------------|----------|-------------------|------------------|----------|------------|----------|-------------------|------------------|
| | | | | | | | | | | Live | Dead | | V | N | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | | | | | | | | | |
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| 35 | | | | | | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | | | | | | | | | | | | | |

| SN | Campy Position | Code |
|----|----------------|------|
| 1 | Dominant | D1 |
| 2 | Dominant | D2 |
| 3 | Suppressed | S1 |
| 4 | Scholar | S2 |



Department of Forests and Park Services
Forest Resources Management Division

NATIONAL FOREST INVENTORY FIELD FORMS
Sapling Form
Plot Identification

F6/12

1. CP NO

CP

2 Plot Name

(Tick the appropriate)

Elbow North East

3. Date

/ / Hrs

Sapling (tree species; of DBH more than 5cm and less than 10cm)

| SN | Scientific name | Local Name | No. of individuals | Sapling Height(m) | Cover percent(%) |
|----|-----------------|------------|--------------------|-------------------|------------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
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| 15 | | | | | |
| 16 | | | | | |
| 17 | | | | | |
| 18 | | | | | |
| 19 | | | | | |
| 20 | | | | | |



Department of Forests and Park Services
Forest Resources Management Division

NATIONAL FOREST INVENTORY FIELD FORMS
Shrub Form
Plot Identification

F7/12

1. CP NO CP East

2. Plot Name Elbow North

(Tick the appropriate)

3. Date / / 4. Time Hrs

Shrubs (Woody plant of less than 5m height)

| SN | Scientific name | Local Name | layer Height(m) | Cover percent(%) |
|----|-----------------|------------|-----------------|------------------|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
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| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |



NATIONAL FOREST INVENTORY FIELD FORMS

Department of Forests and Park Services
Forest Resources Management Division

Herb Form
Plot Identification

1. CP NO CP

2. Plot Name Elbow North East

3. Date / / 4. Time : Hrs

Herb (Data to be collected only in North and East Plots)
(Within 1=0.57m plot)

| SN | Scientific name | Local Name | No. of individuals | layer Height(m) | Cover percent(%) |
|----|-----------------|------------|--------------------|-----------------|------------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |



Department of Forests and Park Services
Forests Resources Management Division

1 CP No. CP

2 Plot Name
(Tick the appropriate)

Elbow

North

East

3. Date

/ /

4. Time

/ / 4 Hrs

NATIONAL FOREST INVENTORY FIELD FORMS
Wildlife (Mammal) Form
Plot Identification

F9/12

Mammal Form (in all three Plots)
(within 25 m around plot centre)

| SN | Mammal (Common Name) | Local Name | Species Identity (Tick the appropriate) | Gender (Tick the appropriate) | Group Size | Wildlife Evidenced (Enter Code) | Remarks | | | | |
|----|----------------------|------------|---|-------------------------------|------------|---------------------------------|-----------|--|--|--|--|
| | | | Certain | Doubtful | Male | Female | Not known | | | | |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
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| 10 | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |

| SN | Wildlife Evidence | Code | SN | Wildlife Evidence | Code |
|----|--------------------|------|----|-------------------|------|
| 1 | Direct Sighting | ME1 | 8 | Burrows/Den | ME8 |
| 2 | Sound | ME2 | 9 | Browsing | ME9 |
| 3 | Dung/Pellets/Scats | ME3 | 10 | Deharking | ME10 |
| 4 | Skeleton/Cadaver | ME4 | 11 | Fraying | ME11 |
| 5 | Horn/antlers | ME5 | 12 | Digging | ME12 |
| 6 | Footprints | ME6 | 13 | Not relevant | ME13 |
| 7 | Tracks/Pulls | ME7 | | | |



Department of Forests and Park Services
Forests Resources Management Division

1. CP No. CP

2. Plot Name (Tick the appropriate) Elbow ☐ North ☐ East ☐

3. Date / / 4. Time : 5. Hrs

NATIONAL FOREST INVENTORY FIELD FORMS
Wildlife (Bird) Form
Plot Identification

Bird Form (in all three Plots)
(within 25 m around plot centre)*

| SN | Bird (Common Name) | Local Name | Species (Identify/Tick the appropriate) | Gender (Tick the appropriate) | Group Size | Wildlife Evidenced (in or Code) | Remarks |
|----|--------------------|------------|---|-------------------------------|------------|---------------------------------|-----------|
| | | | Certain | Doubtful | Male | Female | Not known |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |

| SN | Wildlife Evidence | Code | SN | Wildlife Evidence | Code |
|----|-------------------|------|----|-------------------|------|
| 1 | Direct Sighting | BE1 | 6 | Feathers | BE6 |
| 2 | Sound | BE2 | 7 | Footprints | BE7 |
| 3 | Droppings | BE3 | 8 | Tracks/Paths | BE8 |
| 4 | Eggs | BE4 | 9 | Nests/Burrows | BE9 |
| 5 | Skeleton/Cadaver | BE5 | 10 | Not Relevant | BE10 |



Department of Forests and Park Services
Forests Resources Management Division

1 CP No. CP

2 Plot Name

(Tick the appropriate)

East

3. Date

4. Time

4 Hrs

NATIONAL FOREST INVENTORY FIELD FORMS

Wildlife (Reptile) Form

Plot Identification

F11/12

Reptile Form (in all three Plots)

(within 25 m around plot centre)"

| SN | Reptile (Common Name) | Local Name | Species Identity (Tick the appropriate) | | | Gender (Tick the appropriate) | | | Group Size | Wildlife Evidence (first or Code) | Remarks |
|----|-----------------------|------------|---|----------|--|-------------------------------|--------|-----------|------------|-----------------------------------|---------|
| | | | Certain | Doubtful | | Male | Female | Not Known | | | |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
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| 10 | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |

| SN | Wildlife Evidence | Code | SN | Wildlife Evidence | Code |
|----|-------------------|------|----|-------------------|------|
| 1 | Direct Sighting | RE1 | 5 | Skin | RE5 |
| 2 | Sound | RE2 | 6 | Tracks/Paths | RE6 |
| 3 | Eggs | RE3 | 7 | Nests/Burrows | RE7 |
| 4 | Skeleton | RE4 | 8 | Not Relevant | RE8 |



Department of Forests and Park Services
Forest Resources Management Division

NATIONAL FOREST INVENTORY FIELD FORMS

Coarse Woody Debris

Plot Identification

1. CP No:

2. To Plot

East

3. Date

4. Time

Hrs

F12/12

Coarse Woody Debris (50 m transect between plots)

| SN | Scientific name | Dia. Large end (cm) | Dia. Intersection (cm) | Dia. Small end (cm) | Length intersection (m) | CWD Length (m) | CWD Width (m) |
|----|-----------------|------------------------|---------------------------|------------------------|----------------------------|-------------------|------------------|
| 1 | | | | | | | |
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| 14 | | | | | | | |
| 15 | | | | | | | |

ANNEXURE II: SLOPE CORRECTION TABLE

| Slope Correction Table | | | | | |
|--------------------------|------------------------|-------|-------|-------|-------|
| Slope (in Degrees) | Horizontal Distance(m) | | | | |
| | 3.57 | 10 | 12.62 | 20 | 50 |
| | Slope Distance(m) | | | | |
| 1 | 3.57 | 10.00 | 12.62 | 20.00 | 50.01 |
| 2 | 3.57 | 10.01 | 12.63 | 20.01 | 50.03 |
| 3 | 3.57 | 10.01 | 12.64 | 20.03 | 50.07 |
| 4 | 3.58 | 10.02 | 12.65 | 20.05 | 50.12 |
| 5 | 3.58 | 10.04 | 12.67 | 20.08 | 50.19 |
| 6 | 3.59 | 10.06 | 12.69 | 20.11 | 50.28 |
| 7 | 3.60 | 10.08 | 12.71 | 20.15 | 50.38 |
| 8 | 3.61 | 10.10 | 12.74 | 20.20 | 50.49 |
| 9 | 3.61 | 10.12 | 12.78 | 20.25 | 50.62 |
| 10 | 3.63 | 10.15 | 12.81 | 20.31 | 50.77 |
| 11 | 3.64 | 10.19 | 12.86 | 20.37 | 50.93 |
| 12 | 3.65 | 10.22 | 12.90 | 20.45 | 51.12 |
| 13 | 3.66 | 10.26 | 12.95 | 20.53 | 51.31 |
| 14 | 3.68 | 10.31 | 13.01 | 20.61 | 51.53 |
| 15 | 3.70 | 10.35 | 13.06 | 20.70 | 51.76 |
| 16 | 3.71 | 10.40 | 13.13 | 20.81 | 52.01 |
| 17 | 3.73 | 10.46 | 13.20 | 20.91 | 52.28 |
| 18 | 3.75 | 10.51 | 13.27 | 21.03 | 52.57 |
| 19 | 3.78 | 10.58 | 13.35 | 21.15 | 52.88 |
| 20 | 3.80 | 10.64 | 13.43 | 21.28 | 53.21 |
| 21 | 3.82 | 10.71 | 13.52 | 21.42 | 53.55 |
| 22 | 3.85 | 10.78 | 13.61 | 21.57 | 53.92 |
| 23 | 3.88 | 10.86 | 13.71 | 21.73 | 54.31 |
| 24 | 3.91 | 10.95 | 13.81 | 21.89 | 54.73 |
| 25 | 3.94 | 11.03 | 13.92 | 22.07 | 55.16 |
| 26 | 3.97 | 11.12 | 14.04 | 22.25 | 55.62 |
| 27 | 4.01 | 11.22 | 14.16 | 22.44 | 56.11 |
| 28 | 4.04 | 11.32 | 14.29 | 22.65 | 56.62 |
| 29 | 4.08 | 11.43 | 14.43 | 22.86 | 57.16 |
| 30 | 4.12 | 11.55 | 14.57 | 23.09 | 57.73 |
| 31 | 4.16 | 11.66 | 14.72 | 23.33 | 58.32 |
| 32 | 4.21 | 11.79 | 14.88 | 23.58 | 58.95 |
| 33 | 4.26 | 11.92 | 15.04 | 23.84 | 59.61 |
| 34 | 4.31 | 12.06 | 15.22 | 24.12 | 60.30 |
| 35 | 4.36 | 12.21 | 15.40 | 24.41 | 61.03 |
| 36 | 4.41 | 12.36 | 15.60 | 24.72 | 61.79 |
| 37 | 4.47 | 12.52 | 15.80 | 25.04 | 62.59 |
| 38 | 4.53 | 12.69 | 16.01 | 25.37 | 63.43 |

| | | | | | |
|----|---------|----------|----------|----------|----------|
| 39 | 4.59 | 12.86 | 16.23 | 25.73 | 64.32 |
| 40 | 4.66 | 13.05 | 16.47 | 26.10 | 65.25 |
| 41 | 4.73 | 13.25 | 16.72 | 26.49 | 66.23 |
| 42 | 4.80 | 13.45 | 16.98 | 26.90 | 67.26 |
| 43 | 4.88 | 13.67 | 17.25 | 27.34 | 68.34 |
| 44 | 4.96 | 13.90 | 17.54 | 27.79 | 69.48 |
| 45 | 5.05 | 14.14 | 17.84 | 28.27 | 70.68 |
| 46 | 5.14 | 14.39 | 18.16 | 28.78 | 71.95 |
| 47 | 5.23 | 14.66 | 18.50 | 29.31 | 73.28 |
| 48 | 5.33 | 14.94 | 18.85 | 29.88 | 74.69 |
| 49 | 5.44 | 15.23 | 19.23 | 30.47 | 76.17 |
| 50 | 5.55 | 15.55 | 19.62 | 31.10 | 77.75 |
| 51 | 5.67 | 15.88 | 20.04 | 31.76 | 79.41 |
| 52 | 5.80 | 16.23 | 20.49 | 32.47 | 81.17 |
| 53 | 5.93 | 16.61 | 20.96 | 33.21 | 83.03 |
| 54 | 6.07 | 17.00 | 21.46 | 34.00 | 85.01 |
| 55 | 6.22 | 17.42 | 21.99 | 34.84 | 87.11 |
| 56 | 6.38 | 17.87 | 22.55 | 35.74 | 89.35 |
| 57 | 6.55 | 18.35 | 23.15 | 36.69 | 91.73 |
| 58 | 6.73 | 18.86 | 23.80 | 37.71 | 94.28 |
| 59 | 6.93 | 19.40 | 24.48 | 38.80 | 97.00 |
| 60 | 7.13 | 19.98 | 25.22 | 39.96 | 99.91 |
| 61 | 7.36 | 20.61 | 26.01 | 41.21 | 103.03 |
| 62 | 7.60 | 21.28 | 26.85 | 42.56 | 106.39 |
| 63 | 7.86 | 22.00 | 27.77 | 44.01 | 110.01 |
| 64 | 8.13 | 22.79 | 28.76 | 45.57 | 113.93 |
| 65 | 8.44 | 23.63 | 29.82 | 47.27 | 118.16 |
| 66 | 8.77 | 24.55 | 30.99 | 49.11 | 122.77 |
| 67 | 9.12 | 25.56 | 32.25 | 51.11 | 127.79 |
| 68 | 9.52 | 26.65 | 33.64 | 53.31 | 133.27 |
| 69 | 9.95 | 27.86 | 35.16 | 55.72 | 139.30 |
| 70 | 10.42 | 29.19 | 36.84 | 58.38 | 145.94 |
| 71 | 10.95 | 30.66 | 38.69 | 61.32 | 153.30 |
| 72 | 11.53 | 32.30 | 40.76 | 64.59 | 161.49 |
| 73 | 12.18 | 34.13 | 43.07 | 68.26 | 170.65 |
| 74 | 12.92 | 36.20 | 45.68 | 72.39 | 180.98 |
| 75 | 13.76 | 38.54 | 48.64 | 77.08 | 192.71 |
| 76 | 14.72 | 41.22 | 52.03 | 82.45 | 206.12 |
| 77 | 15.82 | 44.32 | 55.94 | 88.65 | 221.62 |
| 78 | 17.12 | 47.94 | 60.50 | 95.88 | 239.71 |
| 79 | 18.64 | 52.22 | 65.90 | 104.44 | 261.10 |
| 80 | 20.48 | 57.36 | 72.39 | 114.71 | 286.79 |
| 90 | 4483.08 | 12557.66 | 15847.77 | 25115.32 | 62788.30 |

ANNEXURE III: LAND USE CLASSES, DEFINITIONS and CODE

| Sl. No | Land Use Type | Definition | Code |
|--------|-----------------------|---|------|
| 1 | Coniferous forests | Forest In which more than 75 percent of tree cover consists of coniferous (Fir, Spruce, Pine) species. | FC |
| 2 | Broadleaf forests | Forest In which more than 75 percent of tree cover consists of broadleaf and hardwood species. | FB |
| 3 | Coniferous plantation | Plantations of more than 75 percent coniferous species | FPc |
| 4 | Broadleaf plantation | Plantations of more than 75 percent broadleaf species | FPb |
| 5 | Scrub forests | Forest areas characterized by less than 10 percent tree cover; or where vegetations are stunted or dwarfed. | FS |
| 6 | Meadow | Open areas of predominantly grassy vegetation cover and herbaceous plants. | MDW |
| 7 | Chuzhing | Irrigated, bench terraced and land cultivated mainly for rice | AW |
| 8 | Kamzhing | Rainfed, cultivated land which may be terraced or untterraced. | AD |
| 9 | Mixed agriculture | | AM |
| 10 | Apple orchard | Self explanatory | HOa |
| 11 | Citrus orchard | Self explanatory | Hoc |
| 12 | Areca nut | Self explanatory | HPa |
| 13 | Cardamom Plantation | Self explanatory | HPc |
| 14 | Other horticulture | | HPo |
| 15 | Urban | Towns and areas of habitation(near houses but besides roads or other concrete surfaces). | UR |
| 16 | Rural | Areas of habitation in villages (near houses, footpaths, or areas which are not forest, or meadows or agricultural fields) | RU |
| 17 | Impervious surface | Man-made surfaces like roads, concretes, pavements | IMP |
| 18 | Snow/glacier | Only those areas which appear to remain permanently under snow or glacier should be identified as one. | OS |
| 19 | Rocky outcrop | Areas of rocky outcrop and rocky barren lands, sometimes associated with sparse trees/scrub cover | OR |
| 20 | Scree | Scree , or talus , is accumulation of broken rock fragments at the base of crags, mountain cliffs, or valley shoulders. | OScr |
| 21 | Lake | A lake is a body of relatively still fresh or salt water of considerable size, localized in a basin, which is surrounded by land apart from a river, stream, or other form of moving water that serves to feed or drain the lake. (Source:en.wikipedia.org/wiki/Lake). Lakes can be Alpine lake, Sub-alpine lakes, Glacier lakes, Supra Glacial lake, Supra snow lake or Tsho. | Olk |
| 22 | Reservoir | Any water body held within man-made structure. | Ores |
| 23 | River | | Orv |
| 24 | Marshy area | Poorly drained or waterlogged areas of permanent swamp or marsh | OM |
| 25 | Landslide | Areas in which there is clear evidence of erosion | OL |
| 26 | Gully | Gullies are vast gaps, crevices created by erosion of soil on hillside by running waters. | OG |
| 27 | Others- | | OU |

Note: The Land Use Classes have been derived from the LUPP, 1995 definitions of Land Use/Land Cover Classes and categories. Additional Land use Classes have been added based on the field experiences.

ANNEXURE IV: VEGETATION COMPOSITION TYPE and CODE

VEGETATION COMPOSITION (as per Land Use code combination in Forestry Services Division, Laumans, P. *Guidelines for Forest Management Inventory Field work*, 1994)

| CODE | VEGETATION COMPOSITION |
|--------|--|
| Ac | Acer sp. |
| Ac-Be | Acer sp./Betula sp. |
| Ac-Oc | Acer sp./Populus ciliate |
| Ac-Qs | Acer sp./Quercus semecarpifolia |
| Al | Alnus nepalensis |
| Be | Betula sp. |
| Bk | Temporarily unstocked/Blank |
| Bl | Low bamboo |
| Bl(Nc) | Low bamboo with sparse Mixed coniferous |
| Bl(Nf) | Low bamboo with sparse tree cover |
| Bt | Tall bamboo |
| Ch | Schima wallichii, Chilaune |
| Cu | Agriculture/Cultivation |
| Cy | Cypress sp. |
| Ex | Exbucklandia populnea |
| Fi | Fir |
| Fi(Be) | Fir with minor Betula sp. |
| Fi(He) | Fir with minor Hemlock |
| Fi-Ac | Fir/Acer sp. |
| Fi-Ar | Fir/Prunus sp. |
| Fi-Be | Fir/Betula sp. |
| Fi-He | Fir/Hemlock |
| Fi-Ju | Fir/Juniper sp. |
| Fi-La | Fir/Larch |
| Fi-Rh | Fir/Rhododendron sp. |
| Fi-Sp | Fir/Spruce |
| Ga | Alpine grassland |
| Ga(Fi) | Alpine Grassland with sparse Fir |
| Ga(Ju) | Alpine Grassland with sparse Juniper sp. |
| Ga(Sp) | Alpine Grassland with sparse Spruce |

| | |
|-----------|--|
| Gr | Grassland |
| Gr(Nf) | Grassland with sparse tree cover |
| Gr(Pb) | Grassland with sparse Blue Pine |
| Gr(Pc) | Grassland with sparse Chir Pine |
| Gr(Sp) | Grassland with sparse Spruce |
| He | Hemlock |
| He(Be) | Hemlock with minor Betula sp. |
| He(Fi) | Hemlock with minor Fir |
| He(Pb) | Hemlock with minor Blue Pine |
| He(Sp) | Hemlock with minor Spruce |
| He-Ac | Hemlock/Acer sp. |
| He-Ar | Hemlock/Prunus sp. |
| He-Be | Hemlock/Betula sp. |
| He-La | Hemlock/Larch |
| He-Nb | Hemlock/broadleaved |
| He-Pb | Hemlock/Blue Pine |
| He-Qs | Hemlock/Quercus semecarpifolia |
| Ju | Juniper sp. |
| Ka | Castanopsis sp., Katus |
| Ka-Qu | Castanopsis sp./Quercus sp. |
| La | Larch |
| La-Qs | Larch/Quercus semecarpifolia |
| Ma | Macaranga sp. |
| Nb | Mixed broadleaved |
| Nc | Mixed coniferous |
| Nc-Nb | Mixed coniferous/Mixed broadleaved |
| Oc | Populus ciliate |
| Oc-Nc | Populus ciliata/Mixed coniferous |
| Oc-Qs | Populus ciliata/Quercus semecarpifolia |
| Or | Populus rotundifolia |
| Pb | Blue Pine |
| Pb-He | Blue Pine/Hemlock |
| Pb-He(Sp) | Blue Pine/Hemlock with minor Spruce |
| Pb-Nb | Blue Pine/Mixed broadleaved |
| Pb-Oc | Blue Pine/Populus ciliate |
| Pb-Or | Blue Pine/Populus rotundifolia |
| Pb-Qg | Blue Pine/Quercus griffithii |

| | |
|--------|---|
| Pb-Qs | Blue Pine/ <i>Quercus semecarpifolia</i> |
| Pb-Qu | Blue Pine/ <i>Quercus</i> sp. |
| Pb-Rh | Blue Pine/ <i>Rhododendron</i> sp. |
| Pc | Chir Pine |
| Pc-Nb | Chir Pine/Mixed broadleaved |
| Pl | Forest plantation |
| Qg | <i>Quercus griffithii</i> |
| Qg-Nc | <i>Quercus griffithii</i> /Mixed coniferous |
| Qg-Qs | <i>Quercus griffithii</i> /semecarpifolia |
| Qg-Rh | <i>Quercus griffithii</i> / <i>Rhododendron</i> sp. |
| Qn | <i>Quercus lanata</i> |
| Qs | <i>Quercus semecarpifolia</i> |
| Qs-Nc | <i>Quercus semecarpifolia</i> /Mixed coniferous |
| Qu | <i>Quercus</i> sp. |
| Qu-Nc | <i>Quercus</i> sp./Mixed coniferous |
| Rh | <i>Rhododendron</i> sp. |
| Ro | Rocky outcrops and barren land |
| Ro(Nf) | Barren land with sparse tree cover |
| Ro(Pb) | Barren land with sparse Blue Pine |
| Ro(Pc) | Barren land with sparse Chir Pine |
| Sa | Alpine shrubland |
| Sa(Fi) | Alpine shrubland with sparse Fir |
| Sc | Shrubland |
| Sc(Nf) | Shrubland with sparse tree cover |
| Sc(Pb) | Shrubland with sparse Blue pine |
| Sc(Pc) | Shrubland with sparse Chir Pine |
| Se | Settlements |
| Sp | Spruce |
| Sp-Ac | Spruce/ <i>Acer</i> sp. |
| Sp-He | Spruce/Hemlock |
| Sp-Nb | Spruce/Mixed broadleaved |
| Sp-Oc | Spruce/ <i>Populus ciliate</i> |
| Sp-Pb | Spruce/Blue Pine |
| Sp-Qs | Spruce/ <i>Quercus semecarpifolia</i> |
| Wa | Lakes and rivers |
| Ye | Yew |
| Ye-Oc | <i>Taxus baccata</i> / <i>Populus ciliate</i> |

| | |
|-----------|--|
| ZZZZZZZ01 | Foothill-broadleaved |
| ZZZZZZZ02 | Upper hill-broadleaved |
| ZZZZZZZ03 | Montane-broadleaved |
| ZZZZZZZ04 | Mixed coniferous/montane-broadleaved |
| ZZZZZZZ05 | Hemlock/montane-broadleaved |
| ZZZZZZZ06 | <i>Populus ciliata</i> /Mixed coniferous |
| ZZZZZZZ07 | Blue Pine/montane-broadleaved |
| ZZZZZZZ08 | Chir Pine/foothill-broadleaved |
| ZZZZZZZ09 | Chir Pine/upper hill-broadleaved |
| ZZZZZZZ10 | Blue Pine/upper hill-broadleaved |
| ZZZZZZZ11 | Spruce/montane-broadleaved |
| ZZZZZZZ12 | Oak shrubland |
| ZZZZZZZ13 | Oak shrubland with sparse Blue Pine |
| ZZZZZZZ14 | Oak shrubland with sparse tree cover |
| ZZZZZZZ15 | <i>Acer</i> sp. |
| Fi-He(Ju) | Fir/Hemlock with minor Juniper |
| Nb-He | Mixed broadleaf/Hemlock |
| Nb-Pb | Mixed broadleaf/Blue Pine |
| Nb-Pc | Mixed broadleaf/Chir Pine |
| Nb-Qu | Mixed broadleaf/ <i>Quercus</i> sp. |
| He-Fi | Hemlock/Fir |
| He-Fi(Sp) | Hemlock/Fir with minor Spruce |
| He-Pb(Qu) | Hemlock/Blue Pine with minor <i>Quercus</i> sp. |
| Ju-He | Juniper/Hemlock |
| Pb-Pc | Blue Pine/Chir Pine |
| Pb-Pc(Qu) | Blue Pine/Chir Pine with minor <i>Quercus</i> sp |
| Qu-Nb | <i>Quercus</i> sp/Mixed broadleaf |
| Qu-Nb(He) | <i>Quercus</i> sp/Mixed brl with minor Hemlock |
| Qu-Nb(Pb) | <i>Quercus</i> sp/Mixed brl with minor Blue Pine |
| Pb-Sp | Blue Pine/Spruce |
| Nc-He | Mixed coniferous/Hemlock |
| Nb-Nc | Mixed coniferous/Mixed broadleaf |
| He-Pb(Sp) | Hemlock/Blue Pine with minor Spruce |
| He-Sp | Hemlock/Spruce |
| He-Sp(Pb) | Hemlock/Spruce with minor Blue Pine |
| Sp-He(Pb) | Spruce/Hemlock with minor Blue Pine |
| Dp | <i>Daphniphyllum</i> sp. |

| | |
|-----------|---|
| Nb-Dp | Mixed broadleaf/Daphniphyllum sp. |
| Qu-Pc | Quercus sp./Chir Pine |
| Qg-Pb | Quercus griffithii/Blue Pine |
| Fi(Ju) | Fir with minor Juniper |
| He-Be(Fi) | Hemlock/Betula sp. with minor Fir |
| Pb-Sp(Qu) | Blue Pine/Spruce with minor Quercus sp. |
| Qu-He | Quercus sp./Hemlock |
| Ju-Fi | Juniperus sp./Fir |
| Qu-He(Sp) | Quercus sp./Hemlock with minor Spruce |
| Pb-Qu(Sp) | Blue Pine/Quercus sp. with minor Spruce |
| Pb(Sp) | Blue Pine with minor Spruce |
| Sp-Pb(He) | Spruce/Blue Pine with minor Hemlock |
| Sp-Pb(Qu) | Spruce/Blue Pine with minor Quercus sp. |
| Qu-Sp | Quercus sp./Spruce |
| Qu-Sp(Be) | Quercus sp./Spruce with minor Betula sp. |
| Ju(Fi) | Juniperus sp. with minor Fir |
| He-Fi(Be) | Hemlock/Fir with minor Betula sp. |
| He-Sp(Fi) | Hemlock/Spruce with minor Fir |
| Sp(Fi) | Spruce with minor Fir |
| Pb-Sp(He) | Blue Pine/Spruce with minor Hemlock |
| He-Qu | Hemlock/Quercus sp. |
| He-Qu(Sp) | Hemlock/Quercus sp. with minor Spruce |
| Fi(Sp) | Fir with minor Spruce |
| Fi-Ju(He) | Fir/Juniperus sp. with minor Hemlock |
| Fi-Sp(He) | Fir/Spruce with minor Hemlock |
| Ju-Sp | Juniperus sp./Spruce |
| Pb(Qs) | Blue Pine with minor Quercus semecarpif. |
| Pb-He(Qs) | Blue Pine/Hemlock with minor Q. semecarpi |
| Op | Populus sp. |
| Pb-Op | Blue Pine/Populus sp. |
| Pb-Qs(Sp) | Blue Pine/Q. semec. with minor Spruce |
| Pb-Qs(He) | Blue Pine/Q. semec. with minor Hemlock |
| Pb-Sp(Qs) | Blue Pine/Spruce with minor Q. semec. |
| Qs-Pb | Quercus semecarpifolia/Blue Pine |
| Qs-Pb(Sp) | Q. semec./Blue Pine with minor Spruce |
| Qs-Sp | Quercus semecarpifolia/Spruce |
| Sp-Fi(Qs) | Spruce/Fir with minor Quercus semec. |

| | |
|-----------|---|
| Sp(Pb) | Spruce with minor Blue Pine |
| Sp-Fi | Spruce/Fir |
| Sp-Fi(He) | Spruce/Fir with minor Hemlock |
| Sp-He(Fi) | Spruce/Hemlock with minor Fir |
| Sp-He(Ju) | Spruce/Hemlock with minor Juniperus sp. |
| Sp-Ju | Spruce/Juniperus sp. |
| Sp-Ju(Fi) | Spruce/Juniperus sp. with minor Fir |
| Sp-Pb(Qs) | Spruce/Blue Pine with minor Q. semec. |
| Sp-Qs(He) | Spruce/Q. semec. with minor Hemlock |
| Sp-Qs(La) | Spruce/Q. semec. with minor Larch |
| Sp-Qs(Pb) | Spruce/Q. semec. with minor Blue Pine |
| He-Pb(Qs) | Hemlock/Blue Pine with minor Q. semec. |
| He-Qs(Sp) | Hemlock/Quercus semec. with minor Spruce |
| Qs-He | Quercus semecarpifolia/Hemlock |
| Qs-He(Sp) | Quercus semec./Hemlock with minor Spruce |
| Qs-Sp(Be) | Quercus semec./Spruce with minor Betula |
| He-Qs(Nb) | Hemlock/Q. semec. with minor Mixed brl. |
| He-Rh | Hemlock/Rhododendron sp. |
| Sp-Rh | Spruce/Rhododendron sp. |
| He-Qs(Rh) | Hemlock/Q. semec. with minor Rhododendron |
| Qs-He(Rh) | Q. semec./Hemlock with minor Rhododendron |
| He-Fi(Rh) | Hemlock/Fir with minor Rhododendron sp. |
| He-Sp(Qs) | Hemlock/Spruce with minor Q. semec. |
| He-Qs(Fi) | Hemlock/Quercus semec. with minor Fir |
| Pb-Sp(Fi) | Blue Pine/Spruce with minor Fir |
| He-Fi(Qs) | Hemlock/Fir with minor Quercus semec. |
| He-Rh(Nb) | Hemlock/Rhodo sp. with minor Mixed brl. |
| Rh-Fi | Rhododendron sp./Fir |
| He-Rh(Qs) | Hemlock/Rhodo sp. with minor Q. semec. |
| He-Ju | Hemlock/Juniperus sp. |
| Be-Fi | Betula sp./Fir |
| Ju-Fi(Rh) | Juniperus sp./Fir with minor Rhodo. sp. |
| Ma-Nb | Macaranga/Mixed broadleaved |
| Nb-Ma | Mixed broadleaf/Macaranga sp. |

ANNEXURE V: FOREST TYPES OF BHUTAN¹

| Sl. No | Forest Type | Code | Characteristics | Characteristic species |
|--------|--------------------------|------|--|---|
| 1 | Subtropical Forest | STFr | <ul style="list-style-type: none"> Contain many tropical genera and species, forming dense jungle Scattered Sal trees in Sarbang areas Altitudinal range: 200-1000 m (-1200m) | <i>Acraocarpus fraxinifolius</i> , <i>Ailanthus grandis</i> , <i>Bombax ceiba</i> , <i>Crateva regillosa</i> , <i>Dellinia pentgyna</i> , <i>Duanbanga grandiflora</i> . <i>Gmelina arborea</i> , <i>Leea asiatica</i> , <i>Musa</i> , <i>Pnadanus</i> , <i>Pterospermum acerifolium</i> , <i>Shorea robusta</i> , <i>Tetrameles nudiflora</i> , <i>Thunbergia</i> |
| 2 | Warm Broad-leaved Forest | WBFr | <ul style="list-style-type: none"> Type of Subtropical forest, but occurs at higher altitude with lower rainfall Contains mixture of Evergreen and deciduous broad leaved species Many of the tropical genera e.g. <i>Duabanga</i>, <i>Pterospermum</i> and <i>Tetrameles</i> are absent Altitudinal range: 1000-2000m (-2300m) | <i>Alangium chinensis</i> , <i>Altingia excels</i> , <i>Bischofia javanica</i> <i>Calicarpa arborea</i> , <i>Castanopsis indica</i> , <i>Cordia oblique</i> , <i>Dendrocalamus hookeri</i> <i>Dichroa febrifuga</i> , <i>Engelhardia spicata</i> , <i>Eoudia fraxinifolia</i> , <i>Macaranga pustulata</i> , <i>Maesa spp.</i> , <i>Mussaenda roxburghii</i> , <i>Pouzolzia sanguine</i> , <i>Raphidophora eximea</i> , <i>Schima wallichii</i> , <i>Wandlandia puberula</i> |
| 3 | Chirpine Forest | CPFr | <ul style="list-style-type: none"> Low-altitude xerophytic forest occurring in the deeper dry valleys of Bhutan Almost no other tree species occur in such forest other than <i>Chirpine</i> Altitudinal range: 900-1800 m (-2000m) | <i>Buddleja asiatica</i> , <i>B.bhutanica</i> , <i>Cycas pectinata</i> , <i>Cymbopogon flexuosus</i> , <i>Euphobia royleana</i> , <i>Ficus obligodon</i> , <i>Grewia sapida</i> <i>Indigofera dosua</i> , <i>Rhus paniculata</i> , <i>Zizyphus incurve</i> |
| 4 | Cool Broad-leaved Forest | CBFr | <ul style="list-style-type: none"> Found on moist exposed slopes Mixed forest in which oaks are LESS COMMON and other trees, both deciduous and evergreen, e.g. <i>Lauraceae</i>, <i>Exbucklandia</i> etc., are more abundant together with dense shrubs, climbers and epiphytes Altitudinal range: 2000-2900m | <i>Acer campbelli</i> , <i>A.sterculiaceum</i> , <i>Betula alonoides</i> , <i>Brassiopsis alpine</i> , <i>Chirita lachensis</i> , <i>Corylopsis himalayana</i> , <i>Elatostema monandrum</i> , <i>E. obtusum</i> , <i>Exbucklandia populnea</i> , <i>Ilex fragilis</i> , <i>Lecanthus peduncularis</i> , <i>Lindera neesiana</i> , <i>L.pulcherrima</i> , <i>Persea clarkeana</i> , <i>Pilea bracteosa</i> , <i>Rosa moschata</i> , <i>Rubus lineatus</i> , <i>Schisandra grandiflora</i> , <i>Symplocos dryiphila</i> |

¹ Derived from *Flora of Bhutan Vol*

| | | | | |
|---|----------------------|------|--|---|
| 5 | Evergreen Oak Forest | EOFr | <ul style="list-style-type: none"> • Characteristic feature of some parts of Central Bhutan (for e.g. Trongsa and hills above Mongar) • Composition varies according to altitude and rainfall • At lower levels, <i>Castanopsis hystrix</i> and <i>C.tribuloides</i> are often dominant, higher up <i>Quercus lamellose</i> becomes commoner • With increasing dryness, more xerophytic <i>Quercus</i> species, e.g. <i>Q.lanata</i>, <i>Q.griffithii</i> and <i>Q.semicarpifolia</i> and <i>Pinus wallichiana</i> are seen • Not much shrub layer, whilst shady humid floors are dominated by small herbs • Altitudinal range: (1800-)2000-2600m | <p><i>Acer campbelli</i>, <i>castanopsis hystrix</i>, <i>C. tribuloides</i>, <i>Elatostema hookerianum</i>, <i>E.sessile</i>, <i>Galeola lindleyana</i>,</p> <p><i>Juglans regia</i>, <i>Pilea symmeria</i>, <i>Quercus lamellose</i>, <i>Skimmia arborescens</i>, <i>Symplocus lucida</i></p> |
| 6 | Blue Pine Forest | BPFr | <ul style="list-style-type: none"> • Temperate equivalent of Chirpine forest and occupies the dry valleys of Bhutan • Bluepine dominant with <i>Quercus species</i> in some places • Xerophytic shrubs occurs and herbs mostly appear during the monsoon season • Altitudinal range: 2100-3000(-3200)m | <p><i>Berberis asiatica</i>, <i>Berchemia edgeworthii</i>, <i>Cotoneaster griffithii</i>, <i>Eleagnus parviflora</i>, <i>Euonymus grandiflorus</i>, <i>Indigofera heterantha</i>, <i>Jasminum humile</i>,</p> <p><i>Prinsepia utilis</i>, <i>Lyonia ovalifolia</i>, <i>Quercus griffithii</i>,</p> <p><i>Q.semicarpifolia</i>, <i>Rhododendron arboretum</i>, <i>Rosa sericea</i>, <i>Spirea canescens</i>, <i>Zanthoxylum armatum</i></p> |
| 7 | Spruce Forest | SPFr | <ul style="list-style-type: none"> • Spruce forest with Hemlock and Fir forests occupy the montane cloud-forest zone of Bhutan • Often mixed with each other but separate forests can frequently be recognized • Spruce are found at lower altitude than Hemlock and Fir • Altitudinal range: 2700- 3100(-3200)m | <p><i>Acer cappadocicum</i>, <i>A.pectinatum</i>, <i>Berberis praecipua</i>,</p> <p><i>Enkianthus deflexus</i>, <i>Larix griffithiana</i>,</p> <p><i>Lindera heterophylla</i>, <i>Osmanthus suavis</i>,</p> <p><i>Picea brachytyla</i>, <i>P. spinolosa</i>, <i>Salix dalinianiana</i>,</p> <p><i>Salvia campanulata</i>, <i>Taxus baccata</i></p> |
| 8 | Hemlock Forest | HMFr | <ul style="list-style-type: none"> • Appears at higher altitude than Spruce where <i>Tsuga dumosa</i> is dominant species mixed with Spruce and Fir • Shrubby and arborescent rhododendrons are frequent with dense growth of ferns, lichens and bryophytes • Altitudinal range: 2800-3100m | <p><i>Arundinaria griffithiana</i>, <i>Betula utilis</i>, <i>Buddleja colvilei</i>, <i>Daphne bholua</i>, <i>Gaultheria fragmentissima</i>, <i>Larix griffithiana</i>, <i>Litsea sericea</i>, <i>Maddenia himalaica</i>, <i>Magnolia globosa</i>, <i>Panax pseudo-ginseng</i>, <i>Rhododendron falconeri</i>, <i>R.hodgsonis</i>, <i>R. keysii</i>, <i>Rubus calophyllus</i>, <i>R.pentagonus</i>, <i>Sorbus tibetica</i>, <i>Tsuga dumosa</i>, <i>Viburnum mullaha</i></p> |

| | | | | |
|----|----------------------------|------|---|--|
| 9 | Fir Forest | FIFr | <ul style="list-style-type: none"> Occurs in the highest ridges of Bhutan below tree line, where huge tracts are covered by no other tree species than Fir (<i>Abies densa</i>) and some Hemlock and Birch in places. Luxuriant undergrowth of Rhododendrons and other shrubs with many small herbs on mossy ground layer are found. As tree lines are approached, the firs become stunted and are mixed with Junipers and smaller Rhododendron species Altitudinal range: 3300- 3800m | <p><i>Abies densa, Arundinaria maling, Betula utilis, Bryicarpum himalaicum, Daphne bholua,</i></p> <p><i>Juniperus pseudosabina, Maddenia himalaica,</i></p> <p><i>Primula denticulate, Prunus rufa, Rheum acuminatum, Rhododendron cinnabarinum, R. hodgsonii, Ribes tikare, Rubus fragarioides, Skimmia laureola, Sorbus foliolosa, Viburnum nervosum</i></p> |
| 10 | Juniper-Rhododendron Scrub | JUSc | <ul style="list-style-type: none"> Moist scrub vegetation occurring above treeline throughout Northern and Central Bhutan Consists of scattered shrubs of <i>Junipers, Rhododendron</i> and <i>Potentilla arbuscula</i> but with rich herb layer appearing during the monsoon Damp grassy meadow commonly found in this zone Altitudinal range: 3700-4200m | <p><i>Gaultheria trichophylla, Juniperus recurva, J.squamata, Morina nepalensis, Pedicularis megalantha, Phlomis tibetica, Potentilla arbuscula, Primula sikkimensis, Rhododendron lepidotum, Thalictrum chelidonii, Trollius purnilus</i></p> |
| 11 | Dry Alpine Scrub | DASc | <ul style="list-style-type: none"> More xerophytic vegetation found Higher altitude than Juniper-Rhododendron Scrub Altitudinal range: 4000-4600m | <p><i>Aconitum orochryseum, Astragalus acaulis, Chesneya nubigena, Cremanthodium thomsonii,</i></p> <p><i>Ephedra gerardiana, Meconopsis calderiana,</i></p> <p><i>Rheum nobile, Rhododendron anthopogon, Salix lindleyana, Saussurea gossypiphora, S. obvallata, Saxifraga moorcroftiana, Tanacetum gossypinum, Thermopsis barbata</i></p> |
| 12 | Not sure | NS | <ul style="list-style-type: none"> When the data collector is not sure or doesn't know, which category of Forest type to record the plot into, it may be recorded as : "Not Sure" | - |

ANNEXURE VI: LIST OF TREE SPECIES

| Botanical name | Local name |
|---|--|
| <i>Abies densa</i> | Dhungshing(Dz), Waang shing(Sh),Gobre salla(Lh), Fir(Eng) |
| <i>Acacia auriculiformis</i> | Akasmoni-exotic |
| <i>Acacia catechu</i> | Khair(Lh) |
| <i>Acacia lenticularis</i> | Kakur(Lh) |
| <i>Acacia mearnsii</i> | Black wattle(Eng)-exotic |
| <i>Acer campbellii</i> | Maple(Eng), Chalam(Dz), Sermaling shing or Busung ja shing(Sh), Kapasi(Lh) |
| <i>Acer laevigatum</i> | Putli |
| <i>Acrocarpus fraxinifolius</i> | Cha shing(Dz), Choktse shing(Sh),MandaLhy(Lh) |
| <i>Actinodaphne obovata</i> | Runchey(Lh) |
| <i>Adina cordifolia</i> | Haldu, karan(Lh) |
| <i>Aesandra butyracea</i> | chiwari, pinshing, yikashing |
| <i>Aesculus assamica</i> | Satpati(Lh), Horse chestnut(Eng) |
| <i>Ailanthus excelsa</i> | maharukh(Lh)-exotic |
| <i>Ailanthus grandis/Ailanthus integrifolia</i> | Poeke shing(Dz),Pekar shing(Sh),Gokul(Lh) |
| <i>Ailanthus integrifolia</i> | Gokul(Lh) |
| <i>Alangium alpinum</i> | GalasuLh(Lh) |
| <i>Alangium chiLhnse</i> | Luma shing(Dz) |
| <i>Albizia falcata</i> | (exotic) |
| <i>Albizia julibrissin</i> | |
| <i>Albizia lebbeck</i> | Kalo siris(Lh) |
| <i>Albizia lucidior</i> | Rato siris(Lh) |
| <i>Albizia odoratissima</i> | Karkur siris(Lh) |
| <i>Albizia procera</i> | Seto siris(Lh) |
| <i>Alcimandra cathcartii</i> | Tite champ(Lh), Golden trumpet(Eng) |
| <i>Alnus nepalensis</i> | Gama(Dz), Alder(Eng) |
| <i>Alstonia scholaris</i> | Chatiwan, chatiun(Lh) |
| <i>Altingia excelsa</i> | Seti kath, Jhikri, jutuli(Lh) |
| <i>Amoora rohitococa</i> | LahasuLh(Lh) |
| <i>Amoora wallichii</i> | Lali, Amari(Lh) |
| <i>Anogeissus latifolius</i> | banghi-exotic |
| <i>Anthocephalus cadamba</i> | Kadam(Lh) |
| <i>Aphanomixis polystachya</i> | Wagorey doroshing(Sh),lahasune(Lh) |
| <i>Aquilaria malaccensis</i> | Aarnag(Dz and Sh),Eaglewood(Eng, Agoor/Agar(Lh) |
| <i>Artocarpus chama</i> | Yitsu sing(Sh),lathar(Lh) |
| <i>Artocarpus heterophyllus</i> | Dam-zay shing(Dz),Dremling sey(Sh),ruk kathal(Lh) |
| <i>Artocarpus hirsuta</i> | Aini koko(Sh) |
| <i>Artocarpus lacucha</i> | barrar, dewa |
| <i>Azadirachta indica</i> | Ja shing(Dz), Lhyra shing(Sh), Bakaina(Lh),Lhem |
| <i>Baccaurea ramiflora</i> | Kusum(Lh) |
| <i>Bauhinia purpurea</i> | Zibzibshing(Dz),Pegpeyposhing, Tanki(Lh) |
| <i>Bauhinia variegata</i> | Ruchashing(Dz), Koiralo(Lh) |
| <i>Beilschmiedia dalzellii</i> | Tarshing(Lh) |
| <i>Beilschmiedia gammieana</i> | Golong shing(Sh), Tarshing(Lh) |
| <i>Beilschmiedia roxburghiana</i> | Thulo tarshing(Lh) |
| <i>Benthamidia capitata</i> | Phoetshe(Dz), Namenpa shing(Sh), Ramkattar(Lh) |
| <i>Betula alnoides</i> | Taap shing(Dz),Chaar shing(Sh),Saur(Lh), Birch(Eng) |
| <i>Betula sp.</i> | unspecified, birch |
| <i>Betula utilis</i> | La taap(Dz), Phuga chaar shing(Sh), Bhojpatra(Lh) |
| <i>Bischofia javanica</i> | Goile shing(Dz),Kanjai(Lh), Black jack(Eng) |

| | |
|-----------------------------------|--|
| <i>Boehmeria rugulosa</i> | Dongtsong(Sh), Dar(Lh) |
| <i>Bombax ceiba</i> | Pemageyershing(Dz and Sh),Simal(Lh), Red Cotton Tree(Eng) |
| <i>Brassaiopsis hainla</i> | Chuletro |
| <i>Brassaiopsis hispida</i> | Phutta |
| <i>Brassaiopsis mitis</i> | Chuletro |
| <i>Brassaiopsis sp.</i> | unspecified, chuletro |
| <i>Bridelia retusa</i> | Treta shing(Dz), Menchha shing(Sh),Gayo, gaumbha, kuhir, kulir(Lh) |
| <i>Bridelia tomentosa</i> | Muse gayo(Lh) |
| <i>Callicarpa arborea</i> | Khalema(Dz), Jeesey shing(Sh),Guyelo(Lh) |
| <i>Calophyllum polyanthum</i> | Rate |
| <i>Camellia kissii</i> | Yangchen metog(Dz and Sh),Hinguwa(Sh) |
| <i>Canarium sikkimense</i> | Gokul dhup(Lh) |
| <i>Carpinus viminea</i> | rutoshing(Dz), lungshing(Sh), Hornbeam(Eng) |
| <i>Caryota urens</i> | Dung Dung kha |
| <i>Cassia fistula</i> | Chakap-Juma shing(Dz),Dongkashing(Sh), Rajbirse, sonalu(Lh) |
| <i>Cassia siamea</i> | (exotic) minjuri |
| <i>Castanopsis hystrix</i> | Sokey(Dz), Tshe shing(Sh), Katus(Lh) |
| <i>Castanopsis indica</i> | Sokey(Dz), Tshe shing(Sh), Aule Katus(Lh) |
| <i>Castanopsis lanceifolia</i> | Patle katus(Lh) |
| <i>Castanopsis tribuloides</i> | Sokey(Dz),Musre katus(Lh) |
| <i>Cedrela toona</i> | Tooni(Lh) |
| <i>Celtis australis</i> | Phantang, Sok sokpa shing(Sh), Khari(Lh) |
| <i>Choerospondias axillaris</i> | Charra shing(Dz), Throong-chung shing(Sh), Lapshi(Lh) |
| <i>Chukrasia tabularis</i> | Chuzim(Dz), halonre, Katli(Lh) |
| <i>Cinnamomum bejolghota</i> | Drongdo(Dz), Tespar shng chilloo(Sh), Bhale sinkoli(Lh) |
| <i>Cinnamomum glaucescens</i> | Shingtsa -zim(Dz), Phagpa Lhng shing(Sh), Kawla or malagiri(Lh) |
| <i>Cinnamomum impressinervium</i> | sissi, korsaLh(Lh) |
| <i>Cinnamomum jaylanicum</i> | Dalchini(Lh) |
| <i>Cinnamomum tamala</i> | Tejpat(Lh) |
| <i>Cordia grandis</i> | |
| <i>Cordia obliqua</i> | Bohari(Lh) |
| <i>Coriaria napalensis</i> | Limphu shing(Dz), Thabshing(Sh) |
| <i>Corylopsis himalayana</i> | |
| <i>Corylus ferox</i> | |
| <i>Croton himalaicus</i> | |
| <i>Croton tiglium</i> | Lapcha |
| <i>Cryptomeria japonica</i> | Ja tshen shing(Dz), Japan shoogpu(Sh), Dhupi(Lh)-exotic |
| <i>Cupressus corneyana</i> | Tshenden shing(Dz),Dhupi(Lh) |
| <i>Cyathea spinulosa</i> | |
| <i>Dalbergia latifolia</i> | Satisal(Lh), Rosewood(Eng)-exotic |
| <i>Dalbergia sericea</i> | Pchang(Dz), Bandre siris(Lh) |
| <i>Dalbergia sissoo</i> | Jesengshing/Tshe-Lhn shing(Dz),Sissoo shing(Sh), Sisau or sissoo(Lh) |
| <i>Daphniphyllum chartaceum</i> | Juru shing(Dz), Awa shing(Lh), Lal chandan(Lh) |
| <i>Daphniphyllum himalense</i> | chandan(Lh) |
| <i>Delonix regia</i> | Gul mohar(Lh)-exotic |
| <i>Desmodium oojeinense</i> | Sandan |
| <i>Dillenia indica</i> | Panchphale(Lh) |
| <i>Dillenia pentagyna</i> | Tantri(Lh) |
| <i>Diploknema butyracea</i> | Yeeka shing(Dz), Peen shing(Sh),Chiwari(Lh) |
| <i>Dipterocarpus macrocarpus</i> | Hollong –exotic |
| <i>Drimycarpus racemosus</i> | |
| <i>Drypetes indica</i> | |

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|---------------------------------|--|
| <i>Duabanga grandiflora</i> | Patang shing(Dz, Bikaling shing(Sh), lampate(Lh) |
| <i>Echinocarpus decicarpus</i> | Gobre(Lh) |
| <i>Elaeocarpus sikkimensis</i> | Bhadrase(Lh) |
| <i>Elaeocarpus sphaericus</i> | Rhudrax(Lh) |
| <i>Elaeocarpus varuna</i> | Bhadrase(Lh) |
| <i>Engelhardtia spicata</i> | Mauwa(Lh) |
| <i>Enkianthus deflexus</i> | |
| <i>Eriobotrya petiolata</i> | Maya kath(Lh) |
| <i>Eriobotrya bengalensis</i> | Maya kath (Lh) |
| <i>Erythrina arborescens</i> | Chatshey shing(Dz), Karshing(Sh), |
| <i>Erythrina sp.</i> | unspecified, phaledo |
| <i>Erythrina stricta</i> | Phaledo(Lh) |
| <i>Erythrina suberosa</i> | Phaledo(Lh) |
| <i>Eucalyptus camaldulensis</i> | Tobdashin(Dz), Red gum(Eng)-exotic |
| <i>Eucalyptus globulus</i> | Tobdashin(Dz), Blue gum(Eng)-exotic |
| <i>Eurya cavinervis</i> | Jhingni(Lh) |
| <i>Evodia fraxinifolius</i> | Khanakpa(Lh) |
| <i>Exbucklandia populnea</i> | Chenjushing(Dz), Lem shing(Sh), Pipli(Lh) |
| <i>Ficus auriculata</i> | Baku shing(Dz), Chongma(Sh), Lhbharo(Lh) |
| <i>Ficus glaberrima</i> | Pangthang chongma(Sh), Karpoa(Lh) |
| <i>Ficus hispida</i> | Koksa(Lh) |
| <i>Ficus lacor</i> | |
| <i>Ficus neriifolia</i> | Rui shing(Sh),Dudhila(Lh) |
| <i>Ficus semicordata</i> | Ridang shing(Dz), Bara chongma(Sh), KhaLhw(Lh) |
| <i>Ficus subincisa</i> | Gugai chongma(Sh), Lootey khanium(Lh) |
| <i>Fraxinus xanthoxyloides</i> | Lankuri(Lh) |
| <i>Gamblea ciliata</i> | |
| <i>Garcinia stipulata</i> | Dur lampate(Lh) |
| <i>Garuga pinnata</i> | |
| <i>Glochidion assamicum</i> | |
| <i>Glochidion bhutanicum</i> | Kotokmo shing(Sh) |
| <i>Glochidion thomsonii</i> | lathi kath |
| <i>Gmelina arborea</i> | Gamar shing(Dz), Kholomshing(Sh), Khamari(Lh) |
| <i>Grevillea robusta</i> | Silver oak(Eng)- exotic |
| <i>Grewia asiatica</i> | |
| <i>Gynocardia odorata</i> | lentem, gante |
| <i>Helicia nilagirica</i> | |
| <i>Heteropanax fragrans</i> | |
| <i>Holoptelia integrifolia</i> | |
| <i>Hovenia acerba</i> | Pumoo ruto(Dz), Froomtegepa shing(Sh), Bhogote(Lh) |
| <i>Hovenia dulcis</i> | Bange kath(Lh) |
| <i>Hymenodictyon excelsum</i> | Lalikaram |
| <i>Illicium griffithii</i> | Dhom leeshi(Dz), Khaila tseenang(Sh) |
| <i>Itea microphylla</i> | |
| <i>Jambosa formosa</i> | Ambake(Lh) |
| <i>Juglans regia</i> | Ta shing(Dz), Khey shing(Sh), Okhar(Lh) |
| <i>Juniperus pseudosabina</i> | Shoop shing(Dz), Shooogpo shing(Sh), Black juniper(Eng) |
| <i>Juniperus recurva</i> | Shoop shing(Dz), Shooogpo shing(Sh), Weeping Blue juniper(Eng) |
| <i>Juniperus squamata</i> | Shoop shing(Dz), Shooogpo shing(Sh) |
| <i>Kydia calycina</i> | kubinde, pichala, chamaktangshing |
| <i>Lagerstroemia hirsuta</i> | Dongka shng(Dz), Buram shing(Sh), jarul(Lh) |
| <i>Lagerstroemia parviflora</i> | Dongka shng(Dz), Buram shing(Sh), Sidha or Buri Damera(Lh) |

| | |
|---------------------------------|---|
| <i>Larix griffithiana</i> | Zashing(Dz), Larch(Eng) |
| <i>Leucaena leucocephala</i> | Exotic |
| <i>Lindera pulcherrima</i> | Sengkermey shing(Sh), Sissi(Lh) |
| <i>Lithocarpus dealbatus</i> | Shakor shing(Sh), Arkaula(Lh) |
| <i>Lithocarpus elegans</i> | Shakor shing(Sh), Arkaula(Lh) |
| <i>Lithocarpus fenestratus</i> | Thasa sokey(Dz), Sodhka tshai shing(Sh), Arkaula(Lh) |
| <i>Lithocarpus pachyphyllus</i> | Sokey(Dz), Tshai shing(Sh), Sungure katus(Lh) |
| <i>Litsea hookeri</i> | Dudhe lampati(Lh) |
| <i>Litsea monopetala</i> | Seychhanglu shing(Sh), Litsa, kutmeri(Lh) |
| <i>Lyonia ovalifolia</i> | Zentu shing(Dz), Shajuley shing(Sh), Angeri(Lh) |
| <i>Lyonia villosa</i> | Lek angeri(Lh) |
| <i>Macaranga denticulata</i> | |
| <i>Macaranga pustulata</i> | |
| <i>Macropanax undulatus</i> | |
| <i>Magnolia campbellii</i> | Gong gong metog(Dz), Dzamling metog(Sh), Ghoge champ(Lh) |
| <i>Magnolia globosa</i> | Kokre champ(Lh) |
| <i>Mallotus philippinensis</i> | Rohini(Lh) |
| <i>Mangifera indica</i> | Am chukuli(Dz), Aam sey(Sh), Aam(Lh) |
| <i>Mangifera sylvatica</i> | Chuche amp(Lh) |
| <i>Melia azaderach</i> | Jashing, Ngerashing(Sh), Bakaina(Lh) |
| <i>Mesua ferrea</i> | Nageswar(Lh), Ironwood(Eng)-exotic |
| <i>Michelia cathcartii</i> | Tite champ(Lh) |
| <i>Michelia champaca</i> | Kha shi(Dz), Kar shing, Champey shing(Sh), Champ(Lh) |
| <i>Michelia doltsopa</i> | Kha shi(Dz), Kar shing, Champey shing(Sh), Rani champ, seto champ(Lh) |
| <i>Michelia kisopa</i> | Kha shi(Dz), Kar shing, Champey shing(Sh), Champ(Lh) |
| <i>Michelia velutina</i> | Phusre, guay champ(Lh) |
| <i>Morus macroura</i> | Tshendey(Dz), kimbu, bola(Lh) |
| <i>Myrica esculenta</i> | Chisishing(Dz), Kaphal(Lh) |
| <i>Neolitsea foliosa</i> | bhal sissi |
| <i>Nyssa javanica</i> | Pasjamshing(Dz), Lai momnang(Sh), Lekh chilau(Lh) |
| <i>Oroxylum indicum</i> | tshampaka metog(Dz), Namkhaling metog(Sh) |
| <i>Ostodes paniculata</i> | Bepari |
| <i>Pandanus nepalensis</i> | Taari ka |
| <i>Pandanus sikkimensis</i> | Taari ka |
| <i>Pentapanax racemosus</i> | Chinde |
| <i>Persea clarkeana</i> | Phampal(Lh) |
| <i>Persea fructifera</i> | Golee shing(Sh), Lapche phal(Lh) |
| <i>Phoebe attenuata</i> | Theinab(Dz), Angare(Lh) |
| <i>Phoebe goalparensis</i> | Bonsum |
| <i>Phoebe hainesis</i> | Bonsum |
| <i>Phoebe lanceolata</i> | Jhakri kath(Lh) |
| <i>Phoenix rupicola</i> | |
| <i>Phyllanthus emblica</i> | Churooshing(Dz), Churgensey shing(Sh), Amla(Lh) |
| <i>Picea spinulosa</i> | Bashing(Dz), kalo salla(Lh), Spruce(Eng) |
| <i>Pieris formosa</i> | kheb-chey(Dz)/tshadhoog(Dz), Dhoog shing, Balu(Lh) |
| <i>Pinus bhutanica</i> | Tongphu(Dz) |
| <i>Pinus roxburghii</i> | Thaetong(Dz), Roi nang shing(Sh), Chir piLh(Eng) |
| <i>Pinus wallichiana</i> | Tongphu(Dz), Chang shing(Sh), Blue piLh(Eng) |
| <i>Plectocomia himalayana</i> | |
| <i>Polyalthia simiarum</i> | Khutti(Lh) |
| <i>Populus ciliata</i> | Kashing(Dz and Sh), Pipal pate(Lh) |
| <i>Populus rotundifolia</i> | Kashing chungku(Dz) |

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|---|---|
| <i>Prunus carmesina</i> | |
| <i>Prunus cerasoides</i> | Paiyun |
| <i>Prunus napaulensis</i> | Khamgo shing(Dz), Arupate(Lh) |
| <i>Pterospermum acerifolium</i> | Dha shom(Dz), Hatipaile(Lh) |
| <i>Pterygota alata</i> | Badam |
| <i>Pyrus pashia</i> | Lih(Dz), Litong(Sh), Naspati(Lh), Pear(Dz) |
| <i>Quercus glauca</i> | Thonp shing(Dz), Thongpa shing(Sh), Musure phalant(Lh) |
| <i>Quercus griffithii</i> | Sisi(Dz), Bainang Shing(Sh), Kasru(Lh) |
| <i>Quercus lamellosa</i> | Bangka/Dhom sokey(Dz), Fangkhoima shing(Sh), Bajranth(Lh) |
| <i>Quercus lanata</i> | gum, banj |
| <i>Quercus lanata</i> | Ghoom(Dz), betshinang shing(Sh) |
| <i>Quercus leucotricophora</i> (<i>Q. incana</i>) | Ghoom(Dz), betshinang shing(Sh) |
| <i>Quercus semecarpifolia</i> | Bjishing(Dz), betshi nang shing(Sh), Khosru(Lh) |
| <i>Rhododendron arboreum</i> | Eto meto(Dz), Zhu daang metog(Sh), Gurans(Lh) |
| <i>Rhus chinensis</i> | datick, bhakimlo |
| <i>Rhus hookeri</i> | Jar shing(Sh), Bhalayo(Lh) |
| <i>Rhus paniculata</i> | Choka shing(Dz), Khyr khobtang(Sh) |
| <i>Rhus succedanea</i> | Say shing(Sh), Rani bhalayo(Lh) |
| <i>Robinia pseudoacacia</i> | Tshang tsha shing(Dz), Zoo tsee shing(Sh)-exotic |
| <i>Salix babylonica</i> | Changma shing(Dz), Changma shing(Sh), Weeping willow(Eng) |
| <i>Salix bhutanensis</i> | Borang changma(Sh) |
| <i>Salix calyculatta</i> | Kholongchuu changma(Sh) |
| <i>Salix daltoniana</i> | Changma nab(Dz), Changma nagpo(Sh) |
| <i>Salix excelsa</i> | Haa changma(Dz) |
| <i>Salix lindleyana</i> | Jowodhoor shing changma(Dz) |
| <i>Salix myrtilleacea</i> | Lingzhi changma(Dz) |
| <i>Salix obscura</i> | Changma barma(Sh) |
| <i>Salix oreophila</i> | Phu changma(Dz) |
| <i>Salix thomsoniana</i> | Chendebjee changma(Dz) |
| <i>Salix wallichiana</i> | Langma(Dz) |
| <i>Salix longiflora</i> | Changma chungku(Dz) |
| <i>Sapindus rarak</i> | Nakupani(Dz), Killing Shing(Sh), Ritha(Lh) |
| <i>Sapium baccatum</i> | Seleng, Akhataruwa |
| <i>Sapium eugeniifolium</i> | Phirphire, Pipalpate(Lh) |
| <i>Sapium insigne</i> | Shushi |
| <i>Sarcosperma arboreum</i> | Kalikath(Lh) |
| <i>Saurauja napaulensis</i> | Mangma dom(Dz), Mingdormashing(Sh), Gogun, |
| <i>Schima wallichii</i> | chilauLh, puyam, gogra, zalashing |
| <i>Shorea robusta</i> | Sal(Eng) |
| <i>SloaLha decicarpus</i> | Gobre |
| <i>SloaLha sterculiacea</i> | Gobre |
| <i>Sorbus griffithii</i> | Pasi(Lh) |
| <i>Sorbus microphylla</i> | Tsema shing(Dz), Sanu pasi(Lh) |
| <i>Spondias mangifera</i> | Amaro(Lh) |
| <i>Spondias pinnata</i> | Bochong shing, ambar shing(Sh), Amaro(Lh) |
| <i>Sterculia alata</i> | Badam(Lh) |
| <i>Sterculia villosa</i> | Phrangshing(Sh), Odal, godgudal(Lh) |
| <i>Stereospermum chilonoides</i> | tsarim shing(Dz), Abo shing(Sh), Parari(Lh) |
| <i>Stereospermum personatum</i> | Parari(Lh) |
| <i>Symplocos glomerata</i> | Dhomzim(Dz), Zeem shing(Sh), KharaLh(Lh) |
| <i>Symplocos lucida</i> | Dhomma shing(Dz), KharaLh(Lh) |
| <i>Symplocos paniculata</i> | Pangtse shing(Dz), Zeem shing(Sh) |

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|--------------------------------|---|
| <i>Symplocos spicata</i> | KharaLh, kholme(Lh) |
| <i>Syzygium formosum</i> | Ambake(Lh) |
| <i>Syzygium claviflorum</i> | Harre jammuna(Lh) |
| <i>Syzygium cumini</i> | Nyasse shing(Dz), Mentse sey shing(Sh), Jammun(Lh) |
| <i>Talauma hodgsonii</i> | Khem(Dz), Kadering shing(Sh), Balukath(Lh) |
| <i>Tamarindus indica</i> | Titiri(Lh) |
| <i>Taxus baccata</i> | Keyrangshing(Sh), Dengre salla, Yew(Eng) |
| <i>Tectona grandis</i> | Tshomar shing(Dz), Teak shing(Sh), Teak(Eng) |
| <i>Terminalia alata</i> | Ala shing(Dz), baroo ata shing(Sh), Pakhasaj(Lh) |
| <i>Terminalia arjuna</i> | Arjun-(exotic) |
| <i>Terminalia belerica</i> | Baroo(Dz), Barra(Lh) |
| <i>Terminalia bialato</i> | White chaglan(Eng) |
| <i>Terminalia catappa</i> | Leykhulong shing(Sh), Badam(Lh) |
| <i>Terminalia chebula</i> | Aaroo(Dz and Sh), Harra(Lh) |
| <i>Terminalia myriocarpa</i> | Bhoop shing(Dz), Bakalo shing(Sh), Panisaj(Lh),Hollock(Eng) |
| <i>Terminalia procera</i> | Badam(Lh) |
| <i>Terminalia sp.</i> | Unspecified |
| <i>Terminalia tomentosa</i> | Pakhasaj, sain(Lh) |
| <i>Tetradium fraxinifolius</i> | Dongmar shing(Dz), Khanakpa(Lhp) |
| <i>Tetrameles nudiflora</i> | Kadong shing(Dz), Maina kath(Lh) |
| <i>Toona ciliata</i> | Tooni, poma(Lh) |
| <i>Toona sureni</i> | Toon(Lh) |
| <i>Trewia nudiflora</i> | Pitali, ramritta(Lh) |
| <i>Tsuga dumosa</i> | Sey shing(Dz), Tengre sallam(Lh), Hemlock(Eng) |
| <i>Turpinia pomifera</i> | Thali(Lh) |
| <i>Ulmus lanceifolia</i> | Aule pipli/Sandan pipli(Lh), Elm(Eng) |
| <i>Vitex heterophylla</i> | Panchpate |
| <i>Wallichia densiflora</i> | Rang bhang |
| <i>Walsura tubulata</i> | Phalame(Lh) |
| <i>Zanthoxylum armatum</i> | Thingye(Dz), Gee shing(Sh) |
| <i>Zanthoxylum budrunga</i> | Timur(Lh) |
| <i>Zanthoxylum rhetsa</i> | |

ANNEXURE VII: LIST OF SHRUBS

The List of Shrubs has been listed from the Flora of Bhutan, Greirson and Long. The list will be subject to change and will be amended as and when more authoritative information are available. Any addition to the list will be conveyed to the NFI crew.

| SN | Botanical Name | Family | Local Name /Common name |
|----|----------------------------------|----------------|---|
| 1 | <i>Acacia farnesiana</i> | Leguminosae | |
| 2 | <i>Acacia gageana</i> | Leguminosae | Arare Khanra(Lh) |
| 3 | <i>Acalpha hispida</i> | Euphorbiaceae | |
| 4 | <i>Acalpha wilkesiana</i> | Euphorbiaceae | |
| 5 | <i>Acronychia pedunculata</i> | Rutaceae | Puanle(Lh) |
| 6 | <i>Actinidi callosa</i> | Actinidiaceae | Tekiphal(Lh) |
| 7 | <i>Actinidi strigosa</i> | Actinidiaceae | |
| 8 | <i>Alchornea mollis</i> | Euphorbiaceae | |
| 9 | <i>Alchornea tiliifolia</i> | Euphorbiaceae | Sanu Malata(Lh) |
| 10 | <i>Allamanda cathartica</i> | Apocynaceae | Golden(Eng) |
| 11 | <i>Allophylus chartaceus</i> | Sapindaceae | |
| 12 | <i>Alstonia neriifolia</i> | Apocynaceae | Chatiwan(Lh) |
| 13 | <i>Alstonia sebusi</i> | Apocynaceae | |
| 14 | <i>Antidesma acidum</i> | Euphorbiaceae | Archal(Lh) |
| 15 | <i>Antidesma acuminatum</i> | Euphorbiaceae | Kalo Bilaune(Lh) |
| 16 | <i>Antidesma ghaesembilla</i> | Euphorbiaceae | Chipli(Lh) |
| 17 | <i>Antistrophe oxantha</i> | Myrsinaceae | |
| 18 | <i>Ardisia colorata</i> | Myrsinaceae | |
| 19 | <i>Ardisia crispa</i> | Myrsinaceae | |
| 20 | <i>Ardisia macrcarpa</i> | Myrsinaceae | Ressin (Dz) Damai Gera, Khao Argale (Lh) |
| 21 | <i>Ardisia thyriflora</i> | Myrsinaceae | |
| 22 | <i>Arenga westerhoutii</i> | Arecaceae | |
| 23 | <i>Artabotrys caudatus</i> | Annonaceae | Kali Lahara(Lh) |
| 24 | <i>Artabotrys hexapetalus</i> | Annonaceae | Katar Champa(Lh) |
| 25 | <i>Asidocarya uvifera</i> | Menispermaceae | |
| 26 | <i>Aspidoptery glabriuscula</i> | Malpighiaceae | |
| 27 | <i>Baliospermum corymbiferum</i> | Euphorbiaceae | |
| 28 | <i>Baliospermum densiflorum</i> | Euphorbiaceae | |
| 29 | <i>Baliospermum montanum</i> | Euphorbiaceae | Harital(Lh) |
| 30 | <i>Baliospermum nepalense</i> | Euphorbiaceae | |
| 31 | <i>Bauhinia purpurea</i> | Leguminosae | Zib zib shing (Dz), Pegpeyposhing (Ts) Tanki (Lh) |
| 32 | <i>Bauhinia variegata</i> | Leguminosae | Rucha shing(Dz), Koerlo or Taki(Lh) |
| 33 | <i>Berberis angulosa</i> | Berberidaceae | Chutro(Lh) |
| 34 | <i>Berberis aristata</i> | Berberidaceae | Kerpa zoo(Ts), Chutro(Lh) |
| 35 | <i>Berberis asiatica</i> | Berberidaceae | Kepai tsang(Dz), Kerpa zoo (Ts) |
| 36 | <i>Berberis beesiana</i> | Berberidaceae | |
| 37 | <i>Berberis griffithiana</i> | Berberidaceae | |
| 38 | <i>Berberis hookeri</i> | Berberidaceae | |
| 39 | <i>Berberis insignis</i> | Berberidaceae | Chutro(Lh) |
| 40 | <i>Berberis macrosepala</i> | Berberidaceae | |
| 41 | <i>Berberis praecipua</i> | Berberidaceae | Kepe tsang(Dz) |
| 42 | <i>Berberis thomsoniana</i> | Berberidaceae | Chutro(Lh) |
| 43 | <i>Berberis tsarica</i> | Berberidaceae | |
| 44 | <i>Berberis virescens</i> | Berberidaceae | |
| 45 | <i>Bougainvillea jussieu</i> | Nyctaginaceae | |

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|----|------------------------------------|------------------|---|
| 46 | <i>Breynia retusa</i> | Euphorbiaceae | |
| 47 | <i>Bridelia retusa</i> | Euphorbiaceae | Gayo(Lh) |
| 48 | <i>Bridelia sikkimensis</i> | Euphorbiaceae | Gayo(Lh) |
| 49 | <i>Bridelia stipularis</i> | Euphorbiaceae | Lahara Gayo(Lh) |
| 50 | <i>Bridelia tomentosa</i> | Euphorbiaceae | Muse Gayo(Lh) |
| 51 | <i>Brucia mollis</i> | Simaroubaceae | |
| 52 | <i>Caesalpinia cucullata</i> | Leguminosae | Tse Hein(Dz) , Bokshi Khanra (Lh) |
| 53 | <i>Caesalpinia decapetala</i> | Leguminosae | Tatse Tsang, Tsangi Metog(Dz) |
| 54 | <i>Caesalpinia pulcherrima</i> | Leguminosae | |
| 55 | <i>Cajanus cajan</i> | Leguminosae | Pigeon pea(Eng) |
| 56 | <i>Calamus acanthospathus</i> | Arecaceae | Pukka bet(Lh) |
| 57 | <i>Calamus erectus</i> | Arecaceae | Phekri(Lh) |
| 58 | <i>Calliandra haematocephala</i> | Leguminosae | |
| 59 | <i>Callicarpa longifolia</i> | Verbenaceae | Sanu Guenyhlo(Lh) |
| 60 | <i>Callicarpa macrophylla</i> | Verbenaceae | |
| 61 | <i>Callicarpa rubella</i> | Verbenaceae | Nangay Wam(Dz), Jinlab sey shing(Ts) |
| 62 | <i>Camellia kissii</i> | Theaceae | Hinguwa(Lh) |
| 63 | <i>Camellia sinensis</i> | Theaceae | Jashing(Dz), Jashing (Ts), Cha(Lh) |
| 64 | <i>Campylotropis griffithii</i> | Leguminosae | |
| 65 | <i>Campylotropis speciosa</i> | Leguminosae | |
| 66 | <i>Capparis acutifolia</i> | Capparaceae | Chila pati(Lh) |
| 67 | <i>Capparis assamica.</i> | Capparaceae | |
| 68 | <i>Capparis cantoniensis</i> | Capparaceae | |
| 69 | <i>Capparis multiflora.</i> | Capparaceae | |
| 70 | <i>Capparis olacifolia.</i> | Capparaceae | Naski, Hais(Lh) |
| 71 | <i>Capparis sikkimensis</i> | Capparaceae | |
| 72 | <i>Caragana jubata</i> | Leguminosae | |
| 73 | <i>Caragana sukiensis</i> | Leguminosae | |
| 74 | <i>Caryopteris bicolor</i> | Verbenaceae | Sun Pati(Lh) |
| 75 | <i>Caryopteris paniculata</i> | Verbenaceae | |
| 76 | <i>Cassia alata</i> | Leguminosae | Dhongkala dhaza(Ts) |
| 77 | <i>Cassia occidentalis</i> | Leguminosae | |
| 78 | <i>Cassia surattensis</i> | Leguminosae | |
| 79 | <i>Ceratostigma griffithii</i> | Plumbaginaceae | |
| 80 | <i>Cereus peruvianus</i> | Cactaceae | Hedge Cactus(Eng) |
| 81 | <i>Ceriscoides campanulata</i> | Rubiaceae | |
| 82 | <i>Chassalia curviflora</i> | Rubiaceae | |
| 83 | <i>Chloranthus elatior</i> | Chloranthaceae | |
| 84 | <i>Choenomeles lagenaria</i> | Rosaceae | Khomang Shing(Ts) |
| 85 | <i>Cinnamomum glanduliferum</i> | Lauraceae | Kipchu shing(Dz), Kawla or malagiri(Lh) |
| 86 | <i>Cinnamomum glaucescens</i> | Lauraceae | Shingtsa zim(Dz), Phagpa neng shing (Ts) Ghansaray(Lh) |
| 87 | <i>Cinnamomum tenuipilis</i> | Lauraceae | |
| 88 | <i>Circaeaster agrestis</i> | Circaeasteraceae | |
| 89 | <i>Cissampelos pareira</i> | Menispermaceae | Bue roobjee(Dz), jing roo (Ts), Thamarke, Batulpati (Lh) |
| 90 | <i>Citrus medica</i> | Rutaceae | Humpa(Dz) |
| 91 | <i>Clausena excavate</i> | Rutaceae | |
| 92 | <i>Cleidion speciflorum</i> | Euphorbiaceae | Bepari(Lh) |
| 93 | <i>Clerodendrum bracteatum</i> | Verbenaceae | Yong ziwa shing(Ts) Chitu(Lh) |
| 94 | <i>Clerodendrum colebrookeanum</i> | Verbenaceae | Boka Kane(Lh) |
| 95 | <i>Clerodendrum hastatum</i> | Verbenaceae | |
| 96 | <i>Clerodendrum serratum</i> | Verbenaceae | Andekhi(Lh) |

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| 97 | <i>Clerodendrum viscosum</i> | Verbenaceae | Chitu(Lh) |
| 98 | <i>Clerodendrum wallichii</i> | Verbenaceae | |
| 99 | <i>Cocculus laurifolius</i> | Menispermaceae | |
| 100 | <i>Codiaeum variegatum</i> | Euphorbiaceae | |
| 101 | <i>Colebrookea oppositifolia</i> | Labiatae | Dosro(Lh) |
| 102 | <i>Coriaria napalensis</i> | Coriariaceae | Limphu shi, Nimbo(Dz) |
| 103 | <i>Coriaria terminalis</i> | Coriariaceae | |
| 104 | <i>Corylopsis himalayana</i> | Hamamelidaceae | Grong Grongmo Shing(Ts) |
| 105 | <i>Cotoneaster acuminatus</i> | Rosaceae | |
| 106 | <i>Cotoneaster microphyllus</i> | Rosaceae | Katragpa roo(Ts), Brush jhar(Lh), Med: Japho Tsi Tsi, |
| 107 | <i>Cotoneaster nitidus</i> | Rosaceae | |
| 108 | <i>Cotoneaster racemiflorus</i> | Rosaceae | |
| 109 | <i>Cotoneaster rotundifolius</i> | Rosaceae | |
| 110 | <i>Cotoneaster rubens</i> | Rosaceae | |
| 111 | <i>Cotoneaster sanguineus</i> | Rosaceae | |
| 112 | <i>Cotoneaster sherriffii</i> | Rosaceae | |
| 113 | <i>Cotoneaster simonsii</i> | Rosaceae | |
| 114 | <i>Crotolaria alata</i> | Leguminosae | |
| 115 | <i>Crotolaria bracteata</i> | Leguminosae | |
| 116 | <i>Crotolaria capitata</i> | Leguminosae | |
| 117 | <i>Crotolaria cytisoides</i> | Leguminosae | |
| 118 | <i>Crotolaria pallid</i> | Leguminosae | |
| 119 | <i>Crotolaria tetragona</i> | Leguminosae | |
| 120 | <i>Croton bonplandianus</i> | Euphorbiaceae | Seytsala Ngyon(Ts) |
| 121 | <i>Croton joufra</i> | Euphorbiaceae | |
| 122 | <i>Croton roxburghii</i> | Euphorbiaceae | |
| 123 | <i>Cryptolepis buchanani</i> | Asclepiadaceae | Langchu Robji(Dz), Dude Lahara(Lh) |
| 124 | <i>Cyathula capitata</i> | Amaranthaceae | |
| 125 | <i>Cyathula tomentosa</i> | Amaranthaceae | Tagpa roba(Ts) |
| 126 | <i>Cyclea bicristata</i> | Menispermaceae | |
| 127 | <i>Decaisnea insignis</i> | Lardizabalaceae | |
| 128 | <i>Deeringia amaranthoides</i> | Amaranthaceae | Sa shing(Ts), Bakri sag(Lh) |
| 129 | <i>Desmodium caudatum</i> | Leguminosae | |
| 130 | <i>Desmodium concinum</i> | Leguminosae | |
| 131 | <i>Desmodium confertum</i> | Leguminosae | |
| 132 | <i>Desmodium elegans</i> | Leguminosae | Tatur Shi(Dz); Beymangrobu(Ts) ; Neptans Shing; Sarkinu(Lh) |
| 133 | <i>Desmodium gyroides</i> | Leguminosae | Mardum Kumchimo Shing(Ts) |
| 134 | <i>Desmodium heterocarpon</i> | Leguminosae | |
| 135 | <i>Desmodium khasianum</i> | Leguminosae | |
| 136 | <i>Desmodium laxiflorum</i> | Leguminosae | |
| 137 | <i>Desmodium microphyllum</i> | Leguminosae | |
| 138 | <i>Desmodium motorium</i> | Leguminosae | |
| 139 | <i>Desmodium multiflorum</i> | Leguminosae | |
| 140 | <i>Desmodium sequax</i> | Leguminosae | |
| 141 | <i>Desmodium trifolium</i> | Leguminosae | |
| 142 | <i>Desmodium triquetrum</i> | Leguminosae | |
| 143 | <i>Desmos chinensis</i> | Annonaceae | |
| 144 | <i>Desmos dumosus</i> | Annonaceae | Male Lahara(Lh) |
| 145 | <i>Deutzia corymbosa</i> | Philadelphaceae | |
| 146 | <i>Deutzia staminea</i> | Philadelphaceae | |
| 147 | <i>Dichroa febrifuga</i> | Hydrangeaceae | |

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| 148 | <i>Dobinea vulgaris</i> | Anacardiaceae | Zumphu sengkormay(Ts) |
| 149 | <i>Dodonaea angustifolia</i> | Sapindaceae | |
| 150 | <i>Ehretia psilosiphon</i> | Boraginaceae | |
| 151 | <i>Elsholtzia fruticosa</i> | Labiatae | Bhote(Lh) |
| 152 | <i>Embelia floribunda</i> | Myrsinaceae | Chiuri Amla Lahara(Lh) |
| 153 | <i>Embelia frondosa</i> | Myrsinaceae | |
| 154 | <i>Embelia ribes</i> | Myrsinaceae | Khubari(Ts) |
| 155 | <i>Eriosema himalaicum</i> | Leguminosae | |
| 156 | <i>Euchresta horsfieldii</i> | Leguminosae | |
| 157 | <i>Euphorbia leucocephala</i> | Euphorbiaceae | |
| 158 | <i>Euphorbia millii</i> | Euphorbiaceae | |
| 159 | <i>Euphorbia pulcherrima</i> | Euphorbiaceae | |
| 160 | <i>Euphorbia royleana</i> | Euphorbiaceae | |
| 161 | <i>Euptelea pleiosperma</i> | Eupteleaceae | |
| 162 | <i>Eurya acuminata</i> | Theaceae | Sanu Jhingni(Lh) |
| 163 | <i>Eurya cavinervis</i> | Theaceae | |
| 164 | <i>Fagerlindia fasciculata</i> | Rubiaceae | |
| 165 | <i>Fissistigma polyanthum</i> | Annonaceae | |
| 166 | <i>Flemengia bhutanica</i> | Leguminosae | |
| 167 | <i>Flemengia fruticulosa</i> | Leguminosae | |
| 168 | <i>Flemengia macrophylla</i> | Leguminosae | Batwasi(Lh) |
| 169 | <i>Flemengia strobilifera</i> | Leguminosae | |
| 170 | <i>Flueggea virosa</i> | Euphorbiaceae | Geykang Shing(Ts), Darim Pate, Phalame(Lh) |
| 171 | <i>Forsythia intermedia</i> | Oleaceae | |
| 172 | <i>Fraxinus floribunda</i> | Oleaceae | Draythub (Dz), lakuri(Lh) |
| 173 | <i>Fraxinus paxiana</i> | Oleaceae | Lankuri(Lh) |
| 174 | <i>Gardenia augusta</i> | Rubiaceae | |
| 175 | <i>Garuga floribunda</i> | Burseraceae | Dabdabe(Lh) |
| 176 | <i>Glochidion acuminatum</i> | Euphorbiaceae | Latikath(Lh) |
| 177 | <i>Glochidion assamicum</i> | Euphorbiaceae | Haldikath(Lh) |
| 178 | <i>Glochidion bhutanicum</i> | Euphorbiaceae | Kotokmo Shing(Ts) |
| 179 | <i>Glochidion khasicum</i> | Euphorbiaceae | |
| 180 | <i>Glochidion nubigenum</i> | Euphorbiaceae | |
| 181 | <i>Glochidion oblatum</i> | Euphorbiaceae | |
| 182 | <i>Glochidion velutinum</i> | Euphorbiaceae | |
| 183 | <i>Gomphostemma parviflorum</i> | Labiatae | Kaman Dhusur(Dz) |
| 184 | <i>Gylcosmis cymosa</i> | Rutaceae | |
| 185 | <i>Gylcosmis pentaphylla</i> | Rutaceae | |
| 186 | <i>Heynea trijuga</i> | Meliaceae | Ankhataruwa(Lh) |
| 187 | <i>Himalrandia tetrasperma</i> | Rubiaceae | |
| 188 | <i>Hiptage bengalensis</i> | Malpighiaceae | Charpate Lahara(Lh) |
| 189 | <i>Holmskioldia sanguinea</i> | Verbenaceae | Chaling momnang(Ts), Chinese Hat Plant(Eng) |
| 190 | <i>Holobellia latifolia</i> | Lardizabalaceae | Enterobjay(Dz) |
| 191 | <i>Homonoia riparia</i> | Euphorbiaceae | Khola Ruis(Lh) |
| 192 | <i>Hoya lanceolata</i> | Asclepiadaceae | |
| 193 | <i>Hydrangea anomala</i> | Hydrangeaceae | |
| 194 | <i>Hydrangea aspera</i> | Hydrangeaceae | |
| 195 | <i>Hydrangea heteromalla</i> | Hydrangeaceae | |
| 196 | <i>Hydrangea macrophylla</i> | Hydrangeaceae | |
| 197 | <i>Hydrangea stylosa</i> | Hydrangeaceae | |
| 198 | <i>Hypericum choisianum</i> | Hypericaceae | |
| 199 | <i>Hypericum griffithii</i> | Hypericaceae | |

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| 200 | <i>Hypericum hookerianum</i> | Hypericaceae | |
| 201 | <i>Hypericum sherriffii</i> | Hypericaceae | |
| 202 | <i>Hypericum uralum</i> | Hypericaceae | Urilo(Lh) |
| 203 | <i>Ichnocarpus frutescens</i> | Apocynaceae | Dude Lahara(Lh) |
| 204 | <i>Ichnocarpus polyanthus</i> | Apocynaceae | Dude Lahara(Lh) |
| 205 | <i>Illicium griffithii</i> | Illiciaceae | Dhom leeshi(Dz), Khaila tseenang(Ts), Star Anis(Eng) |
| 206 | <i>Indigofera dosua</i> | Leguminosae | Kumchingma Shing(Ts), Chiringgi Jhar(Lh) |
| 207 | <i>Indigofera atropurpurea</i> | Leguminosae | |
| 208 | <i>Indigofera cassioides</i> | Leguminosae | |
| 209 | <i>Indigofera cylindracea</i> | Leguminosae | |
| 210 | <i>Indigofera exilis</i> | Leguminosae | |
| 211 | <i>Indigofera hebeptala</i> | Leguminosae | |
| 212 | <i>Indigofera heterantha</i> | Leguminosae | |
| 213 | <i>Indigofera pseudoreticulata</i> | Leguminosae | |
| 214 | <i>Indigofera zollingeriana</i> | Leguminosae | |
| 215 | <i>Ipomea carnea</i> | Convolvaceae | |
| 216 | <i>Isodon coetse</i> | Labiatae | |
| 217 | <i>Isodon rugosus</i> | Labiatae | Siluguka(Dz) |
| 218 | <i>Isodon ternifolius</i> | Labiatae | Peng-dong-dongla(Dz) |
| 219 | <i>Ixora coccinea</i> | Rubiaceae | |
| 220 | <i>Ixora javanica</i> | Rubiaceae | |
| 221 | <i>Ixora undulate</i> | Rubiaceae | Kalikat(Lh) |
| 222 | <i>Jasminum caudatum</i> | Oleaceae | Kagaji Phul(Lh) |
| 223 | <i>Jasminum dispersum</i> | Oleaceae | hare Lahara(Lh) |
| 224 | <i>Jasminum elongatum</i> | Oleaceae | |
| 225 | <i>Jasminum grandiflorum</i> | Oleaceae | |
| 226 | <i>Jasminum humile</i> | Oleaceae | |
| 227 | <i>Jasminum lanceolarium</i> | Oleaceae | |
| 228 | <i>Jasminum aurifolium</i> | Oleaceae | |
| 229 | <i>Jasminum nepalense</i> | Oleaceae | |
| 230 | <i>Jasminum nervosum</i> | Oleaceae | |
| 231 | <i>Jasminum officinale</i> | Oleaceae | |
| 232 | <i>Jasminum sambac</i> | Oleaceae | Arabian Jasmine(Eng) |
| 233 | <i>Jasminum sempervirens</i> | Oleaceae | |
| 234 | <i>Jatropha curas</i> | Euphorbiaceae | Nera Khar Shing(Ts), Poison nut(Eng) |
| 235 | <i>Jatropha podagrica</i> | Euphorbiaceae | |
| 236 | <i>Juncus sphacelatus</i> | Juncaceae | |
| 237 | <i>Kadsura heteroclita</i> | Schisandraceae | Pattiamlo(Lh) |
| 238 | <i>Lantana camara</i> | Verbenaceae | Shing singba(Ts), Barra(Lh) |
| 239 | <i>Lasianthus biermannii</i> | Rubiaceae | Siyal Phusre(Lh) |
| 240 | <i>Lepisanthes senegalensis</i> | Sapindaceae | Achatta(Lh) |
| 241 | <i>Leptodermis amoena</i> | Rubiaceae | |
| 242 | <i>Leptodermis kumaonensis</i> | Rubiaceae | |
| 243 | <i>Leptodermis ludlowii</i> | Rubiaceae | |
| 244 | <i>Leptodermis stapfiana</i> | Rubiaceae | |
| 245 | <i>Lespedeza gerardiana</i> | Leguminosae | |
| 246 | <i>Lespedeza juncea</i> | Leguminosae | |
| 247 | <i>Leucaena leucocephala</i> | Leguminosae | Tsa shing(Dz), Tsee shing (Ts), Ghans siris(Lh) |
| 248 | <i>Lindera heterophylla</i> | Lauraceae | Chur tego(Dz) |
| 249 | <i>Lindera melatomacea</i> | Lauraceae | |
| 250 | <i>Lindera neesiana</i> | Lauraceae | Nenshing/Roo neng(Ts) |
| 251 | <i>Lindera pulcherrima</i> | Lauraceae | Sengkyermay shing(Ts), Sisi (Lh) |

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| 252 | <i>Litsea cubeba</i> | Lauraceae | Nenshing(Ts), Timur(Lh) |
| 253 | <i>Litsea kingie</i> | Lauraceae | Siltimur(Lh) |
| 254 | <i>Litsea laeta</i> | Lauraceae | |
| 255 | <i>Litsea salicifolia</i> | Lauraceae | Sanu pahenle(Lh) |
| 256 | <i>Litsea sericea</i> | Lauraceae | Geywe(Dz), Lekh siltimur (Lh) |
| 257 | <i>Luculia gratissima</i> | Rubiaceae | Tongden Meto(Dz) |
| 258 | <i>Maesa macrophylla</i> | Myrsinaceae | |
| 259 | <i>Mahonia napaulensis</i> | Berberidaceae | Chutro, Kesari(Lh) |
| 260 | <i>Malus bacata</i> | Rosaceae | Khomang Shing(Dz) |
| 261 | <i>Malus pumila</i> | Rosaceae | Apple(Eng) |
| 262 | <i>Malus sikkimensis</i> | Rosaceae | Mindu Shing(Dz) |
| 263 | <i>Manihot esculenta</i> | Euphorbiaceae | Dori,Simal Tarul(Lh), Sengi Ki(Kh), Casava Tapioca(Eng) |
| 264 | <i>Melianthus major</i> | Hippocastanaceae | |
| 265 | <i>Meliosma dillenifolia</i> | Sabiaceae | Lekh Gogun(Lh) |
| 266 | <i>Meliosma simplicifolia</i> | Sabiaceae | Chiuri, Chiwari, patpate(Lh) |
| 267 | <i>Miliusa macrocarpa</i> | Annonaceae | |
| 268 | <i>Miliusa roxburghiana</i> | Annonaceae | |
| 269 | <i>Mimosa himalayana</i> | Leguminosae | Arere Khanra(Lh) |
| 270 | <i>Mimosa pudica</i> | Leguminosae | Shawa-dengkhan ngon (Ts), Booarey(Lh) |
| 271 | <i>Morinda angustifolia</i> | Rubiaceae | Hardi-Kat(Lh) |
| 272 | <i>Murraya koenigii</i> | Rutaceae | Ngebtang shing(Ts) |
| 273 | <i>Murraya paniculata</i> | Rutaceae | |
| 274 | <i>Mussaenda glabra</i> | Rubiaceae | Kange Lahara(Lh) |
| 275 | <i>Mussaenda macrophylla</i> | Rubiaceae | Dhobine Phul(Lh) |
| 276 | <i>Mussaenda roxburghii</i> | Rubiaceae | Mencha patong(Ts), Dhobi Kat(Lh) |
| 277 | <i>Mussaenda treutleri</i> | Rubiaceae | Neptenta (Dz), Dhobine Phul(Lh) |
| 278 | <i>Myrsine semiserrata</i> | Myrsinaceae | Palami,Phalame, Jhingni(Lh) |
| 279 | <i>Narvelia zeylanica</i> | Ranunculaceae | |
| 280 | <i>Neillia rubiflora</i> | Rosaceae | |
| 281 | <i>Neillia thyrsiflora</i> | Rosaceae | |
| 282 | <i>Nopalea cochenillifera</i> | Cactaceae | Cochineal Cactus(Eng) |
| 283 | <i>Nostolachma khasiana</i> | Rubiaceae | |
| 284 | <i>Nyctanthes arbor</i> | Verbenaceae | |
| 285 | <i>Opuntia vulgaris</i> | Cactaceae | Gawairinga Tsang(Dz) |
| 286 | <i>Orthosiphon rubicundus</i> | Labiatae | |
| 287 | <i>Osmanthus suavis</i> | Oleaceae | Chatshe Kam(Dz), Silingi (Lh) |
| 288 | <i>Ostodes paniculata</i> | Euphorbiaceae | Bepari(Lh) |
| 289 | <i>Paederia cruddasiana</i> | Rubiaceae | Biri(Lh) |
| 290 | <i>Paederia foetida</i> | Rubiaceae | Biri, Biri Lahare(Lh) |
| 291 | <i>Paeonia suffruticosa</i> | Ranunculaceae | |
| 292 | <i>Parabaena sagittata</i> | Menispermaceae | Karpati Lahara(Lh) |
| 293 | <i>Paramignya monophylla</i> | Rutaceae | Natkanta(Lh) |
| 294 | <i>Pavatta polyantha</i> | Rubiaceae | Kanjol Phul(Lh) |
| 295 | <i>Pavatta subcapitata</i> | Rubiaceae | |
| 296 | <i>Pedilanthus tithymaloides</i> | Euphorbiaceae | |
| 297 | <i>Pegia nitida</i> | Anacardiaceae | Lahara Anp(Lh) |
| 298 | <i>Pericampylus glaucus</i> | Menispermaceae | Tschethangru(Lh) |
| 299 | <i>Periploca calophylla</i> | Asclepiadaceae | |
| 300 | <i>Petrea volubilis</i> | Verbenaceae | Eng: Queen; Wreath(Lh) |
| 301 | <i>Philadelphus tomentosus</i> | Philadelphaceae | |
| 302 | <i>Photina beauverdiana</i> | Rosaceae | |
| 303 | <i>Phyllanthus clarkei</i> | Euphorbiaceae | |

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| 304 | <i>Phyllanthus glaucus</i> | Euphorbiaceae | Dosem(Dz), Prang Shing (Tr) |
| 305 | <i>Phyllanthus leschenaultii</i> | Euphorbiaceae | |
| 306 | <i>Phyllanthus parvifolius</i> | Euphorbiaceae | |
| 307 | <i>Phyllanthus reticularis</i> | Euphorbiaceae | Dosem(Dz) |
| 308 | <i>Phyllanthus sikkimensis</i> | Euphorbiaceae | |
| 309 | <i>Phyllanthus emblica</i> | Euphorbiaceae | Amala(Lh) |
| 310 | <i>Pinanga gracilis</i> | Arecaceae | |
| 311 | <i>Piper attenuatum</i> | Piperaceae | Chabo(Lh) |
| 312 | <i>Piper betleoides</i> | Piperaceae | Pan(Lh) |
| 313 | <i>Piper chuyva</i> | Piperaceae | Chaba(Lh) |
| 314 | <i>Piper khasianum</i> | Piperaceae | Chabo(Lh) |
| 315 | <i>Piper longum</i> | Piperaceae | Peepeeling(Dz), Peepeeling(Ts), Pipla (Lh) |
| 316 | <i>Piper mullesua</i> | Piperaceae | Peepeeling(Dz), Peepeeling(Ts), Dala Charbo (Lh) |
| 317 | <i>Piper pedicellatum</i> | Piperaceae | Bale Chabo, Long pipila(Lh) |
| 318 | <i>Piper peepuloides</i> | Piperaceae | Ruk peepla(Lh) |
| 319 | <i>Piper rhytidocarpum</i> | Piperaceae | Chabo, Tsabo(Lh) |
| 320 | <i>Piper suipigua</i> | Piperaceae | Dakley Chabo(Lh) |
| 321 | <i>Piper syvaticum</i> | Piperaceae | |
| 322 | <i>Piptanthus nepalensis</i> | Leguminosae | Gahate Phul(Lh) |
| 323 | <i>Pithecellobium dulce</i> | Leguminosae | |
| 324 | <i>Pittosporum napaulense</i> | Pittosporaceae | |
| 325 | <i>Pogostemon benghalensis</i> | Labiatae | |
| 326 | <i>Pogostemon elsholtzioides</i> | Labiatae | |
| 327 | <i>Pogostemon tuberosus</i> | Labiatae | |
| 328 | <i>Polygala arillata</i> | Polgalaceae | Baahu(Dz) |
| 329 | <i>Polygala karensum</i> | Polgalaceae | |
| 330 | <i>Potentilla arbuscula</i> | Rosaceae | Chiriy Phal(Lh) |
| 331 | <i>Premna interrupta</i> | Verbenaceae | |
| 332 | <i>Prinsepia utilis</i> | Rosaceae | |
| 333 | <i>Prunus jenkinsii</i> | Rosaceae | |
| 334 | <i>Prunus rufa</i> | Rosaceae | Lekh paiyun(Lh) |
| 335 | <i>Prunus undulata</i> | Rosaceae | Lekh arupate(Lh) |
| 336 | <i>Psilanthus bengalensis</i> | Rubiaceae | Chitu,Morichi kat(Lh) |
| 337 | <i>Psychotria calocarpa</i> | Rubiaceae | Damey Gach(Lh) |
| 338 | <i>Psychotria denticulata</i> | Rubiaceae | Bon Golcul(Lh) |
| 339 | <i>Psychotria erratica</i> | Rubiaceae | |
| 340 | <i>Psychotria monticola</i> | Rubiaceae | |
| 341 | <i>Pterolobium hexapetalum</i> | Leguminosae | |
| 342 | <i>Pterolobium macropterum</i> | Leguminosae | |
| 343 | <i>Pycnarrhena pleniflora</i> | Menispermaceae | |
| 344 | <i>Pyracantha crenulata</i> | Rosaceae | |
| 345 | <i>Rapanea capitellata</i> | Myrsinaceae | Kalachamp,Phalamkanth(Lh) |
| 346 | <i>Reinwardtia indica</i> | Linaceae | |
| 347 | <i>Rhus chinensis</i> | Anacardiaceae | Pok pokpa shing((Ts) |
| 348 | <i>Rhus paniculata</i> | Anacardiaceae | Khyr khobtang(Dz) |
| 349 | <i>Rhus succedanea</i> | Anacardiaceae | Say shing(Ts) |
| 350 | <i>Ribes acuminatum</i> | Grossulariaceae | |
| 351 | <i>Ribes alpestre</i> | Grossulariaceae | |
| 352 | <i>Ribes glaciale</i> | Grossulariaceae | |
| 353 | <i>Ribes griffithii</i> | Grossulariaceae | |
| 354 | <i>Ribes himalense</i> | Grossulariaceae | |
| 355 | <i>Ribes laciniatum</i> | Grossulariaceae | |

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|-----|---------------------------------|-----------------|--|
| 356 | <i>Ribes luridum</i> | Grossulariaceae | |
| 357 | <i>Ribes orientale</i> | Grossulariaceae | |
| 358 | <i>Rosa brunonii</i> | Rosaceae | Tagtsher kaap(Dz) |
| 359 | <i>Rosa macrophylla</i> | Rosaceae | Tagtsher marp(Dz) |
| 360 | <i>Rosa sericea</i> | Rosaceae | Sew Shing(Dz), Sisi Chungchung (Lh), Med: Sewai Metog, |
| 361 | <i>Rubus acuminatus</i> | Rosaceae | Koma tshang(Dz), Biraley kara or Sanu aselu(Lh) |
| 362 | <i>Rubus alexeterius</i> | Rosaceae | |
| 363 | <i>Rubus biflorus</i> | Rosaceae | Thulu gongsey(Ts) |
| 364 | <i>Rubus calophyllus</i> | Rosaceae | |
| 365 | <i>Rubus calycinoides</i> | Rosaceae | Tsheimai tsheloo (Dz) |
| 366 | <i>Rubus cooperi</i> | Rosaceae | |
| 367 | <i>Rubus efferatus</i> | Rosaceae | |
| 368 | <i>Rubus ellipticus</i> | Rosaceae | Tsheimai tsheloo(Dz), Sergong or Gong zoo(Ts) |
| 369 | <i>Rubus hamiltoni</i> | Rosaceae | |
| 370 | <i>Rubus hypargyus</i> | Rosaceae | |
| 371 | <i>Rubus indotibetanus</i> | Rosaceae | Gempe Aselu(Lh) |
| 372 | <i>Rubus inopertus</i> | Rosaceae | Phusre Asaelu(Lh) |
| 373 | <i>Rubus insignis</i> | Rosaceae | |
| 374 | <i>Rubus irritans</i> | Rosaceae | |
| 375 | <i>Rubus lineatus</i> | Rosaceae | |
| 376 | <i>Rubus macilentus</i> | Rosaceae | |
| 377 | <i>Rubus mesogaesus</i> | Rosaceae | |
| 378 | <i>Rubus niveus</i> | Rosaceae | Thulu Gong; Trongsa(Ts), Tsang Guma, Kalo Aselu(Lh) |
| 379 | <i>Rubus paniculatus</i> | Rosaceae | Domay tsheloo(Dz) |
| 380 | <i>Rubus penagonous</i> | Rosaceae | |
| 381 | <i>Rubus phengodes</i> | Rosaceae | |
| 382 | <i>Rubus preptanthus</i> | Rosaceae | |
| 383 | <i>Rubus Pungens</i> | Rosaceae | |
| 384 | <i>Rubus sikkimensis</i> | Rosaceae | |
| 385 | <i>Rubus splendidissimus</i> | Rosaceae | |
| 386 | <i>Rubus sumatranus</i> | Rosaceae | |
| 387 | <i>Rubus thomsonii</i> | Rosaceae | |
| 388 | <i>Rubus treutleri</i> | Rosaceae | |
| 389 | <i>Sabia campanulata</i> | Sabiaceae | Kali Lahara(Lh) |
| 390 | <i>Sabia lanceolata</i> | Sabiaceae | Simali Lahara(Lh) |
| 391 | <i>Sabia paniculata</i> | Sabiaceae | Kali Lahara(Lh) |
| 392 | <i>Sabia parviflora</i> | Sabiaceae | Simali Lahara(Lh) |
| 393 | <i>Sabia purpurea</i> | Sabiaceae | |
| 394 | <i>Saurauja armata</i> | Actinidiaceae | Mangmadom(Dz), Nyabjala shing(Ts) |
| 395 | <i>Sauropus androgynus</i> | Euphorbiaceae | |
| 396 | <i>Sauropus quadrangularis</i> | Euphorbiaceae | |
| 397 | <i>Sauropus repandus</i> | Euphorbiaceae | |
| 398 | <i>Schisandra grandiflora</i> | Schisandraceae | Singghatte lahare(Lh) |
| 399 | <i>Skimmia laureola</i> | Rutaceae | Jainberiphul(Lh) |
| 400 | <i>Smilax minutiflora</i> | Smilacaceae | |
| 401 | <i>Smilax myrtilus</i> | Smilacaceae | |
| 402 | <i>Sophora velutina</i> | Leguminosae | |
| 403 | <i>Sophora wightii</i> | Leguminosae | |
| 404 | <i>Spartium junceum</i> | Leguminosae | |
| 405 | <i>Spermadictyon suaveolens</i> | Rubiaceae | Bhain Chanpa(Lh) |
| 406 | <i>Spiraea arcuta</i> | Rosaceae | |
| 407 | <i>Spiraea bella</i> | Rosaceae | |

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|-----|----------------------------------|----------------|--|
| 408 | <i>Spiraea canescens</i> | Rosaceae | |
| 409 | <i>Spiraea micrantha</i> | Rosaceae | Khangtshalo(Ts) |
| 410 | <i>Stephania elegans</i> | Menispermaceae | |
| 411 | <i>Stephania glabra</i> | Menispermaceae | Tamarke Pailo(Lh) |
| 412 | <i>Stephania glandulifera</i> | Menispermaceae | Chechu robji (Dz), Zala mathang roo (Ts) |
| 413 | <i>Stephania japonica</i> | Menispermaceae | Charcharey Lahara(Lh) |
| 414 | <i>Strophanthus wallichii</i> | Apocynaceae | |
| 415 | <i>Symplocos dryophila</i> | Symplocaceae | Kharane(Lh) |
| 416 | <i>Symplocos glomerata</i> | Symplocaceae | Kholme(Lh) |
| 417 | <i>Symplocos ramosissima</i> | Symplocaceae | Kharane(Lh) |
| 418 | <i>Tarennoidea wallichii</i> | Rubiaceae | |
| 419 | <i>Tephrosia Candida</i> | Leguminosae | Kumchumo Shing(Ts), Bun Mara(Lh) |
| 420 | <i>Tetradium glabrifolium</i> | Rutaceae | Thulo Khanakpa(Lh) |
| 421 | <i>Tetradium ruticarpum</i> | Rutaceae | |
| 422 | <i>Toddalia asiatica</i> | Rutaceae | Kapore ru/Khaytore(Ts) |
| 423 | <i>Tournefortia hookeri</i> | Boraginaceae | Arupate Lahara(Lh) |
| 424 | <i>Tournefortia montana</i> | Boraginaceae | |
| 425 | <i>Toxocarpus aurantiacus</i> | Asclepiadaceae | |
| 426 | <i>Toxocarpus himalensis</i> | Asclepiadaceae | |
| 427 | <i>Trachelospermum assamense</i> | Apocynaceae | |
| 428 | <i>Trachelospermum axillare</i> | Apocynaceae | Lali-lara(Lh) |
| 429 | <i>Tylophora tenerrima</i> | Asclepiadaceae | |
| 430 | <i>Uraria lagopus</i> | Leguminosae | |
| 431 | <i>Uraria sinensis</i> | Leguminosae | |
| 432 | <i>Vitex negundo</i> | Verbenaceae | Sewali(Lh) |
| 433 | <i>Wallichia densiflora</i> | Arecaceae | Takoru(Lh) |
| 434 | <i>Wendlandia grandis</i> | Rubiaceae | Tilki(Lh) |
| 435 | <i>Wendlandia pendula</i> | Rubiaceae | |
| 436 | <i>Wendlandia puberula</i> | Rubiaceae | |
| 437 | <i>Wendlandia speciosa</i> | Rubiaceae | |
| 438 | <i>Wrightia arborea</i> | Apocynaceae | Raba warong shing(Ts), Khirra (Lh) |
| 439 | <i>Wrightia coccinea</i> | Apocynaceae | |
| 440 | <i>Zanthoxylum acanthopodium</i> | Rutaceae | Dreytshang(Dz) Hagee zoo(Ts), Boke Timur(Lh) |
| 441 | <i>Zanthoxylum armatum</i> | Rutaceae | Thing-gi (Dz), Gee shing(Ts), Bale timur(Lh) |
| 442 | <i>Zanthoxylum bungeanum</i> | Rutaceae | Thing-gi (Dz), Gee shing(Ts) Timur(Lh) |
| 443 | <i>Zanthoxylum oxyphyllum</i> | Rutaceae | Bhainsi Timur(Lh) |
| 444 | <i>Zanthoxylum tomentellum</i> | Rutaceae | |

ANNEXURE VIII: LIST OF HERBS

| SN | Botanical Name | Local Name |
|----|-----------------------------------|------------|
| 1 | <i>Acalypha brachystachya</i> | |
| 2 | <i>Achyranthes aspera</i> | |
| 3 | <i>Achyranthes bidentata</i> | |
| 4 | <i>Aconitum bisma</i> | |
| 5 | <i>Aconitum bulbilliferum</i> | |
| 6 | <i>Aconitum deinorrhizum</i> | |
| 7 | <i>Aconitum ferox</i> | |
| 8 | <i>Aconitum fletcherianum</i> | |
| 9 | <i>Aconitum funiculare</i> | |
| 10 | <i>Aconitum heterophylloides</i> | |
| 11 | <i>Aconitum hicksii</i> | |
| 12 | <i>Aconitum hookeri</i> | |
| 13 | <i>Aconitum laciniatum</i> | |
| 14 | <i>Aconitum nakaoi</i> | |
| 15 | <i>Aconitum naviculare</i> | |
| 16 | <i>Aconitum novoluridum</i> | |
| 17 | <i>Aconitum orochryseum</i> | |
| 18 | <i>Aconitum patulum</i> | |
| 19 | <i>Aconitum scaposum</i> | |
| 20 | <i>Aconitum sherriffii</i> | |
| 21 | <i>Aconitum spicatum</i> | |
| 22 | <i>Acrocephalus indicus</i> | |
| 23 | <i>Acronema bellum</i> | |
| 24 | <i>Acronema hookeri</i> | |
| 25 | <i>Acronema nervosum</i> | |
| 26 | <i>Acronema sichuanense</i> | |
| 27 | <i>Acronema tenerum</i> | |
| 28 | <i>Actaea acuminata</i> | |
| 29 | <i>Adonis brevistyla</i> | |
| 30 | <i>Aerva sanguinolenta</i> | |
| 31 | <i>Aeschynomene indica</i> | |
| 32 | <i>Ajuga bracteosa</i> | |
| 33 | <i>Ajuga lobata</i> | |
| 34 | <i>Ajuga macrosperma</i> | |
| 35 | <i>Alternanthera bettzickiana</i> | |
| 36 | <i>Alternanthera brasiliana</i> | |
| 37 | <i>Alternanthera pungens</i> | |
| 38 | <i>Alternanthera sessilis</i> | |
| 39 | <i>Alysicarpus vaginalis</i> | |
| 40 | <i>Amaranthus hybridus</i> | Lasomo(Ts) |
| 41 | <i>Amaranthus spinosus</i> | |

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|----|-----------------------------------|----------------|
| 42 | <i>Amaranthus viridis</i> | |
| 43 | <i>Anagallis arvensis</i> | |
| 44 | <i>Androsace geraniifolia</i> | |
| 45 | <i>Androsace globifera</i> | |
| 46 | <i>Androsace hemisphaerica</i> | |
| 47 | <i>Androsace henryi</i> | |
| 48 | <i>Androsace hookeriana</i> | |
| 49 | <i>Androsace ludlowiana</i> | |
| 50 | <i>Androsace selago</i> | |
| 51 | <i>Androsace strigillosa</i> | |
| 52 | <i>Androsace tapete</i> | |
| 53 | <i>Anemone demissa</i> | |
| 54 | <i>Anemone griffithii</i> | |
| 55 | <i>Anemone obtusiloba</i> | Ugala(Trongsa) |
| 56 | <i>Anemone polyanthes</i> | |
| 57 | <i>Anemone rivularis</i> | |
| 58 | <i>Anemone rupestris</i> | |
| 59 | <i>Anemone rupicola</i> | |
| 60 | <i>Anemone smithiana</i> | |
| 61 | <i>Anemone trullifolia</i> | |
| 62 | <i>Anemone vitifolia</i> | |
| 63 | <i>Anethum graveolens</i> | |
| 64 | <i>Anglelica cyclocarpa</i> | |
| 65 | <i>Anglelica sikkimensis</i> | |
| 66 | <i>Anisadenia meisner</i> | |
| 67 | <i>Anisadenia pubescens</i> | |
| 68 | <i>Anisadenia saxatilis</i> | |
| 69 | <i>Anisochilus pallidus</i> | |
| 70 | <i>Apios carnea</i> | |
| 71 | <i>Apium graveolens</i> | |
| 72 | <i>Arabidopsis himalaica</i> | |
| 73 | <i>Arabidopsis lasiocarpa</i> | |
| 74 | <i>Arabidopsis mollissima</i> | |
| 75 | <i>Arabis amplexicaulis</i> | |
| 76 | <i>Arabis axilliflora</i> | |
| 77 | <i>Arabis pterosperma</i> | |
| 78 | <i>Arabis venusta</i> | |
| 79 | <i>Archyosperma primulifolium</i> | |
| 80 | <i>Arenaria ciliolata</i> | |
| 81 | <i>Arenaria debilis</i> | |
| 82 | <i>Arenaria densissima</i> | |
| 83 | <i>Arenaria depauperata</i> | |
| 84 | <i>Arenaria edgeworthiana</i> | |

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|-----|-----------------------------------|--|
| 85 | <i>Arenaria glanduligera</i> | |
| 86 | <i>Arenaria ischnophylla</i> | |
| 87 | <i>Arenaria ludlowii</i> hara | |
| 88 | <i>Arenaria melandryiformis</i> | |
| 89 | <i>Arenaria melandryoides</i> | |
| 90 | <i>Arenaria polytrichoides</i> | |
| 91 | <i>Arenaria pulvinata</i> | |
| 92 | <i>Arenaria rotundifolia</i> | |
| 93 | <i>Argemonia pilosa</i> | Brumzey(Tr) |
| 94 | <i>Argostemma sarmentosum</i> | |
| 95 | <i>Argostemma verticillatum</i> | |
| 96 | <i>Argyrela venusta</i> | |
| 97 | <i>Aruncus dioicus</i> | |
| 98 | <i>Asteropyrum peltatum</i> | |
| 99 | <i>Astilbe rivularis</i> | (Ts) Tonsar Gugay; Nep: Buro Okhate |
| 100 | <i>Astilbe rubra</i> | |
| 101 | <i>Astragalus floridus</i> | |
| 102 | <i>Astragalus acaulis</i> | |
| 103 | <i>Astragalus bhotanensis</i> | |
| 104 | <i>Astragalus chlorostachys</i> | |
| 105 | <i>Astragalus concretus</i> | |
| 106 | <i>Astragalus donianus</i> | |
| 107 | <i>Astragalus kongrensis</i> | |
| 108 | <i>Astragalus lessertoides</i> | |
| 109 | <i>Astragalus rigidulus</i> | |
| 110 | <i>Astragalus sikkimensis</i> | |
| 111 | <i>Astragalus stipulatus</i> | |
| 112 | <i>Astragalus strictus</i> | |
| 113 | <i>Astragalus tongolensis</i> | |
| 114 | <i>Barbarea elata</i> | |
| 115 | <i>Barbarea intermedia</i> | |
| 116 | <i>Basella alba</i> | |
| 117 | <i>Bergenia ciliata</i> | |
| 118 | <i>Bergenia purpurascens</i> | |
| 119 | <i>Boenninghausenia albiflora</i> | Med: Yerma shing |
| 120 | <i>Boerhavia coccinea</i> | |
| 121 | <i>Brachystemma calycinum</i> | |
| 122 | <i>Brassica juncea</i> | |
| 123 | <i>Brassica campestris</i> | |
| 124 | <i>Braya forrestii</i> | |
| 125 | <i>Braya oxycarpa</i> | |
| 126 | <i>Braya tibetica</i> | |
| 127 | <i>Bryocarpum himalaicum</i> | Dum (Dz) |

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|-----|---|-----------------------|
| 128 | <i>Bupleurm candollei</i> | |
| 129 | <i>Bupleurm dalhousieanum</i> | |
| 130 | <i>Bupleurm falcatum</i> | |
| 131 | <i>Bupleurm gracillimum</i> | |
| 132 | <i>Bupleurm hamiltonii</i> | |
| 133 | <i>Bupleurm marginatum</i> | |
| 134 | <i>Butea buteiformis</i> | Phrogpa Laga(Ts) |
| 135 | <i>Cajanus elongatus</i> | |
| 136 | <i>Cajanus mollis</i> | Semchung Robjay(Dz) |
| 137 | <i>Calathodes palamata</i> | |
| 138 | <i>Callianthemum pimpinel- loides</i> | |
| 139 | <i>Callitriche palustris</i> | |
| 140 | <i>Callitriche stagnalis</i> | |
| 141 | <i>Caltha palustris</i> | |
| 142 | <i>Caltha scaposa</i> | |
| 143 | <i>Calystegia hederacea</i> | |
| 144 | <i>Camylotropis bunge</i> | |
| 145 | <i>Capsella bursapastoris</i> | Shepherd's purse(Eng) |
| 146 | <i>Cardamine elegantula</i> | |
| 147 | <i>Cardamine flexuosa</i> | |
| 148 | <i>Cardamine griffithii</i> | |
| 149 | <i>Cardamine impatiens</i> | |
| 150 | <i>Cardamine loxostemonoi- des</i> | |
| 151 | <i>Cardamine macrophylla</i> | |
| 152 | <i>Cardamine multijuga</i> | |
| 153 | <i>Cardamine scoriarum</i> | |
| 154 | <i>Cardamine trifoliolata</i> | |
| 155 | <i>Cardamine violacea</i> | |
| 156 | <i>Cardamine yunnanensis</i> | |
| 157 | <i>Carum carvi</i> | |
| 158 | <i>Cassia hochstetteri</i> | |
| 159 | <i>Cassia lechenaultiana</i> | |
| 160 | <i>Cathcartia villosa</i> | |
| 161 | <i>Celosia argentea</i> | |
| 162 | <i>Centella asiatica</i> | Tuni manakuni (Dz) |
| 163 | <i>Cerastium glomeratum</i> | |
| 164 | <i>Chaeropyllum villosum</i> | |
| 165 | <i>Chamaesium novemjugum</i> | |
| 166 | <i>Chenopodium album</i> | |
| 167 | <i>Chenopodium ambrosioides</i> | |
| 168 | <i>Chenopodium botrys</i> | |
| 169 | <i>Chenopodium ficifolium Smith</i> | Hethu, Nep: Bethu(Dz) |

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|-----|----------------------------------|---------------|
| 170 | <i>Chrysobraya glaricola</i> | |
| 171 | <i>Chrysosplenium adoxoides</i> | |
| 172 | <i>Chrysosplenium carnosum</i> | |
| 173 | <i>Chrysosplenium forrestii</i> | |
| 174 | <i>Chrysosplenium griffithii</i> | |
| 175 | <i>Chrysosplenium nepalense</i> | |
| 176 | <i>Chrysosplenium tenellum</i> | |
| 177 | <i>Cimicifuga foetida</i> | |
| 178 | <i>Cleome gynandra</i> | |
| 179 | <i>Cleome viscosa</i> | |
| 180 | <i>Clitoria mariana</i> | |
| 181 | <i>Clitoria ternatea</i> | |
| 182 | <i>Cnidium bhutanicum</i> | |
| 183 | <i>Cochlearia himalaica</i> | |
| 184 | <i>Consolida ambigua</i> | Larkspur(Eng) |
| 185 | <i>Convolvulus arvensis</i> | |
| 186 | <i>Coriandrum sativum</i> | |
| 187 | <i>Cortia depressa</i> | |
| 188 | <i>Cortiella cortioides</i> | |
| 189 | <i>Cortiella hookeri</i> | |
| 190 | <i>Corydalis alperstris</i> | |
| 191 | <i>Corydalis autantiaca</i> | |
| 192 | <i>Corydalis bowes-hyonii</i> | |
| 193 | <i>Corydalis calliantha</i> | |
| 194 | <i>Corydalis cashmeriana</i> | |
| 195 | <i>Corydalis casimiriana</i> | |
| 196 | <i>Corydalis chaerophylla</i> | |
| 197 | <i>Corydalis chasmophila</i> | |
| 198 | <i>Corydalis crispa</i> | |
| 199 | <i>Corydalis delicatula</i> | |
| 200 | <i>Corydalis dorjii</i> | |
| 201 | <i>Corydalis drepanantha</i> | |
| 202 | <i>Corydalis dubia</i> | |
| 203 | <i>Corydalis ecristata</i> | |
| 204 | <i>Corydalis flaccida</i> | |
| 205 | <i>Corydalis franchetiana</i> | |
| 206 | <i>Corydalis gerdae</i> | |
| 207 | <i>Corydalis juncea</i> | |
| 208 | <i>Corydalis laelia</i> | |
| 209 | <i>Corydalis lathyroides</i> | |
| 210 | <i>Corydalis leptocarpa</i> | |
| 211 | <i>Corydalis longipes</i> | |
| 212 | <i>Corydalis meifolia</i> | |

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|-----|----------------------------------|-----------------------------|
| 213 | <i>Corydalis oligantha</i> | |
| 214 | <i>Corydalis ophiocarpa</i> | |
| 215 | <i>Corydalis oxalidifolia</i> | |
| 216 | <i>Corydalis polygalina</i> | |
| 217 | <i>Corydalis sikkimensis</i> | |
| 218 | <i>Corydalis stracheyi</i> | |
| 219 | <i>Corydalis trifolitata</i> | |
| 220 | <i>Crawfuradia campanulacea</i> | |
| 221 | <i>Crawfuradia puberula</i> | |
| 222 | <i>Crawfuradia speciosa</i> | |
| 223 | <i>Crotolaria albida</i> | |
| 224 | <i>Crotolaria ferruginea</i> | |
| 225 | <i>Crotolaria humifusa</i> | |
| 226 | <i>Crotolaria trifoliastrium</i> | |
| 227 | <i>Cucubalus bacciferus</i> | |
| 228 | <i>Cuminum cyminum</i> | |
| 229 | <i>Cuscuta campestris</i> | |
| 230 | <i>Cuscuta europaea</i> | |
| 231 | <i>Cuscuta reflexa</i> | Roba-je (Dz) |
| 232 | <i>Cuscuta scandens</i> | |
| 233 | <i>Cyathula prostrata</i> | |
| 234 | <i>Cynoglossum lanceolatum</i> | Khirpatey (Lh) |
| 235 | <i>Delphinium altissimum</i> | |
| 236 | <i>Delphinium bhutanicum</i> | |
| 237 | <i>Delphinium caeruleum</i> | |
| 238 | <i>Delphinium cooperi</i> | |
| 239 | <i>Delphinium glaciale</i> | |
| 240 | <i>Delphinium ludlowii</i> | |
| 241 | <i>Delphinium muscosum</i> | |
| 242 | <i>Delphinium nepalense</i> | |
| 243 | <i>Delphinium scabriflorum</i> | |
| 244 | <i>Delphinium stapeliosmum</i> | |
| 245 | <i>Delphinium viscosum</i> | |
| 246 | <i>Desmodium ducclouxii</i> | |
| 247 | <i>Desmodium heterocarpon</i> | |
| 248 | <i>Desmodium podocarpum</i> | |
| 249 | <i>Desmodium williamsii</i> | |
| 250 | <i>Dianthus barbatus</i> | Sweet William(Eng) |
| 251 | <i>Dianthus chinensis</i> | Chinese or Indian Pink(Eng) |
| 252 | <i>Dichocarpum adiantifolium</i> | |
| 253 | <i>Dilophia salsa</i> | |
| 254 | <i>Dolichos tenuicaulis</i> | |
| 255 | <i>Dontostemon glandulosus</i> | |

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|-----|--------------------------------|-------------------|
| 256 | <i>Draba bhutanica</i> | |
| 257 | <i>Draba elata</i> | |
| 258 | <i>Draba eriopoda</i> | |
| 259 | <i>Draba eriopoda</i> | |
| 260 | <i>Draba gracillima</i> | |
| 261 | <i>Draba hicksii</i> | |
| 262 | <i>Draba lasiophylla</i> | |
| 263 | <i>Draba oariocarpa</i> | |
| 264 | <i>Draba oreades</i> | |
| 265 | <i>Draba sherriffii</i> | |
| 266 | <i>Draba sikkimensis</i> | |
| 267 | <i>Draba williamsii</i> | |
| 268 | <i>Drosera peltata</i> | |
| 269 | <i>Drymaria cordata</i> | |
| 270 | <i>Drymaria villosa</i> | |
| 271 | <i>Duchesnea indica</i> | |
| 272 | <i>Dumasia villosa</i> | |
| 273 | <i>Elsholtzia blanda</i> | Shingtsem (Dz) |
| 274 | <i>Elsholtzia ciliata</i> | |
| 275 | <i>Elsholtzia concinna</i> | |
| 276 | <i>Elsholtzia densa</i> | |
| 277 | <i>Elsholtzia eriostachya</i> | |
| 278 | <i>Elsholtzia pilosa</i> | |
| 279 | <i>Elsholtzia stachyodes</i> | |
| 280 | <i>Elsholtzia strobilifera</i> | |
| 281 | <i>Eryngium foetidum</i> | |
| 282 | <i>Erysimum hieracifolium</i> | |
| 283 | <i>Erysimum longisiliquum</i> | |
| 284 | <i>Erysimum pachycarpum</i> | |
| 285 | <i>Eutrema deltoideum</i> | |
| 286 | <i>Eutrema griffithii</i> | |
| 287 | <i>Eutrema heterophyllum</i> | |
| 288 | <i>Eutrema himalaicum</i> | |
| 289 | <i>Eutrema himalayensis</i> | |
| 290 | <i>Eutrema hirta</i> | |
| 291 | <i>Eutrema hypericifolia</i> | |
| 292 | <i>Eutrema longifolia</i> | |
| 293 | <i>Eutrema prostrata</i> | |
| 294 | <i>Eutrema stracheyi</i> | |
| 295 | <i>Eutrema thymifolia</i> | |
| 296 | <i>Evplvulus alsinoides</i> | |
| 297 | <i>Exacum hamiltonii</i> | Geethri Meto (Dz) |
| 298 | <i>Exacum ters</i> | |

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| 299 | <i>Foeniculum vulgare</i> | |
| 300 | <i>Fragaria daltoniana</i> | |
| 301 | <i>Fragaria nubicola</i> | |
| 302 | <i>Fumaria indica</i> | |
| 303 | <i>Gentiana albicalyx</i> | |
| 304 | <i>Gentiana algida</i> | |
| 305 | <i>Gentiana bryoides</i> | |
| 306 | <i>Gentiana capitata</i> | |
| 307 | <i>Gentiana cephalodes</i> | |
| 308 | <i>Gentiana crassuloides</i> | |
| 309 | <i>Gentiana depressa</i> | |
| 310 | <i>Gentiana elwesii</i> | |
| 311 | <i>Gentiana emodi</i> | |
| 312 | <i>Gentiana gilvostrata</i> | |
| 313 | <i>Gentiana glabriusula</i> | |
| 314 | <i>Gentiana hicksii</i> | |
| 315 | <i>Gentiana himalayensis</i> | |
| 316 | <i>Gentiana infelix</i> | |
| 317 | <i>Gentiana karelinii</i> | |
| 318 | <i>Gentiana lacerulata</i> | |
| 319 | <i>Gentiana leucantha</i> | |
| 320 | <i>Gentiana loureirii</i> | |
| 321 | <i>Gentiana maeulchanensis</i> | |
| 322 | <i>Gentiana marginata</i> | |
| 323 | <i>Gentiana micans</i> | |
| 324 | <i>Gentiana micantiformis</i> | |
| 325 | <i>Gentiana nyalamensis</i> | |
| 326 | <i>Gentiana obconica</i> | |
| 327 | <i>Gentiana oreodox</i> | |
| 328 | <i>Gentiana ornata</i> | |
| 329 | <i>Gentiana pedicellata</i> | |
| 330 | <i>Gentiana phyllocalyx</i> | |
| 331 | <i>Gentiana prainii</i> | |
| 332 | <i>Gentiana prolata</i> | |
| 333 | <i>Gentiana sikkimensis</i> | |
| 334 | <i>Gentiana simulatrix</i> | |
| 335 | <i>Gentiana tibetica</i> | |
| 336 | <i>Gentiana tubiflora</i> | |
| 337 | <i>Gentiana urnula</i> | |
| 338 | <i>Gentiana veitchiorum</i> | |
| 339 | <i>Gentiana verayi</i> | |
| 340 | <i>Gentianella azurea</i> | |
| 341 | <i>Gentianella griersonii</i> | |

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| 342 | <i>Gentianella paludosa</i> | |
| 343 | <i>Gentianella pedunculata</i> | |
| 344 | <i>Gentianella stellariifolia</i> | |
| 345 | <i>Gentianella urnigera</i> | |
| 346 | <i>Geranium donianum</i> | |
| 347 | <i>Geranium lambertii</i> | |
| 348 | <i>Geranium nakaoanum</i> | |
| 349 | <i>Geranium nepalense</i> | |
| 350 | <i>Geranium polyanthes</i> | |
| 351 | <i>Geranium procurrens</i> | |
| 352 | <i>Geranium refractum</i> | |
| 353 | <i>Geum aleppicum</i> | |
| 354 | <i>Geum elatum</i> | |
| 355 | <i>Geum macrpsepalum</i> | |
| 356 | <i>Geum sikkimense</i> | |
| 357 | <i>Glinus lotoides</i> | |
| 358 | <i>Glycine max</i> | Soybean(Eng) |
| 359 | <i>Gomphrena celosioides</i> | |
| 360 | <i>Gomphrena globosa</i> | |
| 361 | <i>Gueldenstaedtia himalaica</i> | |
| 362 | <i>Gypsophila cerastioides</i> | |
| 363 | <i>Hackelia bhutanica</i> | |
| 364 | <i>Hackelia obtusifolia</i> | |
| 365 | <i>Hackelia uncinata</i> | |
| 366 | <i>Halenia elliptica</i> | |
| 367 | <i>Haplosphera himalayensis</i> | |
| 368 | <i>Hedysarum sikkimense</i> | |
| 369 | <i>Heliotropium indicum</i> | |
| 370 | <i>Heliotropium strigosum</i> | |
| 371 | <i>Heracleum bhutanicum</i> | |
| 372 | <i>Heracleum nepalense</i> | |
| 373 | <i>Heracleum obtusifolium</i> | |
| 374 | <i>Heracleum sphondylium</i> | |
| 375 | <i>Heracleum sublineare</i> | |
| 376 | <i>Heracleum woodii</i> | |
| 377 | <i>Houttuynia cordata</i> | Mombering, Nombaring(Ts) |
| 378 | <i>Hydrobryum griffithii</i> | |
| 379 | <i>Hydrocotyle himalaica</i> | Ghora tophay (Lh) |
| 380 | <i>Hydrocotyle nepalensis</i> | |
| 381 | <i>Hydrocotyle sibthorpiodes</i> | |
| 382 | <i>Hypericum elodeoides</i> | |
| 383 | <i>Hypericum gramineum</i> | |
| 384 | <i>Hypericum himalaicum</i> | |

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| 385 | <i>Hypericum japonicum</i> | |
| 386 | <i>Hypericum leptocarpum</i> | |
| 387 | <i>Hypericum ludlowii</i> | |
| 388 | <i>Hypericum monanthemum</i> | |
| 389 | <i>Hypericum petiolulatum</i> | |
| 390 | <i>Hypericum wightianum</i> | |
| 391 | <i>Hyptis suaveolens</i> | |
| 392 | <i>Impatiens arguta</i> | |
| 393 | <i>Impatiens cristata</i> | |
| 394 | <i>Impatiens discolor</i> | |
| 395 | <i>Impatiens drepanophora</i> | |
| 396 | <i>Impatiens exilis</i> | |
| 397 | <i>Impatiens florigera</i> | |
| 398 | <i>Impatiens infundibularis</i> | |
| 399 | <i>Impatiens jurpia</i> | |
| 400 | <i>Impatiens latiflora</i> | |
| 401 | <i>Impatiens longipes</i> | |
| 402 | <i>Impatiens puberula</i> | |
| 403 | <i>Impatiens pulchra</i> | |
| 404 | <i>Impatiens racemosa</i> | |
| 405 | <i>Impatiens radiata</i> | |
| 406 | <i>Impatiens spirifer</i> | |
| 407 | <i>Impatiens stenantha</i> | |
| 408 | <i>Impatiens tripetala</i> | Doorgonang(Ts) |
| 409 | <i>Indigofera linifolia</i> | |
| 410 | <i>Indigofera trifoliata</i> | |
| 411 | <i>Ipomoea batatas</i> | |
| 412 | <i>Ipomoea indica</i> | |
| 413 | <i>Ipomoea nill</i> | |
| 414 | <i>Ipomoea pes-tigridis</i> | |
| 415 | <i>Ipomoea purpurea</i> | |
| 416 | <i>Ipomoea turbinata</i> | |
| 417 | <i>Isodon atroruber</i> | |
| 418 | <i>Isodon coetse</i> | |
| 419 | <i>Isodon hispidus</i> | |
| 420 | <i>Isodon lophanthoides</i> | Dolo patey (Dz) |
| 421 | <i>Isodon repens</i> | |
| 422 | <i>Isodon scrophularioides</i> | |
| 423 | <i>Isodon ternifolius</i> | Peng-dong-dongla (Dz) |
| 424 | <i>Kelloggia chinensis</i> | |
| 425 | <i>Keraymonia pinnatifolia</i> | |
| 426 | <i>Labilab purpureus</i> | Orey(Ts), Shimi(Nep) |
| 427 | <i>Lalldhwojia acronemiflia</i> | |

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| 428 | <i>Lasiocaryum densiflorum</i> | |
| 429 | <i>Lasiocaryum ludlowii</i> | |
| 430 | <i>Lasiocaryum munroi</i> | |
| 431 | <i>Lepidium capitatum</i> | |
| 432 | <i>Lepidostemon pedunculatus</i> | |
| 433 | <i>Lepidum virginicum</i> | |
| 434 | <i>Leucas cephalotes</i> | |
| 435 | <i>Leucas ciliate</i> | |
| 436 | <i>Leucas indica</i> | |
| 437 | <i>Leucas lanata</i> | |
| 438 | <i>Leucas mollissima</i> | |
| 439 | <i>Lignariella hobsonii</i> | |
| 440 | <i>Ligusticum acuminatum</i> | |
| 441 | <i>Ligusticum elatum</i> | |
| 442 | <i>Lomatogonium brachyantherum</i> | |
| 443 | <i>Lomatogonium chumbicum</i> | |
| 444 | <i>Lomatogonium himalayense</i> | |
| 445 | <i>Lomatogonium sikkimense</i> | |
| 446 | <i>Lomatogonium stapfii</i> | |
| 447 | <i>Lotus corniculatus</i> | Birdsfoot Trefoil(Eng) |
| 448 | <i>Loxostemon pulchellus</i> | |
| 449 | <i>Lysimachia alternifolia</i> | |
| 450 | <i>Lysimachia chenopodio</i> | |
| 451 | <i>Lysimachia congestiflora</i> | |
| 452 | <i>Lysimachia decurrens</i> | |
| 453 | <i>Lysimachia evalvis</i> | |
| 454 | <i>Lysimachia ferruginea</i> | |
| 455 | <i>Lysimachia japonica</i> | |
| 456 | <i>Lysimachia laxa</i> | |
| 457 | <i>Lysimachia lobeliodes</i> | |
| 458 | <i>Lysimachia prolifera</i> | |
| 459 | <i>Macrotyloma uniflorum</i> | |
| 460 | <i>Meconopsis concinna</i> | |
| 461 | <i>Meconopsis discigera</i> | |
| 462 | <i>Meconopsis grandis</i> | |
| 463 | <i>Meconopsis horridula</i> | |
| 464 | <i>Meconopsis napaulensis</i> | |
| 465 | <i>Meconopsis paniculata</i> | |
| 466 | <i>Meconopsis primulina</i> | |
| 467 | <i>Meconopsis sherriifii</i> | |
| 468 | <i>Meconopsis simplicifolia</i> | |
| 469 | <i>Meconopsis sinuate</i> | |
| 470 | <i>Meconopsis superb</i> | |

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| 471 | <i>Meeboldia digitata</i> | |
| 472 | <i>Megacondon stylophorus</i> | |
| 473 | <i>Melilotus indica</i> | |
| 474 | <i>Melissa axillaris</i> | |
| 475 | <i>Mentha longifolia</i> | |
| 476 | <i>Mentha spicata</i> | Babari (Lh) |
| 477 | <i>Mercurialis leiocarpa</i> | |
| 478 | <i>Merremia umbellate</i> | |
| 479 | <i>Merremia vitifolia</i> | |
| 480 | <i>Micromeria biflora</i> | |
| 481 | <i>Microsisymbrium axillare</i> | |
| 482 | <i>Microsisymbrium dasycarpum</i> | |
| 483 | <i>Microula bhutanica</i> | |
| 484 | <i>Mirabilis himalaica</i> | |
| 485 | <i>Mirabilis jalapa</i> | 4 o'clock(Eng) |
| 486 | <i>Mollugo nudicaulis</i> | |
| 487 | <i>Mollugo stricta</i> | |
| 488 | <i>Neanotis gracilis</i> | |
| 489 | <i>Neanotis ingrate</i> | |
| 490 | <i>Nelumbo nucifera</i> | |
| 491 | <i>Nepeta lamiopsis</i> | |
| 492 | <i>Notochaete hamosa</i> | |
| 493 | <i>Ocimum americanum</i> | |
| 494 | <i>Ocimum basilicum</i> | |
| 495 | <i>Oenanthe hookeri</i> | |
| 496 | <i>Oenanthe javanica</i> | |
| 497 | <i>Oenanthe thomsonii</i> | |
| 498 | <i>Olidenlandia brachypoda</i> | |
| 499 | <i>Olidenlandia corymbosa</i> | |
| 500 | <i>Olidenlandia diffusa</i> | |
| 501 | <i>Omphogramma elwesiana</i> | |
| 502 | <i>Onosma bhutanica</i> | |
| 503 | <i>Onosma emodi</i> | |
| 504 | <i>Onosma hookeri</i> | |
| 505 | <i>Onosma paniculatum</i> | |
| 506 | <i>Ophiorrhiza fasciculata</i> | |
| 507 | <i>Ophiorrhiza heterostyla</i> | |
| 508 | <i>Ophiorrhiza longii</i> | |
| 509 | <i>Ophiorrhiza ochroleuca</i> | |
| 510 | <i>Ophiorrhiza repens</i> | |
| 511 | <i>Ophiorrhiza rosea</i> | |
| 512 | <i>Ophiorrhiza rugosa</i> | |
| 513 | <i>Ophiorrhiza succirubra</i> | |

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| 514 | <i>Ophiorrhiza treutleri</i> | |
| 515 | <i>Origanum vulgare</i> | |
| 516 | <i>Orthosiphon</i> | |
| 517 | <i>Orthosiphon rubicundus</i> | |
| 518 | <i>Osmorhiza aristata</i> | |
| 519 | <i>Oxalis corniculata</i> | |
| 520 | <i>Oxalis corymbosa</i> | |
| 521 | <i>Oxalis griffithii</i> | |
| 522 | <i>Oxalis latifolia</i> | |
| 523 | <i>Oxalis leucolepis</i> | |
| 524 | <i>Oxygraphis endlicheri</i> | |
| 525 | <i>Oxytropis lapponica</i> | |
| 526 | <i>Paederia cruddasiana</i> | Biri (Lh) |
| 527 | <i>Paederia foetida</i> | Biri Lara (Lh) |
| 528 | <i>Papaver rhoeas</i> | Field Poppy(Eng) |
| 529 | <i>Papaver somniferum</i> | |
| 530 | <i>Paraquilegia anemonoides</i> | |
| 531 | <i>Parnassia chinensis</i> | |
| 532 | <i>Parnassia cooperi</i> | |
| 533 | <i>Parnassia delavayi</i> | |
| 534 | <i>Parnassia nubicola</i> | |
| 535 | <i>Parnassia pusilla</i> | |
| 536 | <i>Parnassia wightiana</i> | |
| 537 | <i>Paroxygraphis sikkimensis</i> | |
| 538 | <i>Parrya nudicaulis</i> | |
| 539 | <i>Pegaeophyton minutum</i> | |
| 540 | <i>Pegaeophyton scapiflorum</i> | |
| 541 | <i>Pelargonium aiton</i> | |
| 542 | <i>Peperomia heyneana</i> | |
| 543 | <i>Peperomia pellucida</i> | |
| 544 | <i>Peperomia tetraphylla</i> | |
| 545 | <i>Phaeonychium parryoides</i> | |
| 546 | <i>Phlomis breviflora</i> | |
| 547 | <i>Phlomis macrophylla</i> | |
| 548 | <i>Phlomis rotate</i> | |
| 549 | <i>Phlomis tibetica</i> | |
| 550 | <i>Phyla nodiflora</i> | |
| 551 | <i>Phyllanthus debilis</i> | |
| 552 | <i>Phyllanthus urinaria</i> | |
| 553 | <i>Phyllanthus virgatus</i> | |
| 554 | <i>Physospermopsis kingdonwardii</i> | |
| 555 | <i>Physospermopsis obtusiuscula</i> | |

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| 556 | <i>Phytolacca acinosa</i> | Kashakani(Dz) |
| 557 | <i>Pimpinella diversifolia</i> | |
| 558 | <i>Pimpinella tibetanica</i> | |
| 559 | <i>Pimpinella urceolata</i> | |
| 560 | <i>Pisum communis</i> | |
| 561 | <i>Pisum sativum</i> | Field Pea, Garden Pea(Eng) |
| 562 | <i>Plectranthus barbatus</i> | |
| 563 | <i>Pleurospermopsis sikkimensis</i> | |
| 564 | <i>Pleurospermum album</i> | |
| 565 | <i>Pleurospermum amabile</i> | |
| 566 | <i>Pleurospermum angelicoides</i> | |
| 567 | <i>Pleurospermum apiolens</i> | |
| 568 | <i>Pleurospermum benthamii</i> | |
| 569 | <i>Pleurospermum dentatum</i> | |
| 570 | <i>Pleurospermum hookeri</i> | |
| 571 | <i>Pleurospermum pilosum</i> | |
| 572 | <i>Podophyllum hexandrum</i> | |
| 573 | <i>Podophyllum sikkimense</i> | |
| 574 | <i>Pogostemon amaranthoides</i> | Namda (Dz) |
| 575 | <i>Pogostemon brachystachus</i> | |
| 576 | <i>Pogostemon fraternus</i> | |
| 577 | <i>Pogostemon linearis</i> | |
| 578 | <i>Polycarpon prostratum</i> | |
| 579 | <i>Polygala furcata</i> | |
| 580 | <i>Polygala persicariifolia</i> | |
| 581 | <i>Polygala sibirica</i> | |
| 582 | <i>Polygala tararinowii</i> | |
| 583 | <i>Potentilla achilleifolia</i> | |
| 584 | <i>Potentilla anserine</i> | |
| 585 | <i>Potentilla bhutanica</i> | |
| 586 | <i>Potentilla bryoides</i> | |
| 587 | <i>Potentilla coriandrifolia</i> | |
| 588 | <i>Potentilla cuneata</i> | |
| 589 | <i>Potentilla eriocarpa</i> | |
| 590 | <i>Potentilla eriocarpoides</i> | |
| 591 | <i>Potentilla forestii</i> | |
| 592 | <i>Potentilla fragaroides</i> | |
| 593 | <i>Potentilla griffithii</i> | |
| 594 | <i>Potentilla latiloba</i> | |
| 595 | <i>Potentilla leuconota</i> | |
| 596 | <i>Potentilla lineate</i> | |

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| 597 | <i>Potentilla microphylla</i> | |
| 598 | <i>Potentilla monanthes</i> | |
| 599 | <i>Potentilla peduncularis</i> | |
| 600 | <i>Potentilla polyphylla</i> | |
| 601 | <i>Potentilla saundersiana</i> | |
| 602 | <i>Potentilla spodioclora</i> | |
| 603 | <i>Potentilla sundacia</i> | |
| 604 | <i>Potentilla supine</i> | |
| 605 | <i>Primula alpicola</i> | |
| 606 | <i>Primula assamica</i> | |
| 607 | <i>Primula atrodentata</i> | |
| 608 | <i>Primula bellidifolia</i> | |
| 609 | <i>Primula bhutanica</i> | |
| 610 | <i>Primula bracteosa</i> | |
| 611 | <i>Primula calderiana</i> | |
| 612 | <i>Primula capitata</i> | |
| 613 | <i>Primula caveana</i> | |
| 614 | <i>Primula chumbiensis</i> | |
| 615 | <i>Primula concinna</i> | |
| 616 | <i>Primula denticulate</i> | |
| 617 | <i>Primula dickieana</i> | |
| 618 | <i>Primula dryadifolia</i> | |
| 619 | <i>Primula eburnean</i> | |
| 620 | <i>Primula elongate</i> | |
| 621 | <i>Primula erythrocarpa</i> | |
| 622 | <i>Primula filipes</i> | |
| 623 | <i>Primula gambeliana</i> | |
| 624 | <i>Primula geraniifolia</i> | |
| 625 | <i>Primula glabra</i> | |
| 626 | <i>Primula gracilipes</i> | |
| 627 | <i>Primula griffithii</i> | |
| 628 | <i>Primula hooheri</i> | |
| 629 | <i>Primula jigmediana</i> | |
| 630 | <i>Primula kingie</i> | |
| 631 | <i>Primula klattii</i> | |
| 632 | <i>Primula listeri</i> | |
| 633 | <i>Primula macrophylla</i> | |
| 634 | <i>Primula megalocarpa</i> | |
| 635 | <i>Primula mollis</i> | |
| 636 | <i>Primula munroi</i> | |
| 637 | <i>Primula muscoides</i> | |
| 638 | <i>Primula oblique</i> | |
| 639 | <i>Primula prenantha</i> | |

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| 640 | <i>Primula primulina</i> | |
| 641 | <i>Primula reticulate</i> | |
| 642 | <i>Primula sapphirina</i> | |
| 643 | <i>Primula sherriifae</i> | |
| 644 | <i>Primula sikkimensis</i> | |
| 645 | <i>Primula smithiana</i> | |
| 646 | <i>Primula soldanelloides</i> | |
| 647 | <i>Primula stirtoniana</i> | |
| 648 | <i>Primula strumosa</i> | |
| 649 | <i>Primula tanneri</i> | |
| 650 | <i>Primula tenella</i> | |
| 651 | <i>Primula tsariensis</i> | |
| 652 | <i>Primula vaginata</i> | |
| 653 | <i>Primula waddellii</i> | |
| 654 | <i>Primula walshii</i> | |
| 655 | <i>Primula waltonii</i> | |
| 656 | <i>Primula whitei</i> | |
| 657 | <i>Primula xanthopa</i> | |
| 658 | <i>Primulatenuiliba</i> | |
| 659 | <i>Primulatibeteca</i> | |
| 660 | <i>Prunella vulgaris</i> | |
| 661 | <i>Pseudostellaria heterantha</i> | |
| 662 | <i>Pseudostellaria pax</i> | |
| 663 | <i>Pseudostellaria sylvatica</i> | |
| 664 | <i>Pternopetalum radiatum</i> | |
| 665 | <i>Pternopetalum subalpinum</i> | |
| 666 | <i>Pycnolinthopsis bhutanica</i> | |
| 667 | <i>Ranunculus adoxifolius</i> | |
| 668 | <i>Ranunculus brotherusii</i> | |
| 669 | <i>Ranunculus cantoniensis</i> | |
| 670 | <i>Ranunculus chinensis</i> | |
| 671 | <i>Ranunculus diffuses</i> | |
| 672 | <i>Ranunculus ficariifolius</i> | |
| 673 | <i>Ranunculus laetus</i> | |
| 674 | <i>Ranunculus pulchellus</i> | |
| 675 | <i>Ranunculus sceleratus</i> | |
| 676 | <i>Ranunculus silerifolius</i> | |
| 677 | <i>Ranunculus trichophyllus</i> | |
| 678 | <i>Ranunculus tricuspis</i> | |
| 679 | <i>Raphanus raphanistrum</i> | Wild radish(Eng) |
| 680 | <i>Raphanus sativus</i> | Radish(Eng) |
| 681 | <i>Rhodiola amabilis</i> | |
| 682 | <i>Rhodiola atsaensis</i> | |

| | | |
|-----|-----------------------------------|------------|
| 683 | <i>Rhodiola bupleuroides</i> | |
| 684 | <i>Rhodiola chrysanthemifolia</i> | |
| 685 | <i>Rhodiola coccinea</i> | |
| 686 | <i>Rhodiola crenulata</i> | |
| 687 | <i>Rhodiola cretinii</i> | |
| 688 | <i>Rhodiola fastigata</i> | |
| 689 | <i>Rhodiola himalensis</i> | |
| 690 | <i>Rhodiola hobsonni</i> | |
| 691 | <i>Rhodiola humilis</i> | |
| 692 | <i>Rhodiola ludlowii</i> | |
| 693 | <i>Rhodiola marginata</i> | |
| 694 | <i>Rhodiola sherriffi</i> | |
| 695 | <i>Rhodiola stapfii</i> | |
| 696 | <i>Rhynchosia harae</i> | |
| 697 | <i>Rhynchosia minima</i> | |
| 698 | <i>Rorippa benghalensis</i> | |
| 699 | <i>Rorippa madagascariensis</i> | |
| 700 | <i>Rorippa palustris</i> | |
| 701 | <i>Rubia hispidicaulis</i> | |
| 702 | <i>Rubia manjith</i> | Manjit(Lh) |
| 703 | <i>Rubia wallichiana</i> | |
| 704 | <i>Sagina japonica</i> | |
| 705 | <i>Salomonina cantoniensis</i> | |
| 706 | <i>Salvia amplicalyx</i> | |
| 707 | <i>Salvia campanulata</i> | |
| 708 | <i>Salvia castanea</i> | |
| 709 | <i>Salvia nubicola</i> | |
| 710 | <i>Salvia plectranthoides</i> | |
| 711 | <i>Salvia sikkimensis</i> | |
| 712 | <i>Salvia species</i> | |
| 713 | <i>Salvia splendens</i> | |
| 714 | <i>Salvia wardii</i> | |
| 715 | <i>Sanguisorba diandra</i> | Jadum(Dz) |
| 716 | <i>Sanguisorba filiformis</i> | |
| 717 | <i>Sanicula elata</i> | |
| 718 | <i>Saxifraga andersonii</i> | |
| 719 | <i>Saxifraga asarifolia</i> | |
| 720 | <i>Saxifraga bergenoides</i> | |
| 721 | <i>Saxifraga brachypoda</i> | |
| 722 | <i>Saxifraga brunosis</i> | |
| 723 | <i>Saxifraga caveana</i> | |
| 724 | <i>Saxifraga clivorum</i> | |
| 725 | <i>Saxifraga contraria</i> | |

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|-----|-----------------------------------|--|
| 726 | <i>Saxifraga diversifolia</i> | |
| 727 | <i>Saxifraga erinacea</i> | |
| 728 | <i>Saxifraga filicaulis</i> | |
| 729 | <i>Saxifraga flavida</i> | |
| 730 | <i>Saxifraga georgei</i> | |
| 731 | <i>Saxifraga glabricaulis</i> | |
| 732 | <i>Saxifraga granulifera</i> | |
| 733 | <i>Saxifraga haematochora</i> | |
| 734 | <i>Saxifraga harry-smithii</i> | |
| 735 | <i>Saxifraga hemiphaerica</i> | |
| 736 | <i>Saxifraga hispidula</i> | |
| 737 | <i>Saxifraga hookeri</i> | |
| 738 | <i>Saxifraga humilis</i> | |
| 739 | <i>Saxifraga jacquemontiana</i> | |
| 740 | <i>Saxifraga kinchingingae</i> | |
| 741 | <i>Saxifraga kingiana</i> | |
| 742 | <i>Saxifraga latiflora</i> | |
| 743 | <i>Saxifraga lepida</i> | |
| 744 | <i>Saxifraga lychnitis</i> | |
| 745 | <i>Saxifraga matta-florida</i> | |
| 746 | <i>Saxifraga melanocentra</i> | |
| 747 | <i>Saxifraga Montana</i> | |
| 748 | <i>Saxifraga moorcroftiana</i> | |
| 749 | <i>Saxifraga mucronulata</i> | |
| 750 | <i>Saxifraga nigrolandulifera</i> | |
| 751 | <i>Saxifraga pallid</i> | |
| 752 | <i>Saxifraga parnassiflora</i> | |
| 753 | <i>Saxifraga parva</i> | |
| 754 | <i>Saxifraga perpusilla</i> | |
| 755 | <i>Saxifraga petrophilia</i> | |
| 756 | <i>Saxifraga pilifera</i> | |
| 757 | <i>Saxifraga pseudopallida</i> | |
| 758 | <i>Saxifraga pulvinaria</i> | |
| 759 | <i>Saxifraga rubriflora</i> | |
| 760 | <i>Saxifraga saginoides</i> | |
| 761 | <i>Saxifraga saxorum</i> | |
| 762 | <i>Saxifraga serrula</i> | |
| 763 | <i>Saxifraga sherriffii</i> | |
| 764 | <i>Saxifraga sikkimensis</i> | |
| 765 | <i>Saxifraga stella-aurea</i> | |
| 766 | <i>Saxifraga stoltizkae</i> | |
| 767 | <i>Saxifraga strigosa</i> | |
| 768 | <i>Saxifraga subsessiliflora</i> | |

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|-----|---------------------------------|--|
| 769 | <i>Saxifraga subspathulata</i> | |
| 770 | <i>Saxifraga tangutica</i> | |
| 771 | <i>Saxifraga tentaculata</i> | |
| 772 | <i>Saxifraga thiantha</i> | |
| 773 | <i>Saxifraga tsangchanensis</i> | |
| 774 | <i>Saxifraga umbellulata</i> | |
| 775 | <i>Saxifraga vacillans</i> | |
| 776 | <i>Saxifraga viscidula</i> | |
| 777 | <i>Saxifraga wardii</i> | |
| 778 | <i>Schulzia bhutanica</i> | |
| 779 | <i>Schulzia dissecta</i> | |
| 780 | <i>Scutellaria dependens</i> | |
| 781 | <i>Scutellaria discolor</i> | |
| 782 | <i>Scutellaria grossa</i> | |
| 783 | <i>Scutellaria violacea</i> | |
| 784 | <i>Sebaea microphylla</i> | |
| 785 | <i>Sedum correpitum</i> | |
| 786 | <i>Sedum filipes</i> | |
| 787 | <i>Sedum fischeri</i> | |
| 788 | <i>Sedum gagei</i> | |
| 789 | <i>Sedum griffithi</i> | |
| 790 | <i>Sedum multicalae</i> | |
| 791 | <i>Sedum oreades</i> | |
| 792 | <i>Sedum spectabile</i> | |
| 793 | <i>Sedum triactina</i> | |
| 794 | <i>Sedum trullipetalum</i> | |
| 795 | <i>Selinum candollei</i> | |
| 796 | <i>Selinum wallicianum</i> | |
| 797 | <i>Shuteria ferruginea</i> | |
| 798 | <i>Shuteria hirsute</i> | |
| 799 | <i>Shuteria involucrate</i> | |
| 800 | <i>Sibbaldia byssitecta</i> | |
| 801 | <i>Sibbaldia macropetala</i> | |
| 802 | <i>Sibbaldia micropetala</i> | |
| 803 | <i>Sibbaldia parviflora</i> | |
| 804 | <i>Sibbaldia perpusilloides</i> | |
| 805 | <i>Sibbaldia purpurea</i> | |
| 806 | <i>Silene armeria</i> | |
| 807 | <i>Silene bhutanica</i> | |
| 808 | <i>Silene birgittae</i> | |
| 809 | <i>Silene caespitella</i> | |
| 810 | <i>Silene gonosperma</i> | |
| 811 | <i>Silene indica</i> | |

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|-----|---------------------------------|--------------|
| 812 | <i>Silene julaensis</i> | |
| 813 | <i>Silene liniae</i> | |
| 814 | <i>Silene nepalensis</i> | |
| 815 | <i>Silene nigrescens</i> | |
| 816 | <i>Silene purii</i> | |
| 817 | <i>Silene stracheyi</i> | |
| 818 | <i>Sinocarum minus</i> | |
| 819 | <i>Sinocarum pauciradiatum</i> | |
| 820 | <i>Sinocarum pulchellum</i> | |
| 821 | <i>Sinocarum sikkimense</i> | |
| 822 | <i>Sinocarum wolffianum</i> | |
| 823 | <i>Sinocrassula berger</i> | |
| 824 | <i>Sinocrassula indica</i> | |
| 825 | <i>Siphocranion macranthum</i> | |
| 826 | <i>Soiradialis cylindrical</i> | |
| 827 | <i>Souliea vaginata</i> | |
| 828 | <i>Spergula arvensis</i> | |
| 829 | <i>Spermacoce mauritiana</i> | |
| 830 | <i>Spermacoce pusilla</i> | |
| 831 | <i>Spongiocarpella purpurea</i> | |
| 832 | <i>Stachys melissaefolia</i> | |
| 833 | <i>Stachys scaberula</i> | |
| 834 | <i>Stellaria congestiflora</i> | |
| 835 | <i>Stellaria decumbens</i> | |
| 836 | <i>Stellaria lanata</i> | |
| 837 | <i>Stellaria media</i> | |
| 838 | <i>Stellaria monosperma</i> | |
| 839 | <i>Stellaria patens</i> | |
| 840 | <i>Stellaria reticulivena</i> | |
| 841 | <i>Stellaria sikkimensis</i> | |
| 842 | <i>Stellaria uliginosa</i> | |
| 843 | <i>Stellaria vestita</i> | |
| 844 | <i>Stilbanthus scandens</i> | |
| 845 | <i>Swertia bimaculata</i> | Chirata (Lh) |
| 846 | <i>Swertia candelabrum</i> | |
| 847 | <i>Swertia cordata</i> | |
| 848 | <i>Swertia crossoloma</i> | |
| 849 | <i>Swertia grandiflora</i> | |
| 850 | <i>Swertia hookeri</i> | |
| 851 | <i>Swertia macrosperma</i> | |
| 852 | <i>Swertia multicaulis</i> | |
| 853 | <i>Swertia paniculata</i> | |
| 854 | <i>Swertia pseudohookeri</i> | |

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|-----|--------------------------------------|----------------|
| 855 | <i>Swertia ramosa</i> | |
| 856 | <i>Swertia staintonii</i> | |
| 857 | <i>Swertia teres</i> | |
| 858 | <i>Swertia virescens</i> | |
| 859 | <i>Tetramnus flexilis</i> | |
| 860 | <i>Teucrium grandifolium</i> | |
| 861 | <i>Teucrium quadrifarium</i> | |
| 862 | <i>Teucrium viscidum</i> | |
| 863 | <i>Thalictrum alpinum</i> | |
| 864 | <i>Thalictrum chelidonii</i> | |
| 865 | <i>Thalictrum cultratum</i> | |
| 866 | <i>Thalictrum elegans</i> | |
| 867 | <i>Thalictrum foetidum</i> | |
| 868 | <i>Thalictrum foliolosum</i> | |
| 869 | <i>Thalictrum javanicum</i> | |
| 870 | <i>Thalictrum leuconotum</i> | |
| 871 | <i>Thalictrum punuanum</i> | |
| 872 | <i>Thalictrum rostellatum</i> | |
| 873 | <i>Thalictrum setulosinerve</i> | |
| 874 | <i>Thalictrum squamiferum</i> | |
| 875 | <i>Thalictrum virgatum</i> | |
| 876 | <i>Thermosis barbata</i> | Losi Metok(Dz) |
| 877 | <i>Thlaspi andersonii</i> | |
| 878 | <i>Thlaspi arvense</i> | |
| 879 | <i>Thlaspi cochlearioides</i> | |
| 880 | <i>Tiarella polyphylla</i> | |
| 881 | <i>Tongoloa gracilis</i> | |
| 882 | <i>Tongoloa loloensis</i> | |
| 883 | <i>Tordyliopsis brunonis</i> | |
| 884 | <i>Torilis Japonica</i> | |
| 885 | <i>Torularia humilis</i> | |
| 886 | <i>Trachyspermum ammi</i> | |
| 887 | <i>Trachyspermum anethi-folium</i> | |
| 888 | <i>Tribulus terrestris</i> | |
| 889 | <i>Trigonella emodi</i> | |
| 890 | <i>Tripterospermum nigrobaccatum</i> | |
| 891 | <i>Tripterospermum volubile</i> | |
| 892 | <i>Trollius pumilus</i> | |
| 893 | <i>Trollius sikkimensis</i> | |
| 894 | <i>Trollius vaginatus</i> | |
| 895 | <i>Tropaeolum majus</i> | |
| 896 | <i>Tylophora fasciculata</i> | |
| 897 | <i>Tylophora rotundifolia</i> | |
| 898 | <i>Urtica lagopodioides</i> | |
| 899 | <i>Urtica picta</i> | |
| 900 | <i>Veratrum baillonii</i> | |
| 901 | <i>Verbena officinalis</i> | |
| 902 | <i>Vicatia connifolia</i> | |

ANNEXURE IX: RHODODENDRONS OF BHUTAN²

| Sl. No | Botanical name |
|--------|------------------------------------|
| 1 | <i>Rhododendron griffithianum</i> |
| 2 | <i>Rhododendron grande</i> |
| 3 | <i>Rhododendron kesangiae</i> |
| 4 | <i>Rhododendron falconeri</i> |
| 5 | <i>Rhododendron hodgsonii</i> |
| 6 | <i>Rhododendron campylocarpum</i> |
| 7 | <i>Rhododendron kendrickii</i> |
| 8 | <i>Rhododendron papillatum</i> |
| 9 | <i>Rhododendron arboretum</i> |
| 10 | <i>Rhododendron niveum</i> |
| 11 | <i>Rhododendron wightii</i> |
| 12 | <i>Rhododendron bhutanense</i> |
| 13 | <i>Rhododendron lanatum</i> |
| 14 | <i>Rhododendron finckii</i> |
| 15 | <i>Rhododendron tsariense</i> |
| 16 | <i>Rhododendron campanulatum</i> |
| 17 | <i>Rhododendron aeruginosum</i> |
| 18 | <i>Rhododendron wallichii</i> |
| 19 | <i>Rhododendron barbatum</i> |
| 20 | <i>Rhododendron argipeplum</i> |
| 21 | <i>Rhododendron succothii</i> |
| 22 | <i>Rhododendron neriiflorum</i> |
| 23 | <i>Rhododendron fulgens</i> |
| 24 | <i>Rhododendron thomsonii</i> |
| 25 | <i>Rhododendron edgeworthii</i> |
| 26 | <i>Rhododendron pendulum</i> |
| 27 | <i>Rhododendron maddenii</i> |
| 28 | <i>Rhododendron dalhousiae</i> |
| 29 | <i>Rhododendron lindleyi</i> |
| 30 | <i>Rhododendron ciliatum</i> |
| 31 | <i>Rhododendron triflorum</i> |
| 32 | <i>Rhododendron nivale</i> |
| 33 | <i>Rhododendron vaccinioides</i> |
| 34 | <i>Rhododendron pumilus</i> |
| 35 | <i>Rhododendron cinnabarinum</i> |
| 36 | <i>Rhododendron setosum</i> |
| 37 | <i>Rhododendron keysii</i> |
| 38 | <i>Rhododendron virgatum</i> |
| 39 | <i>Rhododendron leptocarpum</i> |
| 40 | <i>Rhododendron camelliiflorum</i> |
| 41 | <i>Rhododendron glaucophyllum</i> |
| 42 | <i>Rhododendron lepidotum</i> |
| 43 | <i>Rhododendron baileyi</i> |
| 44 | <i>Rhododendron anthopogon</i> |
| 45 | <i>Rhododendron pogonophyllum</i> |
| 46 | <i>Rhododendron fragariflorum</i> |

² Source: The Wild Rhododendrons of Bhutan by Rebecca Pradhan (1999)

ANNEXURE X: BAMBOOS OF BHUTAN³

| Sl.No | Botanical name | Local name |
|-------|---|---|
| 1 | <i>Ampelocalamus patellaris</i> | Dhemm or Shogodhong(Ts) |
| 2 | <i>Arundinaria racemosa</i> | Sui chung(Ts) |
| 3 | <i>Bambusa alamii</i> | Dhemm(Ts), Mugi bans(Lh) |
| 4 | <i>Bambusa balcooa</i> | Zhoo shing(Dz), Soh(Ts), Dhanu bans(Lh) |
| 5 | <i>Bambusa clavata</i> | Pagshing (Dz), Pagshi (Kh), Soo (Ts), Chiley bans (Lh) |
| 6 | <i>Bambusa nutans</i> (subsp. <i>Cupalata</i>) | Jhushing (Dz), Mal bans (Lh), Jushi / Gren (Kh) |
| 7 | <i>Bambusa tulda</i> | Juhu shing(Dz) |
| 8 | <i>Bambusa vulgaris</i> | Soh(Ts) |
| 9 | <i>Borinda grossa</i> | Baa (Dz), Rhui (Bu & Kh) shee / shi (Ts) |
| 10 | <i>Cephalostachyum latifolium</i> | Jhi(Dz), Soh(Ts), Ghopi bans(Lh) |
| 11 | <i>Chimonobambus callosa</i> | |
| 12 | <i>Dendrocalamus giganteus</i> | Pagshi (Dz), Tama, Leeshing(Ts), |
| 13 | <i>Dendrocalamus hamiltonii</i> | Pagshi (Dz), Leeshing, or gugsho (Ts), Tama, choya or jungali bans (Lh), Soo (Kh) |
| 14 | <i>Dendrocalamus hookeri</i> | |
| 15 | <i>Drepanostachyum annulatum</i> | Him(Dz), Sheechung(Ts), Ban nigalo(Lh) |
| 16 | <i>Drepanostachyum intermedium</i> | Shee daza(Ts), Tite nigalo(Lh) |
| 17 | <i>Drepanostachyum khasianum</i> | Daohe(Dz), Tsong suiza(Ts), Ban nigalo(Lh) |
| 18 | <i>Himalayacalamus falconeri</i> | Soh zuima(Ts), Singhane(Lh) |
| 19 | <i>Himalayacalamus hookerianus</i> | Soh shee(Ts), Padang or Parang(Lh) |
| 20 | <i>Melocanna baccifera</i> | Philim bans/Lahure bans(Lh) |
| 21 | <i>Neomicrocalamus andropogonifolius</i> | Reengshu(Ts), Langma(Lh) |
| 22 | <i>Pseudostachyum polymorphum</i> | Soh kurpee(Ts), Philim(Lh) |
| 23 | <i>Teinostachyum dullooa</i> | Tokhre bans(Lh) |
| 24 | <i>Thamnocalamus spathiflorus</i> | Hum(Dz), Rato nigalo(Lh) |
| 25 | <i>Yushania hirsute</i> | Hima(Dz), Suiza chilo(Ts) |
| 26 | <i>Yushania maling</i> | Suiza(Ts), Maling(Lh) |
| 27 | <i>Yushania microphylla</i> | Mingma(Dz), Suiza dhoomba(Ts) |
| 28 | <i>Yushania pantlingii</i> | Threy shee(Ts) |

ANNEXURE XI : LIST OF NON WOOD FOREST PRODUCE THAT CAN BE COLLECTED and TRADED⁴

| Sl. No | Name | | Part(s) used |
|--------|---|--|-------------------------|
| | Scientific | Local | |
| 1 | <i>Aconitum laciniatum</i> | Bongkar (Dz), Maanchhen (Ts) | Root / tuber |
| 2 | <i>Aconitum orochryseum</i> | Bong nga (Ts), Bongkar Med) | |
| 3 | <i>Aconogonum tortusum</i> | Ngalachog(Dz) | Root |
| 4 | <i>Acorus calamus</i> | Chudar or chudala (Dz), bojo or bojho (Lh), bar-tsi (Ts) | Rhizome |
| 5 | <i>Artemisia spp.</i> | Khempa (Dz), Titey-pati (Lh) | Leaf, twig and stem |
| 6 | <i>Asphaltum punjabinum</i> / <i>A.amomalutum</i> | Shilajit | Refine part / processed |
| 7 | <i>Bambusa clavata</i> | Chiley bans (Lh), Pagshing (Dz), Pagshi (Kh), Soo (Ts) | Culms, young shoots |
| 8 | <i>Bambusa nutans</i> | Jhushing (Dz), Mal bans (Lh), Jushi / Gren (Kh) | |

3 Source: *Bamboos of Bhutan, An Illustrated Guide*-Chris Stapleton Royal Botanic Garden, Kew on behalf of The overseas Development Adinistration, London. (Local names derived from "Know the Plants of Bhutan-Vol II" by Ugyen Thinley)

4 Source: Non Wood Forest Produce Development Section, Social Forestry and Extension Division, DoFPS

| | | | |
|----|---|---|--------------------|
| 9 | <i>Borinda grossa</i> | Baa (Dz); Rhui (Bu & Kh) shee / shi (Ts) | Culms |
| 10 | <i>Cassia fistula</i> | Golden shower(Eng), Rajbriksha or Rajbrikshay(Lh), Donka sey or Donko shing (Ts), Donga (Med) | Pods and seeds |
| 11 | <i>Choerospondia axillaris</i> | Lapsi(Lh) | Fruits |
| 12 | <i>Ophiocordyceps sinensis</i> | Yar-tsha guenbub (Dz), yar-tsa gumba (Lh) | Entire form |
| 14 | <i>Cymbopogon spp.</i> | Sorbhang (Ts), Lemon grass (Eng) | Upper parts |
| 14 | <i>Daphne spp.</i> | Dheynap (Dz), Kaga-tey, Kagati, Lokta in (Lh) | Bark |
| 15 | <i>Edgeworthia gardneri</i> | Dheykap (Dz), Argaylee (Lh) | |
| 16 | <i>Dendrocalamus hamiltonii</i> | Pagshi (Dz), Tama, choya or jungali bans (Lh), Leeshing, or gugsho (Ts), Soo (Kh) | Culm, young shoots |
| 17 | <i>Diplazium esculentum</i> | Nakey(Dz), Dhawai(Ts) | Young shoots |
| 18 | <i>Diploknema butyracea</i> (Syn. <i>Aesandra butyracea</i> , <i>Bassia butyracea</i>) | Chiuri (Lh), Butter tree (En), Yega shi (Dz), Pin-shing (Ts) | Fruits |

ANNEXURE XII: MAMMALS OF BHUTAN⁵

| Sl. No | Scientific Name | Common Name |
|--------|--------------------------------|--------------------------------|
| 1 | <i>Hipposideros Pomona</i> | Andersen's Leaf-nosed Bat |
| 2 | <i>Soriculus macrusus</i> | Arboreal Brown Toothed Shrew |
| 3 | <i>Elephas maximus</i> | Asian elephant |
| 4 | <i>Barbastella leucomelas</i> | Asian/Eastern Barbestelle Bat |
| 5 | <i>Scotophilus heathi</i> | Asiatic Greater Yellow Bat |
| 6 | <i>Bubalus arnee</i> | Asiatic Water Buffalo |
| 7 | <i>Macaca assamenis</i> | Assamese Macaque |
| 8 | <i>Soriculus baileyi</i> | Bailey's Shrew |
| 9 | <i>Tylonycteris pachypus</i> | Bamboo Bat |
| 10 | <i>Muntiacus mutjak</i> | Barking Deer |
| 11 | <i>Martes foina</i> | Beech or Stone marten |
| 12 | <i>Vulpes bengalensis</i> | Bengal Fox |
| 13 | <i>Arctictis binturong</i> | Binturong/ Asian Bearcat |
| 14 | <i>Rattus rattus</i> | Black Rat/ House Rat |
| 15 | <i>Taphozous melanopogon</i> | Black-bearded Tomb Bat |
| 16 | <i>Ochetana curzoniae</i> | Black-lipped Pika ¹ |
| 17 | <i>Lepus nigricollis</i> | Blacknaped Hare |
| 18 | <i>Sphaerias blanfordi</i> | Blanford's Fruit Bat |
| 19 | <i>Pseudois nayaur</i> | Blue sheep |
| 20 | <i>Rhinolophus Lepidus</i> | Blyth's Horseshoe Bat |
| 21 | <i>Plecotus auritus</i> | Brown long-eared Bat |
| 22 | <i>Mus platythrix</i> | Brown Spiny Field Mouse |
| 23 | <i>Trachypithecus pileatus</i> | Capped Langur |
| 24 | <i>Rhinolophus subbadius</i> | Chestnut Horseshoe Bat |
| 25 | <i>Manis pentadactyla</i> | Chinese Pangolin |
| 26 | <i>Axis axis</i> | Chital/spotted Deer |
| 27 | <i>Pipistrellus affinis</i> | Chocolate Pipistrelle |

| | | |
|----|-----------------------------------|------------------------------|
| 28 | <i>Neofelis nebulosa</i> | Clouded leopard |
| 29 | <i>Nyctalus noctula</i> | Common Noctule |
| 30 | <i>Herpestes edwardsii</i> | Common or Grey Mongoose |
| 31 | <i>Lutra lutra</i> | Common Otter |
| 32 | <i>Paradoxurus hermaphrodites</i> | Common Palm Civet |
| 33 | <i>Ochotona roylei</i> | Common Pika |
| 34 | <i>Pipistrellus pipistrellus</i> | Common Pipistrelle |
| 35 | <i>Eptesicus serotinus</i> | Common Serotine Bat |
| 36 | <i>Herpestes urva</i> | Crab-eating Mongoose |
| 37 | <i>Cuon alpinus primaevus</i> | Dhole/ Wild Dog |
| 38 | <i>Scotozous dormer</i> | Dormer's Bat |
| 39 | <i>Leopoldamys edwardsi</i> | Edward's Rat |
| 40 | <i>Nectogale elegans</i> | Elegant/Tibetan water Shrew |
| 41 | <i>Mus saxicola</i> | Elliot's Spiny Mouse |
| 42 | <i>Mus cervicolor</i> | Fawn-coloured Mouse |
| 43 | <i>Prionailurus viverrinus</i> | Fishing cat |
| 44 | <i>Ochetana forresti</i> | Forrest's Pika |
| 45 | <i>Rousettus leschenaultia</i> | Fulvous Fruit bat |
| 46 | <i>Hipposiderous fulvus</i> | Fulvus Leaf-nosed Bat |
| 47 | <i>Platanista gangetica</i> | Ganges River Dolphins |
| 48 | <i>Bos gaurus</i> | Gaur |
| 49 | <i>Ochetana gloveri</i> | Glover's Pika |
| 50 | <i>Catopuma temmincki</i> | Golden cat |
| 51 | <i>Trachypithecus geei</i> | Golden Langur |
| 52 | <i>Nemorhaedus goral</i> | Goral |
| 53 | <i>Petaurista caniceps</i> | Gray-Headed Flying Squirrel |
| 54 | <i>Petaurista noblis</i> | Gray's Giant Flying Squirrel |
| 55 | <i>Ia io</i> | Great Evening Bat |
| 56 | <i>Rhinolophus luctus</i> | Great Indian Horse shoe bat |
| 57 | <i>Rhinoceros unicornis</i> | Great one-horned Rhinoceros |
| 58 | <i>Murina leucogaster</i> | Great Tube-nosed Bat |

⁵ Source: Wildlife conservation Division, Department of Forest and Park Services, MoAF

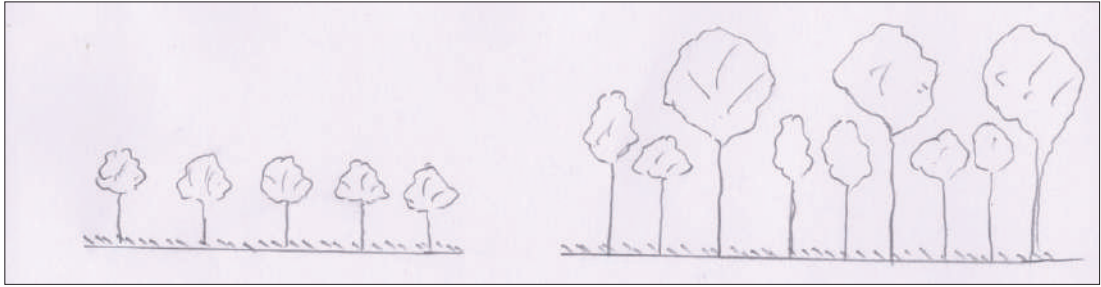
| | | |
|----|----------------------------------|--|
| 59 | <i>Bandicota indica</i> | Greater Bandicot Rat |
| 60 | <i>Megaderma lyra</i> | Greater False Vampire Bat |
| 61 | <i>Hipposiderous arminger</i> | Greater Himalayan Leaf-nosed bat |
| 62 | <i>Rhinolophus ferrumequinum</i> | Greater Horseshoe Bat |
| 63 | <i>Semnopithecus entellus</i> | Grey Langur/ Hanuman Langur |
| 64 | <i>Crociodura attenuate</i> | Grey/Woodland Shrew |
| 65 | <i>Myotis annectans</i> | Hairy-faced Bat |
| 66 | <i>Harpiocephalus harpia</i> | Hairy-winged Bat |
| 67 | <i>Kerivoula hardwickii</i> | Hardwicke's forest Bat |
| 68 | <i>Scotomanes ornatus</i> | Harlequin Bat |
| 69 | <i>Macroglossus sobrinus</i> | Hill Long- tongued Fruit bat |
| 70 | <i>Ursus thibetanus laniger</i> | Himalayan Black Bear |
| 71 | <i>Petaurista magnificus</i> | Himalayan Flying Squirrel |
| 72 | <i>Paguma larvata</i> | Himalayan Palm Civet |
| 73 | <i>Rattus nitidus</i> | Himalayan Rat |
| 74 | <i>Capricornis sumatraensis</i> | Himalayan Serow |
| 75 | <i>Soriculus nigrescens</i> | Himalayan Shrew/ Sikkim Large Clawed Shrew |
| 76 | <i>Alticola stoliczkanus</i> | Himalayan Vole |
| 77 | <i>Mustela sibirica</i> | Himalayan Weasel |
| 78 | <i>Martes flavigula</i> | Himalayan Yellow- Throated Marten |
| 79 | <i>Chimarrogale himalayica</i> | Himalyan Water Shrew |
| 80 | <i>Canis lupus</i> | Himilayan Wolf/ Tibetan Wolf |
| 81 | <i>Caprolagus hispidus</i> | Hispid Hare |
| 82 | <i>Myotis formosus</i> | Hodgson's Bat |
| 83 | <i>Soriculus caudatus</i> | Hodgson's Brown Toothed Shrew |
| 84 | <i>Arctonyx collaris</i> | Hog badger |
| 85 | <i>Axis porcinus</i> | Hog Deer |
| 86 | <i>Hipposiderous larvatus</i> | Horsefield's Leaf-nosed Bat |
| 87 | <i>Crociodura horsfieldi</i> | Horsefield's Shrew |
| 88 | <i>Mus musculus</i> | House Mouse |
| 89 | <i>Suncus murinus</i> | House/Mouse Shrew |
| 90 | <i>Murina huttoni</i> | Hutton's Tube-nosed Bat |
| 91 | <i>Golunda ellioti</i> | Indian Bush Rat |
| 92 | <i>Pteropus giganteus</i> | Indian Flying Fox |
| 93 | <i>Soriculus leucops</i> | Indian long-tailed Shrew |
| 94 | <i>Manis crassicaudata</i> | Indian Pangolin |
| 95 | <i>Pipistrellus coromandra</i> | Indian Pipistrelle |
| 96 | <i>Rhinolophus affinis</i> | Intermediate Horseshoe Bat |
| 97 | <i>Pipistrellus javanicus</i> | Javan's Pipistrelle |
| 98 | <i>Felis chaus</i> | Jungle Cat |
| 99 | <i>Hipposiderous lankadiva</i> | Lankadiva Bat |

| | | |
|-----|---------------------------------|--|
| 100 | <i>Pipistrellus circumdatus</i> | Large Black Pipistrelle |
| 101 | <i>Viverra zibetha</i> | Large Indian civet |
| 102 | <i>Rhinolophus macrotis</i> | Large-eared Horseshoe bat |
| 103 | <i>Ochotona macrotis</i> | Large-eared Pika |
| 104 | <i>Melogale personata</i> | Large-toothed Ferret Badger |
| 105 | <i>Dacnomys millardi</i> | Large-toothed Rat |
| 106 | <i>Hipposiderous ater Dusky</i> | Leaf-nosed Bat |
| 107 | <i>Rhinolophu pusillus</i> | Least Horseshoe Bat |
| 108 | <i>Hipposiderous cineraceus</i> | Least Leaf- nosed Bat |
| 109 | <i>Panthera pardus</i> | Leopard |
| 110 | <i>Prionailurus bengalensis</i> | Leopard cat |
| 111 | <i>Bandicota bengalensis</i> | Lesser Bandicot Rat |
| 112 | <i>Cynopterus brachyotis</i> | Lesser Dog-faced Fruit bat |
| 113 | <i>Megaderma spasa</i> | Lesser False Vampire Bat |
| 114 | <i>Sorex bedfordia</i> | Lesser Stripe-backed Shrew |
| 115 | <i>Myotis sicarius</i> | Little Brown bat |
| 116 | <i>Niviventer heha</i> | Little Himalayan Rat |
| 117 | <i>Murina aurata</i> | Little Tube-nosed Bat |
| 118 | <i>Vandeleuria oleracea</i> | Long-tailed Tree Mouse |
| 119 | <i>Eonycteris spelaea</i> | Long-tongued Fruit Bat |
| 120 | <i>Canis aureus</i> | Lower Risk |
| 121 | <i>Lynx lynx</i> | Lynx |
| 122 | <i>Pardofelis marmorata</i> | Marbled cat |
| 123 | <i>Bos frontalis</i> | Mithun |
| 124 | <i>Ochotona thibetana</i> | Moupin's Pika |
| 125 | <i>Moschus chrysogaster</i> | Musk Deer |
| 126 | <i>Taphozous nudiventris</i> | Naked-rumped Tomb Bat |
| 127 | <i>Myotis muricola</i> | Nepalese- whiskered Bat |
| 128 | <i>Megaerops niphanae</i> | Niphan's Tailless Fruit bat |
| 129 | <i>Tupaia belangeri</i> | Northern Tree Shrew |
| 130 | <i>Rattus norvegicus</i> | Norway Rat |
| 131 | <i>Ochotana nubrica</i> | Nubra Pika |
| 132 | <i>Kerivoula picta</i> | Painted Bat |
| 133 | <i>Mustela altaica</i> | Pale Weasel |
| 134 | <i>Felis manul</i> | Pallas cat |
| 135 | <i>Hylopetes alboniger</i> | Parti-coloured Flying Squirrel |
| 136 | <i>Pipistrellus paterculus</i> | Paternal Pipistrelle |
| 137 | <i>Belomys pearsoni</i> | Pearson's / Hairy footed Flying Squirrel |
| 138 | <i>Rhinolophus pearsonii</i> | Pearson's Horseshoe bat |
| 139 | <i>Minopterus pusillus</i> | Pusillus Long- Fingered Bat |
| 140 | <i>Sus salvanius</i> | Pygmy hog |
| 141 | <i>Pipistrellus mimus</i> | Pygmy Pipistrelle |
| 142 | <i>Sorex minutes</i> | Pygmy Shrew |
| 143 | <i>Suncus etruscus</i> | Pygmy White-toothed Shrew |
| 144 | <i>Cervus elaphus wallichi</i> | Red deer/Sikkim Red Deer |

| | | |
|-----|---------------------------------|-------------------------------|
| 145 | <i>Vulpes vulpes</i> | Red Fox |
| 146 | <i>Petaurista petaurista</i> | Red Giant Flying squirrel |
| 147 | <i>Ailurus fulgens</i> | Red Panda |
| 148 | <i>Macaca mulatta</i> | Rhesus Macaque |
| 149 | <i>Murina cyclotis</i> | Round- eared Tube-nosed bat |
| 150 | <i>Rhinolophus rouxii</i> | Rufous Horseshoe Bat |
| 151 | <i>Miniopterus schreibersii</i> | Schreiber's Long Fingered Bat |
| 152 | <i>Talpa micrura</i> | Short - tailed Mole |
| 153 | <i>Cynopterus sphinx</i> | Short- nosed Fruit Bat |
| 154 | <i>Mus pahari</i> | Sikkim Mouse |
| 155 | <i>Rattus sikkimensis</i> | Sikkim Rat |
| 156 | <i>Microtus sikimensis</i> | Sikkim Vole |
| 157 | <i>Melursus ursinus</i> | Sloth Bear |
| 158 | <i>Nycticebus Bengalensis</i> | Slow Loris |
| 159 | <i>Cervus unicolor</i> | Smabar |
| 160 | <i>Viverricula indica</i> | Small India Civet |
| 161 | <i>Herpestes javanicus</i> | Small Indian Mongoose |
| 162 | <i>Amblonyx cinerus</i> | Small-Clawed Otter |
| 163 | <i>Melogale moschata</i> | Small-toothed Ferret Badger |
| 164 | <i>Myotis siligorensis</i> | Small-toothed Whiskered Bat |
| 165 | <i>Lutrogale perspicillata</i> | Smooth Coated Otter |
| 166 | <i>Uncia uncia</i> | Snow Leopard |

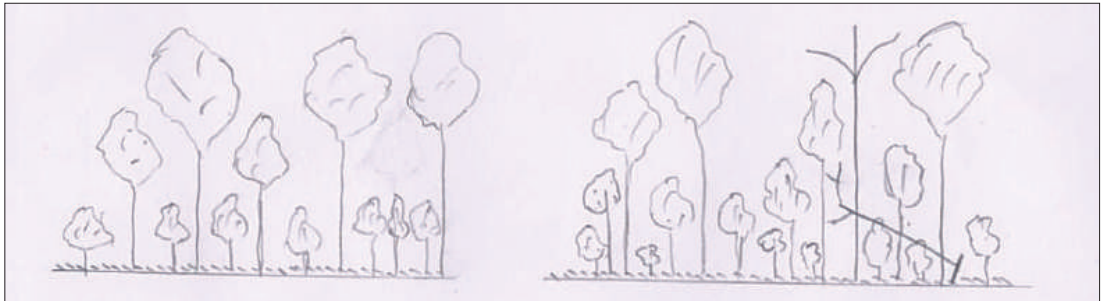
| | | |
|-----|-------------------------------|--------------------------------------|
| 167 | <i>Millardia meltada</i> | Soft-furred Field Rat/Metad |
| 168 | <i>Crocidura fuliginosa</i> | South east Asian White Toothed Shrew |
| 169 | <i>Peturista elegans</i> | Spotted Giant Flying Squirrel |
| 170 | <i>Prionodon pardicolor</i> | Spotted Linsang |
| 171 | <i>Cervus duvauceli</i> | Swamp Deer |
| 172 | <i>Coelops frithi</i> | Tail-less Leaf-nosed Bat |
| 173 | <i>Budorcas taxicolor</i> | Takin |
| 174 | <i>Eptesicus tatei</i> | Tate's Bat |
| 175 | <i>Alticola stracheyi</i> | Thoma's Mountain Vole |
| 176 | <i>Pipistrellus cadornae</i> | Thomas's Pipistrelle |
| 177 | <i>Hesperoptenus tickelli</i> | Tickell's Bat |
| 178 | <i>Panthera tigris</i> | Tiger |
| 179 | <i>Rhinolophus trifolius</i> | Trefoli Horseshoe Bat |
| 180 | <i>Rattus turkestanicus</i> | Turkestan Rat |
| 181 | <i>Myotis daubentonii</i> | Water Bat |
| 182 | <i>Myotis mystacinus</i> | Whiskered Bat |
| 183 | <i>Niviventer niviventer</i> | White-bellied Rat |
| 184 | <i>Sus scrofa</i> | Wild boar |
| 185 | <i>Apodemus sylavaticus</i> | Wood Mouse |
| 186 | <i>Eupetaurus cinerus</i> | Wooly Flying Squirrel |
| 187 | <i>Lepus oiostolus</i> | Wooly Hare |
| 188 | <i>Bos grunniens</i> | Yak |
| 189 | <i>Mustela kathia</i> | Yellow-Bellied Weasel |

ANNEXURE XIII: FOREST STAND STRUCTURE



1. Stand Initiation

2. Stem Exclusion



3. Understory Reinitiation

4. Old, multi-aged Community

ANNEXURE XIV: ROUGH GUIDE FOR IDENTIFYING SOIL TEXTURE IN THE FIELD

| Soil Texture | Feel to fingers and visual | Ball formation | | Stickiness | Ribbon formation |
|-------------------|--|--|---|------------------------|--|
| | | When dry | When moist | | |
| Sand | Very gritty and individual grains visible, free flowing when dry | Does not form ball (falls apart when pressure is released) | Does not form ball (Ball crumbles when lightly touched) | Does not stain fingers | No ribbon formation |
| Sandy Loam | Moderately gritty (sand characteristic predominate) | Forms a ball which falls apart when lightly touched | Forms ball but easily broken | Stains the fingers | No ribbon formation |
| Loam | Neither very gritty nor very smooth | Forms ball but easily broken | Forms firm ball | Stains the fingers | No ribbon formation |
| Silt Loam | Smooth or slick "buttery" "feel". | Forms ball but easily broken and has soft flour like feel | Forms firm ball | Stains the fingers | Slight tendency to ribbon with flaky surface |
| Silt | smooth feel | Forms firm ball | Forms firm ball | | Slight tendency to ribbon with flaky surface |
| Clay Loam | Slightly gritty feel | Moderately hard ball | Forms firm ball which can be handled freely | Stains fingers | Ribbons on squeezing but ribbon breaks easily |
| Clay | Very smooth | Forms firms ball without breaking | Forms firm ball which can be handled freely and cannot be crushed with fingers when dry | Stains fingers | Squeezes out at right moisture into long ribbons |

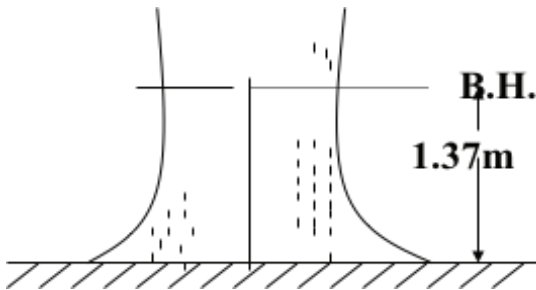
ANNEXURE XV: STANDARD RULES FOR MEASURING DIAMETER AT BREAST HEIGHT (DBH)

Standard Rules for measuring Diameter at

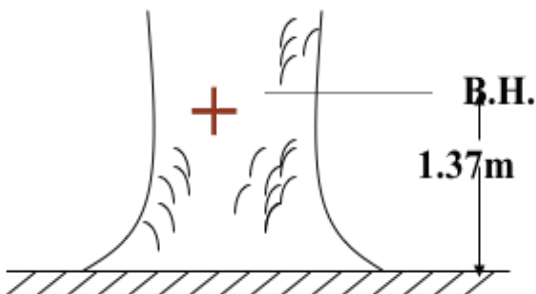
Breast Height (DBH)

Diameter at Breast Height is the diameter of a tree measured at 1.37m above ground. Diameter at Breast Height is abbreviated as DBH. The DBH over bark and under bark are abbreviated as DBH (O.B) and DBH (U.B) respectively. A few but very important rules one must follow while measuring DBH are;

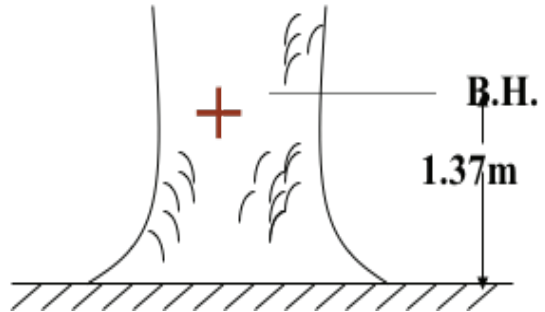
1. Loose bark/ creepers if found on the tree especially near breast height should be removed before measuring the diameter
2. Mark BH by means of measuring stick or white paint or a soft nail (e.g. aluminum) driven into the bark or a scribe mark.



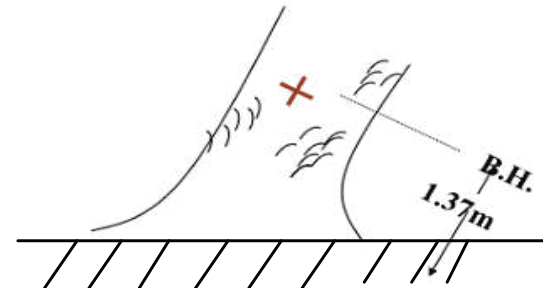
3. On a Flat ground and if the tree is straight, the DBH is taken as depicted in figure below;



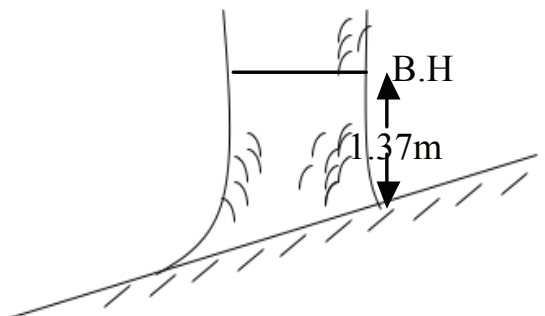
4. If the Ground is Flat but the tree is leaning, Measure DBH along the tree stem and not vertically, on the side of the lean in case the tree is leaning and the ground is flat.



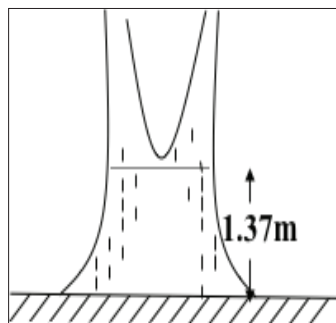
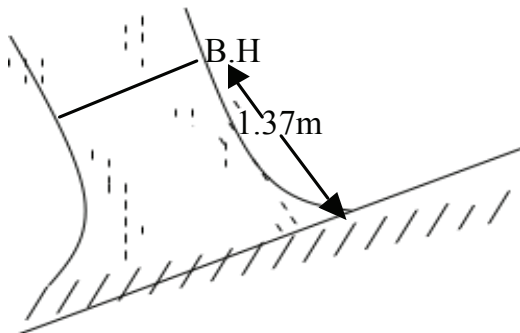
5. On a sloping Ground with Straight tree, the DBH is measured from the up- hill side.



6. On a sloping Ground with tree leaning against the direction of slope of the Ground, measure DBH along the tree stem and not vertically, on the side of the lean

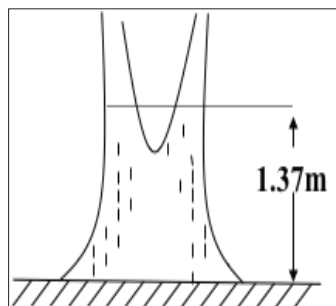


7. On sloping ground with tree leaning towards uphill slope, measure DBH along the tree stem and not vertically, on the side of the lean

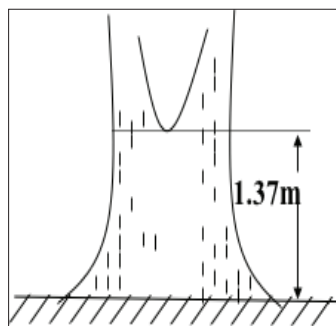
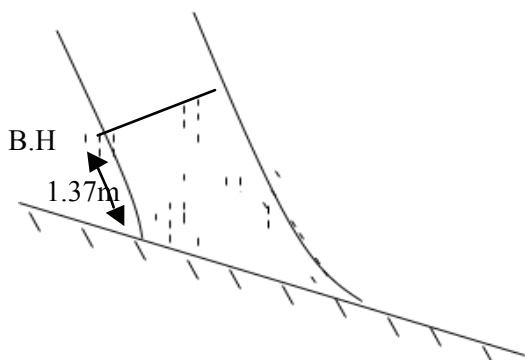


Counted as One Tree

8. If the Tree stem is abnormal at Breast Height level, DBH is measured not at 1.37 m but mark shifted up or down (*as little as possible*) to a more normal position of the stem.

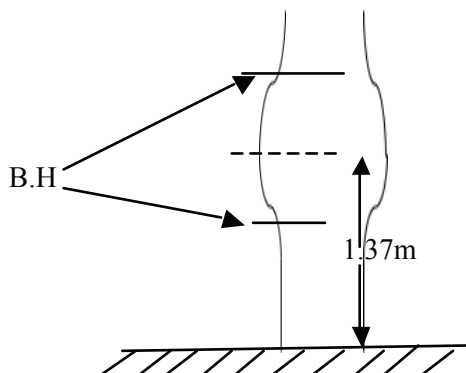


Counted as Two Trees

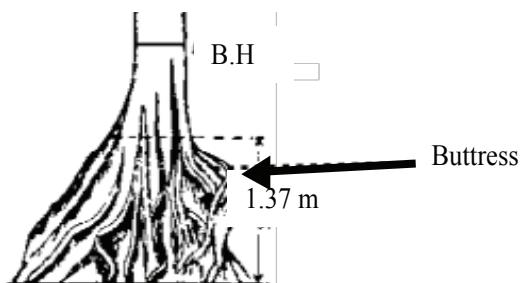


Counted as One or Two Trees depending on place of measurement

9. If the stem is Forked, then



10. Tree stem has buttress at breast height level, then DBH is measured at the lowest point above which the abnormal formation is not likely to extend.



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