

# **National Forest Inventory**

## **Philippines**

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### **Field Manual**

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## **Introduction**

This field manual contains the definitions and procedures used to carry out a national forest inventory. The inventory follows a pilot study realised in Costa Rica in 2000, which allowed testing and refining the methodology in the field.

The inventory has the purpose of assessing the forest and tree outside forest resources and aims at providing new qualitative and quantitative information on the state, use, management and evolution of forest and tree resources.

The first part of the manual describes the sampling design adopted, the distribution of tracts where measurements are carried out, and their configuration. The second part deals with the classification adopted to carry out the inventory. Recommendations to undertake the data collection work in the field are shown in the third part.

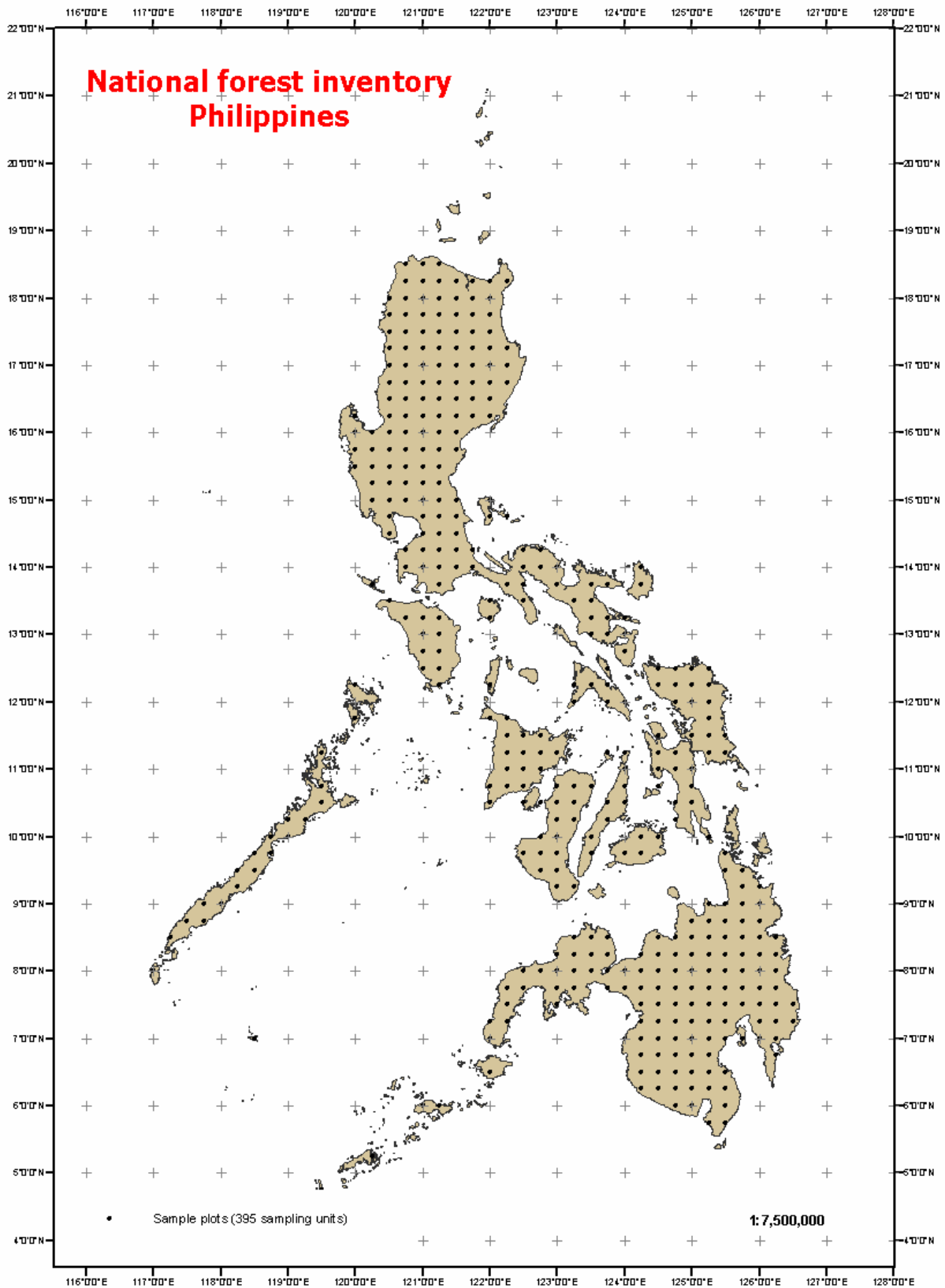
The annexes contain the tools and methods of measuring variables such as diameter, height, horizontal distance and GPS use, as well as interview and group discussion techniques and recommendations.

### **1. Sampling design**

#### **1.1 Tract/sampling site selection and distribution**

The sampling design adopted for the national forest resources assessment of the Philippines is systematic and without stratification. The tracts are selected every 15 minutes on latitude and 15 minutes longitude, which gave 395 tracts nation-wide as shown in the map (Figure 1).

Figure 1. Distribution of tracts for the forest inventory of the Philippines



## 1.2 Tract description

The forest inventory information is exclusively collected at the tract/sampling site location. The data are collected at different levels: at the tract/sampling site, which represents the highest level, and at the smaller sub-units, demarcated within the tract/sampling site.

The tract/sampling site consists of a square measuring 1 Km x 1 Km (see Figure 2.). The coordinates of the south-west corner of the tracts correspond to those of the points located in the initial systematic plan.

Each sampling site contains a group of four field observation plots. The basic lines of this group of plots constitute a square of 500 m, whose center matches with the center of the tract.

The plots are rectangles with each plot measuring 20 m wide and 250 m long. The plots start on each corner of the square, as indicated in Figure 1. The plots are numbered from 1 to 4, clockwise. Plot 1 is located on the southwestern corner of the square and is oriented on a south-north direction. Plot 2 starts on the northeastern corner and is oriented on a west-east direction; plot 3 starts on the northeastern corner and is oriented on a north-south direction; plot 4 starts on the southeastern corner and is oriented from east to west. The measurement of trees above a certain diameter is carried out within the plots.

The plots are divided into sub-plots representing homogenous land use and forest type units, with variable size and shape, which have been identified in the field. The classification adopted to identify land use is described below, in point 3. Most of the data related to forest characteristics, management and resources use are collected within the sub-plots(land use and forest type units).

Besides, 6 nested plots are identified within each plot, these correspond to two different data collection levels: 3 rectangular nested plots, identified as nested plots 1, measuring with each plot 20 m per 10 m and 3 circular nested plots, identified as nested plots 2, with a radius of 3,99 m located in the center of nested plots 1. These small plots(nested plot 2) are also numbered from 1 to 3 at the starting point of the plot. These plots have the purpose of measuring regeneration and small diameter trees. **When the small plots are located in an area classified as « out of the forest » they must not be demarcated.** A point of edaphic and topographic measurements is established in the centre of each nested plot 2.

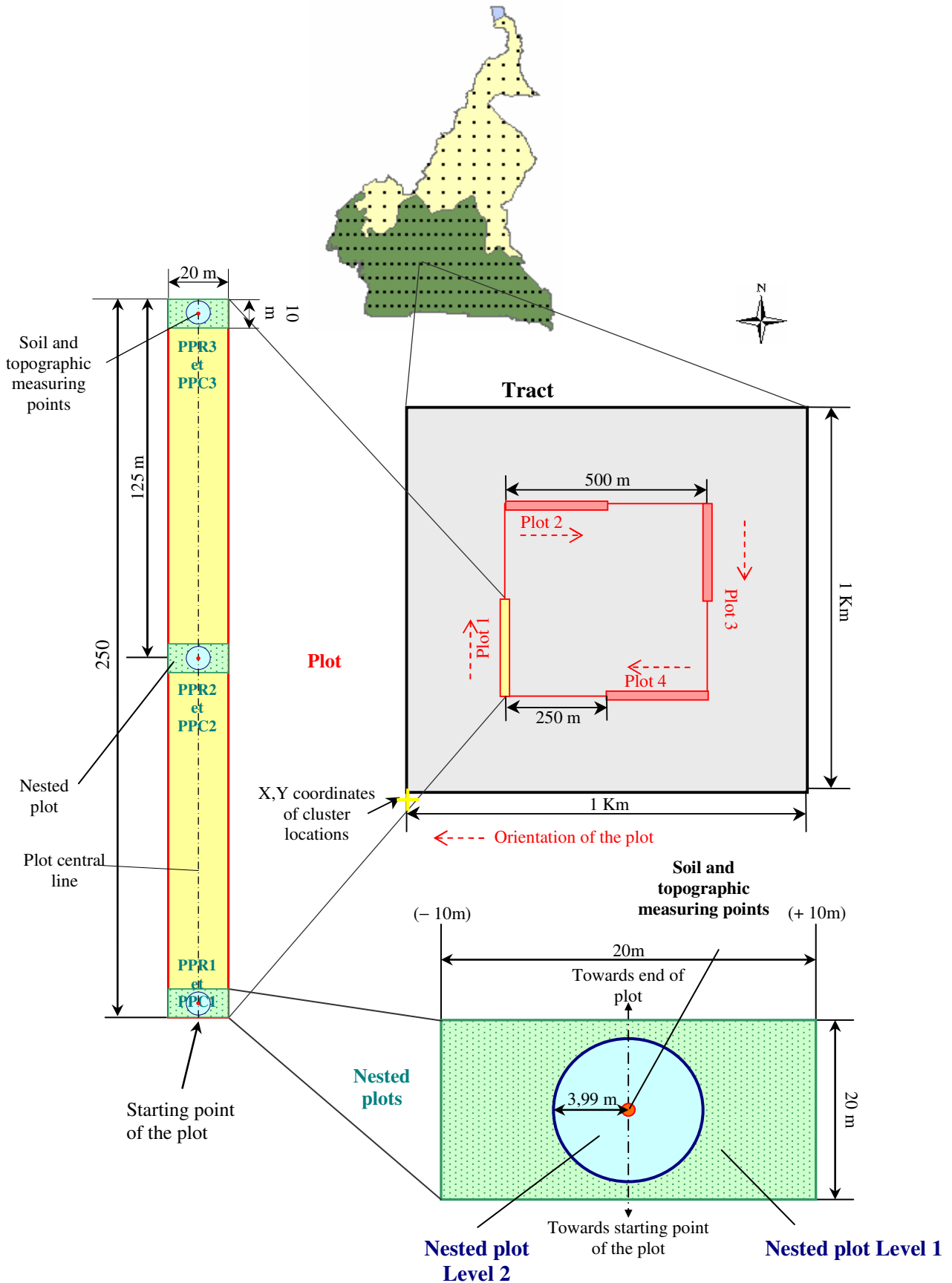
It must be noticed that all the dimensions and distances indicated are horizontal. The specifications of the different data units are listed in the table below :

**Table 1. Different data unit specifications**

| Unit                                      | Shape     | Size (area)                            | Number                 |
|---|-----------|--|------------------------|
| Tract/Sampling site                       | Square    | 1000 m x 1000 m<br>(1km <sup>2</sup> ) | 1                      |
| Plot                                      | Rectangle | 250 m x 20 m<br>(5000 m <sup>2</sup> ) | 4/tract /sampling site |
| Sub-plot (land use and forest type units) | Variable  | Variable                               | Variable               |
| Nested plot 1                             | Rectangle | 20 m x 10 m<br>(400 m <sup>2</sup> )   | 3/plot                 |

|                      |        |  |        |
|----------------------|--------|--|--------|
| <b>Nested plot 2</b> | Circle | Radius $r = 3,99$ m<br>( $50$ m <sup>2</sup> ) | 3/plot |
|----------------------|--------|--|--------|

Figure 2. Tract, plot and nested plot configuration



## **2. Land use and forest type classification**

Land use and forest type classification is based on a two-level approach that includes:

- A basic level, that takes into account the global classes aimed at assessing forest resources at the global level;
- A specific classification level, that uses additional classes, aimed at taking into account national and sub-national needs.

The global classes were developed in the framework of the FAO Forest Resources Assessment, FRA 2000, such classes are described in detail in *the FRA working paper on Terms and Definitions*. The definitions allow to harmonize the national forest assessments at the global level. The basic classification includes the following global classes :

- **Forests;**
- **Other wooded lands;**
- **Other land;**
- **Inland water.**

The second classification level includes more detailed classes, based on FAO global classes. These classes have been created to fulfill country specific needs. Most of them may be used to describe the forest resources in most of the countries.

An alphanumeric code from 2 to 4 characters has been assigned to each class in order to facilitate data collection (and apprehension). The first character corresponds to the first classification level (global class).

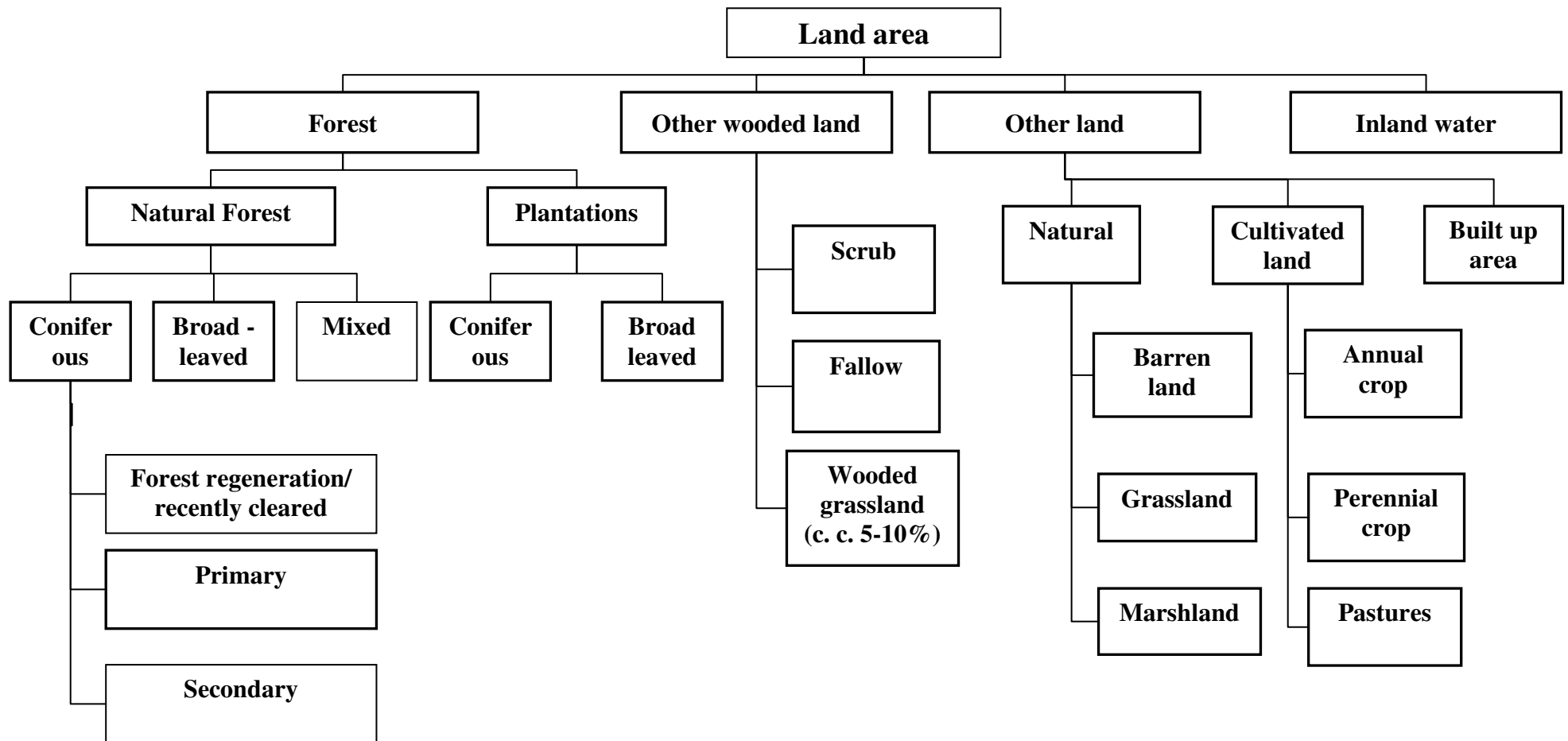
The classes used for the inventory and related codes are shown on Table 2. The diagram on Figure 3. shows the two-level approach and the class subdivision. These have been defined in detail in an annex (section 5.1).

**Table 2. Land use classification**

| <b>Classes</b>                              | <b>Code</b> |
|---|-------------|
| <b>Forest</b>                               |             |
| Primary broad-leaved forest                 | FBP         |
| Secondary broad-leaved forest               | FBS         |
| Regeneration of natural broad-leaved forest | FBØ         |
| Primary coniferous forest                   | FCP         |
| Secondary coniferous forest                 | FCS         |
| Regeneration of natural coniferous forest   | FCØ         |
| Primary mixed forest                        | FMP         |
| Secondary mixed forest                      | FMS         |
| Regeneration of natural mixed forest        | FMØ         |
| Broad-leaved forest plantation              | PB          |
| Coniferous forest plantations               | PC          |
| <b>Other wooded lands</b>                   |             |
| Shrubs                                      | Sh          |
| Fallow                                      | Fa          |
| Wooded grassland (couvert 5-<10%)           | WGL         |
| <b>Others</b>                               |             |
| Barren land                                 | Bl          |
| Grassland                                   | Gl          |
| Marshland                                   | MI          |
| Annual crop                                 | AC          |
| Perennial crop                              | PC          |
| Pastures                                    | Pa          |
| Built up area (urban or rural)              | BUA         |
| <b>Inlandl water</b>                        | <b>IW</b>   |



**Figure 3 Forest Inventory land use classification pattern**



### **3. Field work: preparation and data collection**

This part includes recommendations to prepare and carry out the field work. The field work description includes a step by step inventory development on a tract/sampling site and recommendations on the data collection techniques. The field forms necessary to undertake this task are described in detail below.

#### **3.1 Field work considerations**

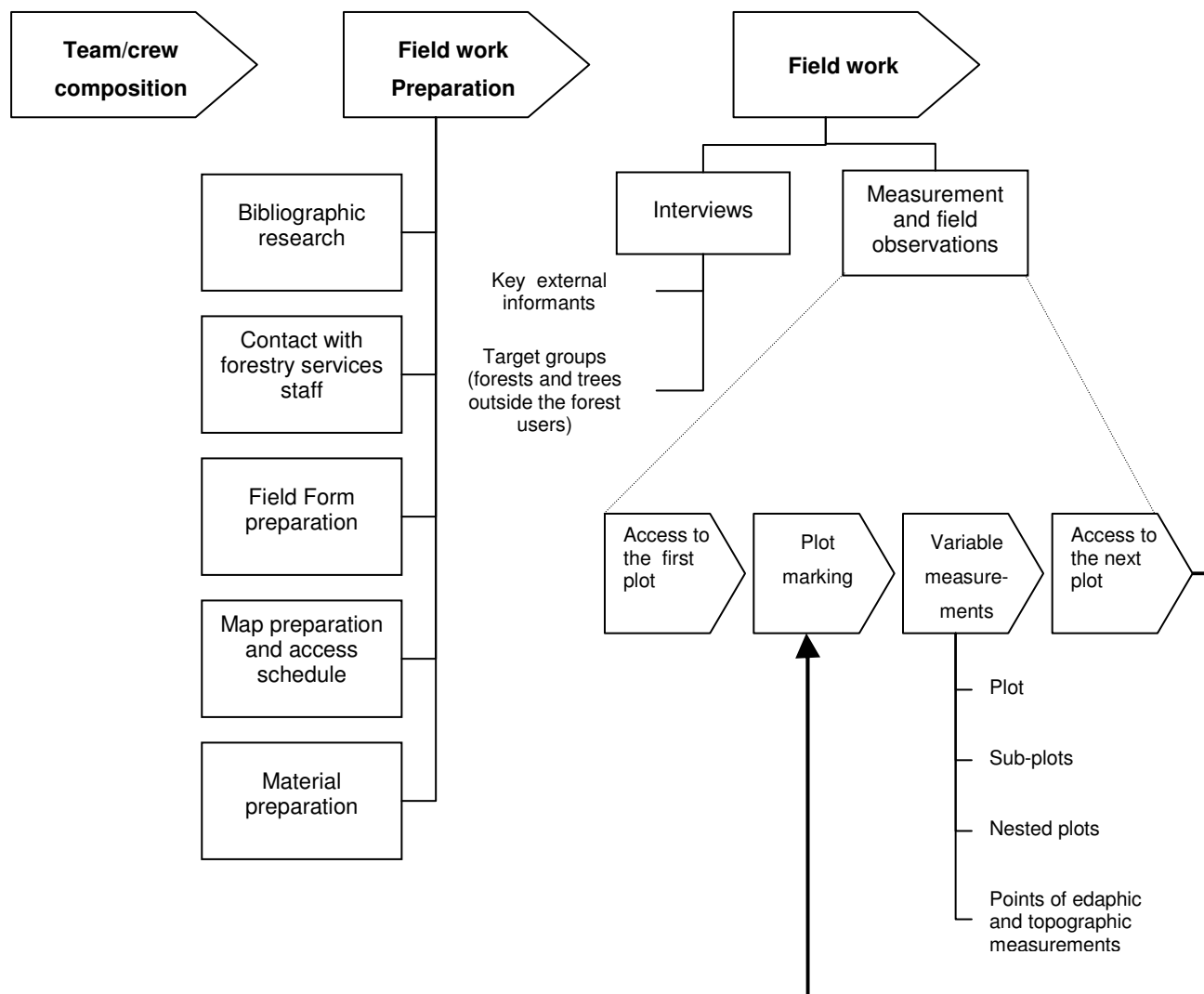
Inventoried variables are the result of measurements and observations carried out by the field crews/teams on tracts/sampling sites, and through local and other people's interviews that may provide information on forest management and use. The two main information sources considered in the inventory are therefore :

- Field measures and observations.
- interviews: interviews with local people, owner(s) or user(s) of land, key external informants such as foresters responsible for the area where the tract/sampling site is located;

Those two sources of information imply the use of different methods and approaches, but they complement each other. One of these two approaches will be used as the main source, according to the type and data situation. If possible, field observation must be applied to confirm the information obtained from interviewees.

Field work stages are summarized on Figure 4.

Figure 4. Field work stages



### 3.2 Field team/crew composition

The teams/crews shall be composed by at least five people (two technicians and three forestry workers). In order to increase the working capacity, additional people may be included. At least one of the team/crew members must belong to the region and act as a guide. Some team/crew members must have experience in participatory techniques and socio-economic data collection through interviews to local people. The technicians or workers are to be recruited locally. If possible, the teams/crews may also include forestry students. It is indispensable to include an expert in local species in order to identify these in the team/crew. Ideally, the team/crew should include both men and women, specially, when carrying out interviews, particularly to local women.

The responsibilities of each team/crew member must be clearly spelled out. A team/crew leader and a team/crew leader assistant must be designated. The tasks of the different team/crew members proposed are as follows:

- The team/crew leader is in charge of organizing all the stages of the field work, from the preparation to the data collection. He is in charge of contacting and maintaining good

relationships with the community and the informants. He must also have a global view of the data collected and of progress achieved in the field work. He must be responsible for :

- preparing the field work: carry out the bibliographic research, preparing field forms and maps;
  - planning the team/crew work ;
  - contacting local forestry services, authorities and the community; he must introduce the inventory objectives and the working plan to the local forestry service staff and to the authorities, and request their assistance to contact the local people, identify the informants, guides and workers;
  - finding tracts/sampling sites and plots (choose the access schedule) ;
  - taking care of logistics: organizing and obtaining information on accommodation facilities; recruiting local workers; organizing access to the tracts/sampling sites;
  - interviewing external informants and local people;
  - taking note of the information collected;
  - ensuring that field forms are filled in and that data collected are reliable;
  - organizing meetings after the field work in order to sum up daily activities.
- The team/crew leader assistant must :
    - Help the team/crew leader to carry out his task ;
    - Carry out the necessary measurements and observations;
    - Make sure that the team/crew materials are always complete and functional;
    - Supervise and orient locally recruited workers
  - The workers will carry out the following tasks, according to their skills and knowledge of local species, language and practices :
    - Help to measure distances ;
    - Open rides to facilitate visibility to technicians;
    - Provide the common/local name of forest species;
    - Inform about access to the tract/sampling site;
    - Provide the information about the use, management of forest resources and forest products;
    - Transport materials.

The team/crew training on methodology will be carried out during a workshop. The measurements will be carried out in the field and the recommendations concerning interviews will be explained. The workshop must include a field visit.

The names and addresses of the team/crew members participating in the inventory of a tract/sampling site must be written down in field form F1 (part B).

### **3.3 Field work preparation**

#### **A) Bibliographic research**

The information generated from secondary data is necessary to prepare the forest inventory and the interviews. In order to understand the local reality, former forest inventory reports, national policy and community forestry issues, local people, etc. have to be studied. Auxiliary data allow to sensitize the field team and are also useful to carry out the data processing and analysis phases that follow after the field phase.

#### **B) Contacts**

Each team leader must previously contact the forestry service staff present in the area where the tracts/sampling sites, assigned to him, are located. The forestry service staff may contact the authorities, local communities and forest owners in order to introduce the inventory and inform the field team/crew. The forestry service staff may also provide information about access conditions to the site and about the people who can be locally recruited as guides or workers. They may also announce the project to the local people.

Forest owners will be requested to sign a written authorization to access the property where the tract/sampling site is located.

A recommendation letter written by the Forestry Department, asking for support and assistance to the field team members, will facilitate the work.

The data related to the owners and informants must be reported in **form F1, part B**.

#### **C) Field form preparation**

The team/crew leader will prepare and print a set of field forms for each tract/sampling site. The set includes 6 forms of one or several pages, which are described, in detail, in the following section (section 4.).

Some information will be entered before the field trip is carried out: the identification sections related to the tract/sampling site and plots (headline of each form page), general data related to the location of the tract/sampling site, (**form F1, part A**), the coordinates of the plot starting point (**form F2, part A**).

The use of secondary information sources, particularly maps, is necessary to determine data such as names of administrative centres (administrative maps), the ecological zone (FAO/FRA 2000 global ecological zones map). Some sections in the form may be filled during the preparation phase, and be verified in the field later on: population data (**form F1, part C**), information on distances to infrastructure (**form F1, part D**).

The team/crew leader must ensure that enough forms are available to carry out the scheduled field phase.

#### **D) Map preparation to find the tract and access to plots**

Maps containing the site under study are to be prepared to indicate the tract location. These will be enlarged and photocopied, if necessary.

Prior to the field visit, each team/crew must plan an itinerary to access the tract/sampling site, taking into account the easiest way to reach it. The advice of local informants (the forestry service staff, for example) may become a very important element during this process.

The tract (T) /sampling site (SS) and plots borders are to be delineated on topographic maps and eventually on aerial photographs/satellite images. The points that correspond to the starting point of the plot in the tract/sampling site are to be indicated together with their respective coordinates in the map projection system (adapted to the country) as well as the decimal degrees (latitude and longitude). The first system is more precise and easier to apply when adapting the maps, and will be used for all the data in GPS.

A map, to be eventually enlarged in the section corresponding to the tract/sampling site surrounding area, will be prepared (photocopy or printed copy, if the paper is available in format), in order to draw the access itinerary to the first plot.

The data collection order in the plots may vary according to the accessibility conditions and it is determined during the preparation phase.

Points of reference (road, river, house) that contribute to better orient the team in the field are identified during the planning phase.

The co-ordinates of plot marker position each plot are determined by GPS. An identification code will be assigned to name each one of the points identified by the GPS :

#### **E) Necessary materials per team**

The materials needed to carry out the inventory are:

- **Compass (bearing)**
- **GPS (Geographic Positioning System)**
- **Meter tape and topofil (distance measuring device)**
- **Tree diameter measuring device: diametric tape or calliper**
- **Tree height and land slope measuring devices: Blume Leiss dendrometer or other dendrometer, clinometer or clisimeter (Suunto, Bitterlich relascope)**
- **50 metre rope, marked off at 10 metres**
- **Bright colored plastic tape for tree marking**
- **50 cm(length) galvanized steel bars for plot marking**
- **Waterproof bags to protect measurement instruments and forms**
- **Alcaline batteries AA**
- **Waterproof boots and outfits**
- **Emergency kit**
- **Topographic maps**
- **Supporting board to take notes**
- **Data collection forms**
- **Field manual**
- **Indelible markers and pens**

- **Flora and species list (common and scientific names)**
- **Flipboard**
- **Flashlight + batteries**

### **3.4 Data collection in the field**

#### **A) Project introduction to the local people**

If the tract area is inhabited, the team must meet with the previously contacted persons and the local people (the village representative, the closest forestry service in place, the owners and/or people living in the forest area) upon its arrival to the tract. In many cases, it will be necessary to contact local people before visiting the area in order to inform them about the visit and request permission to access the property. An introductory meeting may also be organized.

The team must briefly introduce and explain the aim of the study and visit. A map or an aerial photograph, showing the borderlines of the tract/sampling site, may be very useful to facilitate the discussion. It is extremely important to ensure that both, the local people and the team/crew, understand which area will be studied. The aim of the forest inventory must also be clearly introduced to avoid misunderstandings or raise false expectations. Cooperation and support of the local people are essential to carry out the field work and it will be easier to achieve it if the first impression is good. (Nevertheless, it must be stressed that the field work consist in data collection and not in a local development project.)

Some key points about the project introduction are mentioned in Box 1.

**Box 1. Key points to be stressed during National Forest Inventory introduction to the local people**

- This is a global tree and forest data collection programme.
- One of the objectives of this study is to support local capacity to carry out forests inventories and to collect data on forest use in cooperation with local forest users.
- The data are collected from two sources : 1. Measurements carried out in the forests and trees outside the forests and 2. Interviews with forest users and other people who are knowledgeable of the area. Measurement examples to be mentioned may be: tree diameter and height, as well as forest species composition. The field team is equally interested in the local people's perception of forest evolution, the main forest products, forest related problems, and will therefore interview forest users.
- The external world has little information about the local use of forests, and the problems that exist at the local level. Collected information will be used by the country and the international community. The objective is to produce correct information aimed at better forestry policy-making that takes into account the local population and their needs. It is hoped that this exercise will help to manage forest resources in a sustainable and sound way.
- The tract/site to be studied is one of the 395 tracts/sites distributed throughout the country and follow a systematic plan.
- The results of the study carried out in the tract/site will be shared with the local community.
- Some or all of the 395 tracts/sites studied in the country will be monitored in the future, with the aim of assessing forest and tree evolution.

Besides the study introduction, this initial meeting aims at solving logistic issues. After the general introduction, forest access, interview schedule, and food and accommodation issues, will be discussed. This meeting also gives the opportunity to start the interviews aimed at collecting information. The number of people included in the field team/crew must be reduced to avoid giving the impression that the team/crew members dominate the group. Historical information related to the changes in the area (see the participatory exercise with the help of aerial photographs in annex, section 0 are a good starting point for the discussions.

The field inventory schedule to be carried out in the next days must be explained.

This meeting is one of the opportunities to identify key persons for interviews and target groups. It is recommended to schedule the interviews, according to people's availability after daily work.

All the people interviewed and all the people who provide information on the tract/sampling site must be mentioned in the list of persons involved in the inventory (**form F1, part B**).



### **B) Access to the first plot**

The plot identification will be carried out with the help of topographic maps and aerial photographs/satellite images, where the plots will be delineated and marked with reference points to facilitate their identification in the field. A local guide will be also useful to easily access the plots. The GPS will be used for orientation in the field, the starting points of each plot will be marked in the map.

The plot data collection order decided during the preparation stage should be followed and the plot code and orientation must be respected (the collection task must start at the plot starting point).

**Form F1, part (Reference points of access path)** must be filled in throughout the tract access process. This includes access to the first plot. The starting point coordinates in the first plot, must be determined by the GPS (or drawn on the map, if the GPS cannot determine them). The starting time of the operation must also be recorded. An outline representing the itinerary covered will be drawn on the tract map (to be attached to the form), including the reference points that will facilitate the walk back to the plot. The coordinates of each reference point will be identified by GPS, and a reference photograph will be also taken. The film codes and the photograph will be reported in the form. The bright colored tape will be eventually placed along the access path, on trees, in order to facilitate the return to the starting point.

### **C) Plot marking**

When arriving to the starting point of the first plot, a «permanent» mark is made by inserting a galvanized steel tube on the ground. The marker is positioned, as much as it is possible, exactly on the starting point of the plot. If an obstacle hampers such operation (tree, rock, river etc.), the tube will be inserted as close as possible to the starting point.

Several marker location data are to be collected in order to find it, together with the starting point of the plot:

- the distance and direction of the plot starting point, compared with the marker location, must be measured in case they do not correspond (compass bearing in degrees starting from the marker location);
- at least three precise points of reference, possibly fixed (rock, largest tree, houses etc.) may be chosen, as well as their orientation and distance from the marker (compass bearing in degrees starting from the marker location) are to be measured.

These indications are recorded on **part A** of **form F2** and are reported on a sketch where the reference points and the starting point of the plot are indicated. A brief description of the reference points will be also provided in a table (the columns containing the bearing and the distance to the marker may be filled in according to the sketch indications after the field work.

### **D) Data Collection in the plot**

The data are collected from the starting point and in the appropriate direction. The progression along the central line will be made with the help of the compass. In order to facilitate the bearing, bright colored tape may be stretched along the central line and on trees, as the field team advances.

The measurements involve each side of the central line on a 10 metre wide extension. Bright colored tape may also be placed on each corner and on the borderlines of the plot (at 10 m from one side to the other of the central line) as the team advances, in order to easily identify the trees present within the plot.

Different variables are collected according to the data unit level dealt with Table 4. :

- **The Plot:** measure of large diameter trees (DBH over 20cm, or 10 cm for the trees when outside the forest) and other characteristics of the plot (dimensions). These data are to be reported on **forms F3**. A sketch of the plot must be drawn in **form F2 (part C)**. All the details of the plot must be represented. The following characteristics must be present:
  - general characteristics such as intersections with water courses, roads, barriers;
  - borderlines between each land use section;

The sketch must also include all the measurement information and possible observations that may help to better interpret the plot.

- **The sub-plot :** is reported in the land use/forest type sections that stretch across the plot. **Form F5** and **form F6** will be filled in for each one of them and thus there will be as many forms as there will be land use/forest type sections. The data collected at that level are general information related to the area (legal status, designation, environmental problems etc., **part A** of the **form F5**, the stand management and structure, in **part B** and the products and services, separate **form F6**).
- **Nested plots :** topographic, edaphic (soil) and small diameter trees data are to be collected (if they are in the « forest »). The data concerning the trees in the rectangular nested plot level 1 are reported in **form F3**. The topographic and edaphic information, collected in the three measurement points, and the data concerning the three circular nested plots will be reported in **form F4** (one for each plot).

#### (i) **Tree measurements**

All the trees over 20 cm of diameter at breast height (DBH) growing within the plot are to be measured.

As it regards the other diameter categories, tree measurements are to be carried out at nested plot level. The size of trees measured varies according to the unit level where the measurements are carried out (see Table 3).

In the plot parts where the land use is classified as « **outside the forest** », all the trees DBH over 10 cm are measured, and the data are reported on **form F3**.

**Table 3. Trees measurement and corresponding levels and forms**

| Level                                  | Measured trees                           |                    | Form             |
|--|--|--------------------|------------------|
|  | Forest                                   | Outside the forest |                  |
| Plot                                   | Forest : DBH $\geq$ 20 cm                | DBP $\geq$ 10cm    | Form F3          |
| Rectangular Nested plot /nested plot 1 | 10 cm $\leq$ DBH < 20 cm                 | None               | Form F3          |
| Circular nested plot/nested plot 2     | Tree height $\geq$ 1,30 m to DBH < 10 cm | None               | Form F4 (part B) |

The smaller trees (tree height  $\geq$  1,30 m and DBH < 10 cm), whose data are collected within the nested plots, are counted by species. Only the tree species (species reaching 5 m *in situ*) are measured. In the case of other forest categories, the data collected are more complete and include, besides the species identification, height, diameter, health and tree quality measurements. Indications on the diameter and tree height measurement methods are provided in annex (see section 5.2).

### (ii) Forest products and forest services

The data on forest products and services are collected at the sub-plot level (land use/forest type sections). The information will essentially originate from interviews or from people accompanying the team/crew in the field. At least two people must carry out this task. Interviewing and group discussion techniques and instructions are included in section 4.4F. The information may also be collected and checked, as much as possible, through field observations.

#### D) End of data collection work in the plot and access to the next plot

Once the work in the first plot is finished, the time is recorded on **form F2 (part B)** and access to the second plot must begin. If the forest cover allows it, it is possible to directly access the plot with the help of GPS. If this attempt fails, the search may continue along the central line of the plot, by measuring a 250 m distance (horizontal distance). If the point to be reached is not accessible on a straight line, the obstacle must be surpassed using auxiliary methods that allow to find the original line.

#### E) Interviews

Two major groups of people must be interviewed:

- external key informants;
- forest users (presented as individuals or target groups).

It is always possible to find key informants that may provide data on forest use, but it must be noticed that in the absence of local inhabitants, many variables related to the target groups (forest users) will essentially be collected from observation or from key informants.

Table 4 shows an overview of people/groups of people that may provide information.

**Table 4. Interviews**

| <b>Groups/individuals to be interviewed</b>   | <b>How to contact, identify them ?</b>   | <b>Where ?</b>   | <b>When ?</b>  | <b>Information</b>   |
|---|--|--|--|--|
| Key external informants: local forest services, organizations and local administration representatives etc.                             | Directly   | By phone, correspondence or visit  | During the planning phase of the field work<br><br>or/and<br><br>before reaching the tract/site        | Logistics, access to the plot, general information on the population, information on silviculture and land tenure etc. |
| Target groups or individual tree and forest resources users, people who depend from forests (owners, women, men, hunters, residents...) | Recommended by external key informants found close to the site or in it.<br><br>Rapid rural appraisal to identify the stakeholders | At their house/ or in the village<br><br>On the studied site ( transect walk, persons working in the field work) | Introductory meeting to the local people<br><br>Previously fixed meeting (group or individual meeting) | Forest and trees management and use, products and local forestry services.<br><br>Data on population (history etc.)    |

**(i) Identifying external Key informants and target groups and individuals**

• **Identifying external key informants:**

Key informants are external individuals that have particular knowledge of the forest, people and area. They are not forest users themselves, but more likely, they are local foresters, etc.

**How are external key informants identified?** During the planning process of the field work, local foresters, representatives of local development organisations and local administration will be contacted to organize the logistics and scheduled activities. Some of these people may provide very useful general information and they will be selected as key informants.

Key informants may sometimes be interviewed before accessing the sampling site. Often these informants have knowledge about the path to follow in order to access the site. They may also provide literature and existing data.

**Examples of key informants:** forestry services (extension, forest guards), NGO staff, local administration employees, etc.

- **Identifying target groups and individuals**

The target groups are defined as people who are linked to, or use the forests on a permanent basis. These people may live in, or close to the tract, they may be foresters or forest owners. They may be interviewed as a group, or as individuals.

**How are target groups identified?** When the field team arrives to the site, the main forest user groups, or stakeholders must be identified. This task may be carried out through discussions with village representatives, people living in the forest, and external key informants.

Representativity is a complex issue and it is important to be aware of it when identifying forest users or people living in forests for the interviews. Many forest users have common characteristics and are classified within the same group, when carrying out the analysis. Nevertheless, cultural and social factors (sex, age, health, status, religion, etc.) vary and must be taken into account. It is therefore recommended to identify stakeholders together with local participants in order to appropriately define the forest user groups. Many groups may be identified but the study must focus on the individuals and groups that use the forest products and services.

**Example of target group categories:** women, men, long-term residents (for historical changes), young people, forest owners, hunters, mushroom gatherers, people coming from other regions, etc.

**(ii) Data collection from interviewees**

The data collection from interviewees may be organized as follows:

- First, the data may be collected from external key informants **before the field visit** (planning phase). The data collected will mainly refer to the tract (**form F1**).
- In a second phase, the data may be collected **in the field**, in two different sets:
  - o Some variables related to the site may be collected from external key informants and be verified with the target groups;
  - o Variables related to the use of forest products and services at the sub-plot level (land use/forest types sections).

The data collection in the field may start at the introductory meeting with the key external informants and the local people, or during the first meeting with the target groups identified (after the stakeholder identification exercise, see previous section).

General explanations on the data collection techniques and group discussions and interview protocols are provided in an annex (section 5.5). The tools and techniques to adopt include:

- **The participatory analysis of maps** (see annex section 5.5B) may stimulate discussions on a number of variables. This exercise may be carried out during the introductory meeting, or later on, when the target group meets. This work allows to collect essential information both on the variables (use of resources, who uses them, where, etc.) and on the logistics, in order to find out how the field team must proceed to access the tract. It is highly recommended to carry out a Cross-checking or triangulation exercise (see annexes)

- **Direct observation**, shown in annexes, is a very useful tool for data collection and testing of the information given by interviewees;
- **Carry out the interviews in the site itself**, by organizing, for instance, a transect walk (see annexes) or by collecting information from a locally recruited worker who takes part in the plot measurement task. This will allow to better link the information collected with the identification of the tract in the field.
- **The analysis exercise to identify the stakeholders** (see below), is a good opportunity to discuss the use of forest products and services.

A list of variables and questions that may be posed during the interviews is suggested further on, (see annexes). These questions are clear and simple in order for them to be easily understood by the interviewee. Nevertheless, it must be stressed that a lot of flexibility is necessary when posing the questions. These are not rigid models; they are only suggestions. The questions will be posed following a natural and logical order and must not be repeated. When asking the questions, several aspects must be taken into account: people's culture and language of individuals and groups.

- **Examples of data to be collected from external key informants :**

- General information on the site and access to it (form F1, part A) :**

- **Administrative division:** « *What is the administrative/ province/village and local name of the area?* »

- Information on the people living in the tract and its neighbouring areas (form F1, part C) :**

- **Population :** « *How many people live in the site?* »
    - **Since :** « *Since when (which year) do people live in the site?* »
    - **Dynamics :** if there are people living in the neighbouring area of the tract. «*Do most of the people live here since a long time?* » or « *Have you often changed residence during the last 10 years, do many people leave or come ?* ». Have there been changes « *Why ?* »
    - **Main activity:** « *What do you think is the income source and occupation of most of the people living in the neighbouring area of the tract?* ». Cross-checking of direct observations and information provided by the interviewees will provide a good overview.

- General information on the distance and access to the tract (form F1, part D):**

- **Distance** to the permanent road, seasonal road, inhabited area, school, market, hospital: « *Which distance is there from the tract to the closest permanent road, etc.?* »

External key informants may also have an opinion on the variables that may be requested from the target groups, such as: the most important forest products and services, the ecological problems, the issues related with rights and conflicts. It is recommended to keep in mind that in the absence of local people, the information will be provided mostly by the key informants. Moreover, even when the information was provided by the target groups, the

information must be verified by cross-checking with the data provided by the key informants (see annex, section 5.5C).

- **Data provided by the target groups**

Some questions related to the tract may also be posed to the target groups, when analysing the maps, especially :

- **Dynamics (Form F1, part C)** : « *In the past, when you were a child, were there any people living here?* » or « *Do the young people often stay in the area when they have their own family or do they go to the city?* ». « *Who are the people that stay and those who leave?* »

The target groups essentially provide data on the **forest use and the forest products and services (form F6)**.

Several exercises may be carried out in order to identify the forest products and services, as well as their use and ranking.

**Products and services identification exercise and their use:**

The sub-plots (land use/forest type sections) must be grouped according to their forest type. It is important to clarify with the users if they collect different products according to the forest types. The different stages of such exercises are as follows:

- 1) To make a list of the forest types (if necessary)
- 2) To ask which are the forest products and services used in the area of interest: « *here, where we are now (if in the tract) – or in this area shown in the aerial photograph/ (show it), which are the forest products that your family (/you/the village) collect?* », « *Which use do you make of such product?* », « *What is its local name?* »

The type of use will be filled in later in the appropriate column of **form F5** and if possible, an attempt must be done to find the species in the field.

- 3) Remember the gender balance issue and try to organize the target groups as groups of men and women. At least during the ranking and importance of the products and services discussions.
- 4) Let the target group to think about the products they collect and write them down in a board or sheet of paper. If you feel that there are not enough products, try to ask indirect questions such as: « *are there healers here?* » (if there are, this means that they certainly use medicinal plants etc.), « *What do you usually use to cook? firewood, electric energy, gas?* »
- 5) Discuss about one product at a time, draw the product on the flipchart and systematically work on each one of them in order to gather all the necessary variables that are concerned with it.

**Variables that may be taken into account and related questions (suggestions):**

- **products and services:** « *Which are the products that you collect in this part of the forest?* »
- **Collecting season:** « *During which season and month do you collect this product?* »

- **Evolution of the collecting practice:** « *Do you collect (or does your family) as much product now, as 5 years ago?* »
- **Reasons that produced the change :** if there has been any change in the quantity of product collected, « *why is it so?* »
- **Evolution of demand:** « *Do you need to collect more product or is the quantity you collect nowadays enough to satisfy your needs* »
- **Final users:** « *do you sell this product?* » if yes, « *to whom?* »
- **Last collection :** « *When did you collect this product for the last time* »

- **Product ranking exercise:**

This tool provides an overview of the local importance of forest products and services. In many projects it constitutes a good basis to help the local people to establish priorities to manage the forest and carry out other related activities.

The ranking exercise clearly appears as a second stage when the interviews are carried out and leads to group discussions on the forest products and services. It is more appropriate to include few variables, otherwise the result may be confusing. Ranking may sometimes lead to inaccurate results if the local people do not clearly perceive which are the criteria and objectives of the exercise. A common understanding must be achieved when formulating the questions.

When the product list is completed, the discussions about what the most important product is, may start. It is important to be aware that the ranking criterion may vary from group to group: is time an important factor? Is economic value important? May this product be bought or replaced by another one? If there is no agreement on the answers provided, it is important to take notice, as it is a result in itself.

- **Other variables related to the products and forest services**

- **Gatherer:** « *Who are the people that collect and use this product?* »
- **User right:** « *Who has the right to collect/use this product?* » « *Is there anybody who may exclude the others from collecting it* » « *If you can collect it, is it because you are the owner?* » « *Are collecting rights traditional or legal?* »
- **Conflicts:** « *Concerning the product we have talked about, do you think there are disagreements, either with the local people or with people coming from outside, about the collection or use of these products?* »



#### 4. Description of field forms

There are 6 different forms, such as those shown in the table below.

**Table 5. Field forms description and corresponding information level**

| Form no.       | Information   |
|----------------|---|
| <b>F1 Form</b> | Tract   |
| <b>F2 Form</b> | Plot  |
| <b>F3 Form</b> | Sub-plot (land use/forest type) /Trees and stumps $\geq 10$ cm diameter |
| <b>F4 Form</b> | Edaphic and topographic measurement points / nested plots 2             |
| <b>F5 Form</b> | Sub-plot (general information, forest management and structure)         |
| <b>F6 Form</b> | Products and services   |

##### 4.1 F1 Form: Tract

One of these forms will be filled for each tract (1 km x 1 km). The form contains general information related to the tract location and identification; information on the people living in its surrounding areas and on the distance to the main infrastructure, and finally, the list of people involved in the inventory.

##### Headline: identification of the tract

|   |        |
|---|--------|
| 1. NFI Philippines                      | - F1 - |
| 2. Tract No <u>                    </u> | TRACT  |

- **Identification code(2):** tract identification number (from 1 to the number of tracts). See map with tracts.

##### A. Tract location

| A. Tract Location  |                                   |   |
|--------------------|-----------------------------------|---|
| 7. State .....     | 11. GEZ ..... C                   | <i>Co-ordinates Tract south-west corner</i> |
| 8. Province .....  | 12. Altitude Tract centre ..... m | 14a. Latitude <u>    </u> °                 |
| 9. District .....  | 13. Map Name, No .....            | 14b. Longitude <u>    </u> °                |
| 10. Locality ..... |                                   |   |

- **State (7) :** Country
- **Province (8) :** name of the province where the tract is located;
- **District (9):** name of the congressional district where the tract is located;
- **Locality (10):** locality, municipality, etc.

- **GEZ (11):** name of the ecological zone where the tract is located, based on FRA ecological zones map. Their classification is as follows :

| <b>Options</b>                  | <b>Code</b>  |
|---------------------------------|--------------|
| Tropical rain forest            | <b>Tar</b>   |
| Tropical moist deciduous forest | <b>Tawa</b>  |
| Tropical dry forest             | <b>Tawb</b>  |
| Tropical shrubland              | <b>TBSh</b>  |
| Tropical desert                 | <b>TBWh</b>  |
| Tropical mountain               | <b>TM</b>    |
| Subtropical humid forest        | <b>SCf</b>   |
| Subtropical dry forest          | <b>SCs</b>   |
| Subtropical steppe              | <b>SBSh</b>  |
| Subtropical desert              | <b>SBWh</b>  |
| Subtropical mountain            | <b>SM</b>    |
| Temperate oceanic forest        | <b>TeDo</b>  |
| Temperate continental forest    | <b>TeDc</b>  |
| Temperate steppe/prairie        | <b>TeBSk</b> |
| Temperate desert                | <b>TeBWk</b> |
| Temperate mountain              | <b>TeM</b>   |
| Boreal coniferous forest        | <b>Ba</b>    |
| Boreal tundra woodland          | <b>Bb</b>    |
| Boreal mountain                 | <b>BM</b>    |
| Polar                           | <b>P</b>     |

- **Latitude (12):** altitude in meters above the sea level from the central point of the tract. Can be determined from a topographic map.
- **Map name, N° (13):** reference (name, number) of topographic maps and aerial photo or satellite images used (date, coordinates)
- **Co-ordinates, Latitude(14a) Longitude(14b):** in decimal degrees from the south-western corner of the tract (indicated in the list of track IDs)

**B. Crew,/Owner/Informant list**

| I. Crew/Owner/Informant list |            |                 | 13 Crew | 19 Owner | 20 Informant |
|------------------------------|------------|-----------------|---------|----------|--------------|
| 15 Name                      | 16 Address | 17 Phone number |         |          |              |
|                              |            |                 |         |          |              |
|                              |            |                 |         |          |              |
|                              |            |                 |         |          |              |
|                              |            |                 |         |          |              |

This table will include **name, address and telephone number** of:

- **Name (15), Address (16), Phone number (17):**
- **Crew (18):** The team members working in the tract. In this case «crew» will be the term used for team.
- **Owner (19):** Owner(s ) of all, or part of the land where the tract is located. In this case the « owner» will be the term adopted.
- **Informant (20):** The people interviewed in the tract. In this case the column indicating the « informant » will be filled in with the option that most appropriately describes the relationship existing between the informant and the tract :

| Options                       | Description/definition   | Code     |
|-------------------------------|--|----------|
| <b>Estate owner</b>           | Owner of a plot within or close to the tract                     | <b>O</b> |
| <b>Employee</b>               | Person working in the tract                                      | <b>E</b> |
| <b>Manager of site</b>        | Person responsible for natural resources management in the tract | <b>M</b> |
| <b>Settler</b>                | Person living in or close to the tract                           | <b>I</b> |
| <b>External key informant</b> |  | <b>X</b> |

**C. Population**

|  |   |
|--|---|
| <p><b>C. Population</b></p> <p>21. Population on track <input type="text"/></p> <p>22. Population since <input type="text"/></p> <p>23. Population dynamics <input type="checkbox"/> C</p> <p>24. Population main activity <input type="checkbox"/> C</p> <p>25. Settlement history <input type="checkbox"/> C</p> | <p><b>D. Proximity to Infrastructure</b></p> <p><i>Distance from Tract centre to:</i></p> <p>26. Allweather road <input type="text"/> km    29. Hospital <input type="text"/> km</p> <p>27. Seasonal road <input type="text"/> km    30. School <input type="text"/> km</p> <p>28. Settlement <input type="text"/> km    31. Market <input type="text"/> km</p> |
|--|---|

- **Population on site (21):** number of people living in the site (approximate)
- **Population since(22):** year when the settlement was established in the site
- **Population dynamics (23):** evolution of the population living in or close to the tract during the last 5 years. To be indicated according to a series of options:

| Options               | Description/definition  | Code      |
|-----------------------|---|-----------|
| <b>Decrease</b>       | The population living in the site decreased during the last 5 years             | <b>1</b>  |
| <b>Stable</b>         | The number of people living in the site remained stable during the last 5 years | <b>2</b>  |
| <b>Growth</b>         | The population living in the site increased during the last 5 years             | <b>3</b>  |
| <b>Not applicable</b> | No inhabitants in the site  | <b>0</b>  |
| <b>Not known</b>      | There is not enough information to estimate this trend                          | <b>90</b> |

- **Population main activity (24):** income generation and employment sources of most of the population living in or in the surrounding area of the tract. The expression « income generation» refers to the activities carried out by people to satisfy their basic needs such as food and housing, i.e. self-sufficient farmers or as workers in the town. These data are to be entered according to an option list:

| Options                | Description/definition  | Code      |
|------------------------|---|-----------|
| <b>Not applicable</b>  | No inhabitants in the tract   | <b>0</b>  |
| <b>Agriculture</b>     | Farming activities  | <b>1</b>  |
| <b>Herding</b>         | Pastoralist, herding  | <b>2</b>  |
| <b>Forestry</b>        | Livelihood and income generation provided by the forest and related activities, including processing and marketing of forest products | <b>3</b>  |
| <b>Urban/Periurban</b> | Played work in the town or in the industrial sector – income generated from tourism or activities related to recreation               | <b>4</b>  |
| <b>Others</b>          | To be indicated. Includes ecotourism, subsidies, etc.   | <b>99</b> |

- **Settlement history (25):** major historical events affecting the local people and date when the land was occupied. To be indicated according to a list of options.

| Options                               | Description/definition  | Code      |
|---------------------------------------|---|-----------|
| <b>Wars/conflicts</b>                 |   | <b>1</b>  |
| <b>Change of ownership</b>            |   | <b>2</b>  |
| <b>Agricultural expansion</b>         |   | <b>3</b>  |
| <b>Infrastructure, electric power</b> | Electric line, road, channel, etc. recently installed in any plot | <b>4</b>  |
| <b>Others</b>                         | To be indicated   | <b>99</b> |

#### **D. Proximity to infrastructure**

- **All weather road (26) :** Distance, in Km, to reach the closest all weather road (accessible by motor vehicle all the year), departing from the tract centre ( 0 if the road is located within the tract)
- **Seasonal road (27):** Distance, in Km, from the centre of the tract to the seasonal road (road accessible by motor vehicle during some seasons only) the closest (equal to 0 if it is located within the tract)
- **Settlement (28) :** Distance from the tract centre to the closest inhabited area (equal to 0 if it is located within the tract)
- **Hospital (29) :** Distance to reach the closest hospital, departing from the tract centre (0 if the hospital is located within the tract)
- **School (30) :** Distance to reach the closest school, departing from the tract centre ( 0 if the school is located within the tract)
- **Market (31):** Distance to reach the closest market, departing from the tract centre (0 if the market is located within the tract)

**E. Tract access**

E. Tract Access

*Position when leaving road*

32a. Latitude    — . . . . . °

32b. Longitude   — . . . . . °

*Time:*

33. When leaving road    — . . . . .

34. When getting to plot N°  — . . . . .

- **Latitude (32a) and Longitude (32b):** latitude and longitude (decimal degrees, or coordinates in the map projection system) from the starting point by foot to the tract, on the closest road accessible by motor vehicle;
- **When leaving the road (33):** to visit the tract (h:m);
- **When getting to the plot No (34):** time (h:m) when arriving to the first plot. The plot number (from 1 to 4) must be indicated in the respective box;

**Reference points of access path:** these points will be used to retrieve the plot in the future. The following data must be filled in for each plot :

- **ID (35):** reference point code (number from 1 to a series of reference points); this number is reported on the scheme
- **Description (36):** A brief description (i.e. road, river, house, rock...)
- **Latitude (37a) and Longitude (37b):** The coordinates established by GPS (latitude and longitude)
- **Notes (38):** general notes concerning the whole page

| <i>Reference points of access path</i> |                 |               |                |
|--|-----------------|---------------|----------------|
| 35. ID                                 | 36. Description | 37a. Latitude | 37b. Longitude |
|  |                 |               |                |
|  |                 |               |                |
|  |                 |               |                |
|  |                 |               |                |
|  |                 |               |                |
|  |                 |               |                |
|  |                 |               |                |

## 4.2 F2 Form: PLOT

This form will be filled in for each plot contained in the tract (thus, a total of 4 per tract). The forms will include the general data on the plot and the information on its location and access.

### Plot identification

- **Tract number(2) and Plot number(3)** (1 to 4): Identification code

### A. Plot start point description:

#### Plot starting point (calculated)

- **Latitude (39a) and Longitude (39b):** the coordinates of the plot starting point according to the projection system adopted (meters) for the topographic map, and the latitude and longitude (in decimal degrees)

#### Marker position (GPS reading)

- **Latitude (40a) and Longitude (40b):** latitude and longitude (in decimal degrees, or coordinates in the projection system adopted for the topographic maps)
- **Distance from marker to plot start point (41):** distance in meters from the plot starting point to the marker (equal to zero if the marker and the starting point are the same)
- **Bearing from marker to plot start point (42):** sighting angle (from 0 to 360 degrees) from marker to the plot starting point (equal to zero if the marker and the plot starting point coincide)

This part contains the indications to identify the plot starting point and the marker location:

|  |                |
|--|----------------|
| 1. NFI Philippines<br>2. Tract No ..... 3. Plot No <input style="width: 30px;" type="text"/> | - F2 -<br>PLOT |
|--|----------------|

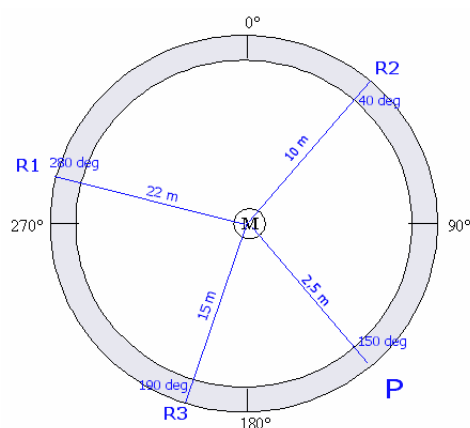
#### A. Plot start point description

|   |   |
|---|---|
| <i>Plot starting point (calculated):</i><br>39a. Latitude <input style="width: 60px;" type="text"/> °<br>39b. Longitude <input style="width: 60px;" type="text"/> ° | <i>Marker position (GPS reading):</i><br>40a. Latitude <input style="width: 60px;" type="text"/> °<br>40b. Longitude <input style="width: 60px;" type="text"/> °<br>41. Distance from MarkertoPlot start point <input style="width: 40px;" type="text"/> m<br>42. Bearing from Marker to Plot start point <input style="width: 40px;" type="text"/> ° |
| Central line bearing:<br>Plot #1 = 0°<br>Plot #2 = 90°<br>Plot #3 = 180°<br>Plot #4 = 270°  | M = Marker position<br>P = Plot starting point, if P ≠ M for any reason   |

**Plot starting point plan (43):**

Accurate, and if possible, fix reference points must be described in order to find the marker (i.e. rock, house, river...). The distance and orientation of at least three reference points, from the marker are to be mentioned.

The scheme centre corresponds to the marker (« M »). The plot starting point (« P ») and the reference points (minimum 3) must be located, by indicating the distance and bearing (from 0 to 360 degrees) from the marker.



**Example:**

| 44. W | 45. Description           | 46. Bearing* | 47. Distance* |
|-------|---------------------------|--------------|---------------|
| W1    | Side of the rock          | 280°         | 22m           |
| W2    | Right corner of the house | 40°          | 10 m          |
| W3    | Big tree (name) DBH 130cm | 190°         | 15 m          |

**B. Time record of work within Plot**

**Starting:**

- **Date (48):** Starting date of sampling at the plot (m/d/y)
- **Time (49):** Starting time of sampling at the plot (military time)

**Ending:**

- **Date (50):** Ending date of sampling at the plot (m/d/y)

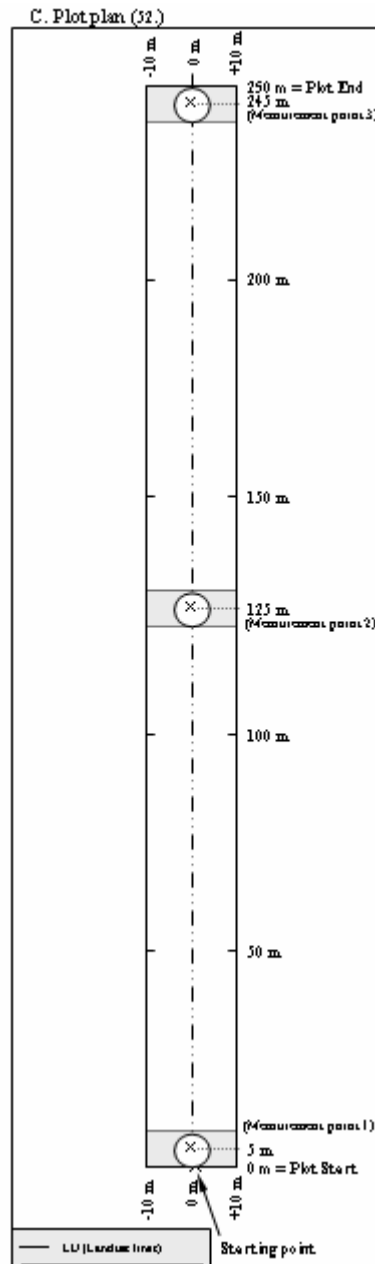
B. Time record of work within Plot

|                        |                        |
|------------------------|------------------------|
| <i>Starting:</i>       | <i>Ending:</i>         |
| 48. Date: __ / __ / __ | 50. Date: __ / __ / __ |
| 49. Time: __: __: __   | 51. Time: __: __: __   |



- **Time (51):** Ending time of sampling at the plot (military time)

**C. Plot plan (52):** scheme form including measures and land use/forest type sections



The scheme represents the plot as a whole. The rectangular and the circular nested plots are both drawn in the scheme. The starting point is located at the bottom of the page. The central axis of the plot (X axis) at 0 m on the vertical axis (Y axis) and the reference points indicating the horizontal distances, and the locations of nested circular and rectangular plots centres (located on the main axis, at 5 m, 125 m and 245 m) are included.

The following elements must also be included:

- Borderlines of the different land use/forest type sections, including the code of the land use class in the corresponding polygon.
- The intersections with roads (roads, paths...) and water courses

A code will be entered on the lines traced to characterize the type of borderline (water courses types, roads). The corresponding legend is included in the form.

- **Notes (53):** (general notes concerning the whole page).

### 4.3 F3 Form: PLOT

This form consist of a table where information related to all the trees and stumps measured in the plots will be entered, with the exception of trees of small diameters (height over 1,30 m and DBH under 10 cm), whose data, collected at nested plot levels, will be reported in F4 form. This table will therefore contain the data related to:

- Trees and stumps with  $\geq 20$  cm DBH present in the nested plot ;
- Trees and stumps with a DBH between 10 to 20 cm measured in rectangular nested plots 1
- Trees and stumps with a  $\geq 10$  cm DBH present in all of non-forest sections.

| 1. NFI Philippines                                |                           |                            |             |                  |                      |                         |     |     |         |                             | - F3a -               |                  |                       |                  |                  |                                  |      |     |
|---|---------------------------|----------------------------|-------------|------------------|----------------------|-------------------------|-----|-----|---------|-----------------------------|-----------------------|------------------|-----------------------|------------------|------------------|----------------------------------|------|-----|
| 2. Tract No ..... 3. Plot No <input type="text"/> |                           |                            |             |                  |                      |                         |     |     |         |                             | PLOT                  |                  |                       |                  |                  |                                  |      |     |
| D. Tree measurement                               |                           |                            |             |                  |                      |                         |     |     |         |                             |                       |                  |                       |                  |                  |                                  |      |     |
| 4. Sub-plot No                                    | 54a. Nested Plot L1 Width | 54b. Nested Plot L1 Length | 55. Tree No | 56. Species      |                      | 57. Tree/Stump location |     |     | 58. DBH | 59. DBH height <sup>e</sup> | 60. Year(s) since cut | 61. Total height | 62. Commercial height | 63. Stem quality | Health           |                                  |      |     |
|   |                           |                            |             | 56a. Common name | 56b. Scientific name | 57a. Along Plot axis    | (-) | (+) |         |                             |                       |                  |                       |                  | 64. Health state | 65. Causing element <sup>f</sup> |      |     |
|   |                           |                            |             |                  |                      | (m)                     | (m) | (m) |         |                             |                       |                  |                       |                  |                  |                                  | (cm) | (m) |
|   |                           |                            |             |                  |                      |                         |     |     |         |                             |                       |                  |                       |                  |                  |                                  |      |     |

**Columns from 1 to 4:** general data to identify and find the tree/stump

- **Sub-plot No (4):** identification code, sub-plot number (from 1 to number of sub-plots) where the tree/stump is found
- **Nested plot L1 Width (54a):** in case nested plot doesn't fall just in one forest type unit/ land use
- **Nested plot L1 Length (54b):** in case nested plot doesn't fall just in one forest type unit/ land use
- **Tree No (55):** identification code, increasing number according to the measurement order
- **Common name (56a):**

- **Scientific name (56b):**
- **Tree/Stump location (57):**
  - **Along plot axis (57a):** Horizontal distance in meters along the central axis of the plot starting point to the tree (from 0 to 250 m)
  - **Left axis (57b) and Right axis (57c):** Horizontal distance in meters along the width of the central axis plot to the tree (from 1 to 10 m): the distance is positive if the tree/stump is located to the right of the axis (facing the end of the plot), negative, and if vice versa.

**Other columns: variables to be measured**

- **In the case of a tree**
  - **Dbh (58):** Diameter at breast height in centimetres (see appendix section 5.2A)
  - **Dbh height (59):** Diameter measurement height (if it differs from 1,30 m)
  - **Total height (61):** in meters (see appendix section 5.2B)
  - **Commercial height (62):** in meters
  - **Stem quality (63):**

| Options       | Description/definition  | Code     |
|---------------|---|----------|
| <b>High</b>   | Straight tree without visible damage due to fire, fungus, animals, etc. | <b>1</b> |
| <b>Medium</b> | Tree with little defects or damage due to fire, fungus, animals, etc.   | <b>2</b> |
| <b>Low</b>    | Tree with several defects or damage due to fire, disease, animals....   | <b>3</b> |

**Health:**

- **Health state (64):** intensity of the symptom, to be indicated according to an option list

| Options                     | Description/definition   | Code     |
|-----------------------------|--|----------|
| <b>Not applicable</b>       | Alive, healthy tree. A tree is alive when any of its parts is alive (leaves,bud, cambium) at diameter measurement height level (1, 30) or above. It does not show any symptoms of disease or the presence of parasites | <b>0</b> |
| <b>Slightly affected</b>    |  | <b>1</b> |
| <b>Strongly affected</b>    |  | <b>2</b> |
| <b>Dying tree</b>           |  | <b>3</b> |
| <b>Dead (standing) tree</b> | A tree is dead when none of its parts is alive (leaves,bud, cambium) at diameter measurement height (DBH) level, standing  | <b>4</b> |
| <b>Dead (laying) tree</b>   | A tree is dead when none of its parts is alive (leaves, bud, cambium) above the diameter measurement point (DBH), laying   | <b>5</b> |

- **Causing element (65):** Problems that have been identified (disease, insects, animals...), symptoms to be indicated according to an option list

| Options                      | Description/definition                                  | Code      |
|------------------------------|---|-----------|
| <b>Healthy</b>               | Healthy tree, with no signs of disease, parasites, etc. | <b>0</b>  |
| <b>Insects</b>               | Trace of insect attacks                                 | <b>1</b>  |
| <b>Disease</b>               | Fungus or other disease                                 | <b>2</b>  |
| <b>Wind-broken tree</b>      |   | <b>3</b>  |
| <b>Fires</b>                 | Burned  | <b>4</b>  |
| <b>Stem debarked</b>         |   | <b>5</b>  |
| <b>Hollow stem</b>           |   | <b>6</b>  |
| <b>Damage due to animals</b> | Damage due to wild or domestic animals                  | <b>7</b>  |
| <b>Damage due to humans</b>  | Marked, bark damage...                                  | <b>8</b>  |
| <b>Other</b>                 | Broken branches, uprooted trees etc. To specify, ...    | <b>99</b> |

- **In the case of a stump**

- **Dbh (58):** Stump diameter, in centimetres at the crown height
- **Year(s) since cut (60):** Felling year
- **Total height (61):** Stump height, in meters

**Notes (68):** general notes concerning the whole page

#### 4.4 F5 Form: SUB-PLOT (land use/forest type sections)

This form will be filled in each one of the land use/forest type sections. It contains general data related to the land use/forest type sections, the information related to the structure and population and forest resources and tree use.

##### Plot identification

- **Tract number (2) and Plot number (3)** (1 to 4): Identification code
- **Sub-plot number (4)** : from 1 to the number of land use /forest type sections identified

| 1. NFI Philippines  |  | - F5 -   |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
|---|--|--|--|---|---------------------------------|---|--------------|---|--|---|---------|---|------------|---|--------------------|---|-------|---|---------|----|-----------|----|-----------|----|-----------|----|-------------|--|---|---|--|--|--|---|
| 2. Tract No .....   | 3. Plot No <input style="width: 30px;" type="text"/>   | SUB-PLOT   |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 4. Sub-plot No <input style="width: 30px;" type="text"/>                          |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| A. General  |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 80. Land use <input style="width: 30px;" type="text"/> C                          | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">84. Environmental problems</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">0</td><td>Not Applicable (urban areas...)</td></tr> <tr><td style="text-align: center;">1</td><td>Not existing</td></tr> <tr><td style="text-align: center;">2</td><td>Loss of water levels in rivers and other sources</td></tr> <tr><td style="text-align: center;">3</td><td>Drought</td></tr> <tr><td style="text-align: center;">4</td><td>Foundation</td></tr> <tr><td style="text-align: center;">5</td><td>Poor water quality</td></tr> <tr><td style="text-align: center;">6</td><td>Pests</td></tr> <tr><td style="text-align: center;">7</td><td>Erosion</td></tr> <tr><td style="text-align: center;">10</td><td>Landslide</td></tr> <tr><td style="text-align: center;">11</td><td>Windthrow</td></tr> <tr><td style="text-align: center;">90</td><td>Not known</td></tr> <tr><td style="text-align: center;">99</td><td>Other .....</td></tr> </tbody> </table> | 84. Environmental problems                           |  | 0 | Not Applicable (urban areas...) | 1 | Not existing | 2 | Loss of water levels in rivers and other sources | 3 | Drought | 4 | Foundation | 5 | Poor water quality | 6 | Pests | 7 | Erosion | 10 | Landslide | 11 | Windthrow | 90 | Not known | 99 | Other ..... | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>85. Fire occurrence <input style="width: 30px;" type="text"/> C</td> <td rowspan="3" style="width: 30%; text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>88. Lianas <input style="width: 30px;" type="text"/></td></tr> <tr><td>89. Epiphyte <input style="width: 30px;" type="text"/></td></tr> </table> </td> </tr> <tr> <td>86. Fire area <input style="width: 30px;" type="text"/> m<sup>2</sup></td> </tr> <tr> <td>87. Fire type <input style="width: 30px;" type="text"/> C</td> </tr> </table> | 85. Fire occurrence <input style="width: 30px;" type="text"/> C | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>88. Lianas <input style="width: 30px;" type="text"/></td></tr> <tr><td>89. Epiphyte <input style="width: 30px;" type="text"/></td></tr> </table> | 88. Lianas <input style="width: 30px;" type="text"/> | 89. Epiphyte <input style="width: 30px;" type="text"/> | 86. Fire area <input style="width: 30px;" type="text"/> m <sup>2</sup> | 87. Fire type <input style="width: 30px;" type="text"/> C |
| 84. Environmental problems  |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 0   | Not Applicable (urban areas...)  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 1   | Not existing   |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 2   | Loss of water levels in rivers and other sources   |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 3   | Drought  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 4   | Foundation   |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 5   | Poor water quality   |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 6   | Pests  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 7   | Erosion  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 10  | Landslide  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 11  | Windthrow  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 90  | Not known  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 99  | Other .....  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 85. Fire occurrence <input style="width: 30px;" type="text"/> C                   | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>88. Lianas <input style="width: 30px;" type="text"/></td></tr> <tr><td>89. Epiphyte <input style="width: 30px;" type="text"/></td></tr> </table>  | 88. Lianas <input style="width: 30px;" type="text"/> | 89. Epiphyte <input style="width: 30px;" type="text"/> |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 88. Lianas <input style="width: 30px;" type="text"/>                              |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 89. Epiphyte <input style="width: 30px;" type="text"/>                            |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 86. Fire area <input style="width: 30px;" type="text"/> m <sup>2</sup>            |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 87. Fire type <input style="width: 30px;" type="text"/> C                         |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 81a. Width <input style="width: 30px;" type="text"/> m                            |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 81b. Length <input style="width: 30px;" type="text"/> m                           |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 82. Designation/<br>Protection status <input style="width: 30px;" type="text"/> C |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |
| 83. Land tenure <input style="width: 30px;" type="text"/> C                       |  |  |  |   |                                 |   |              |   |  |   |         |   |            |   |                    |   |       |   |         |    |           |    |           |    |           |    |             |  |   |   |  |  |  |   |

##### A. General

- **Land use /land cover (80)**: alphanumeric code describing the section, according to the classification shown in section 3.
- **Width (81a)**: Average width of the sub-plot in meters
- **Length (81b)**: Average length of the sub-plot in meters

- **Designation / Protection status (82):** state of protection and legal/official designation. To be indicated according to an option list:

| Options  | Description/definition   | Code      |
|--|--|-----------|
| <b>Production</b>  | Forest outside of a protected area. Including concessions, exploitation license, community forests, etc.           | <b>1</b>  |
| <b>Natural reserve /wildlife area</b>  | Strictly protected area. It corresponds to category I of IUCN protected areas (see Annex)                          | <b>2</b>  |
| <b>National Park</b>   | Ecosystem conservation and recreation. It corresponds to category II of IUCN protected areas (see Annex)           | <b>3</b>  |
| <b>Natural monument</b>  | Natural elements conservation. It corresponds to category III of IUCN protected areas (see Annex)                  | <b>4</b>  |
| <b>Managed area to protect species/habitat terrestrial or marine landscape</b> | Conservation through active management. It corresponds to categories IV and V of IUCN protected areas. (see annex) | <b>5</b>  |
| <b>Not known</b>   | No information available   | <b>90</b> |
| <b>Other</b>   | to be specified (inland water)   | <b>99</b> |

- **Land tenure (83):** land tenure designation under which most of the sub-plot is defined. To be indicated according to an option list :

| Options             | Description/definition   | Code      |
|---------------------|--|-----------|
| <b>Private</b>      | Owned by individuals, families, companies, private companies, cooperatives or institutions           | <b>1</b>  |
| <b>State</b>        | Owned by national, regional or local government, or to state companies                               | <b>2</b>  |
| <b>Municipality</b> | Owned by the city, municipality, village municipalities, villages or communes                        | <b>3</b>  |
| <b>Community</b>    | Tenure right certificate by tribal or indigenous groups in view of the historical use of forest area | <b>4</b>  |
| <b>Not known</b>    | No information available on the land ownership   | <b>90</b> |
| <b>Other</b>        | To be specified  | <b>99</b> |

- **Environmental problems (84):** main environmental problems observed/identified within the sub-plot. To be indicated according to an option list.

| Options  | Description/definition                    | Code |
|--|---|------|
| Not applicable                                   |   | 0    |
| Not existing                                     |   | 1    |
| Loss of water levels in rivers and other sources |   | 2    |
| Drought  |   | 3    |
| Inundation                                       |   | 4    |
| Poor water quality                               |   | 5    |
| Pests  |   | 6    |
| Erosion  |   | 7    |
| Landslide  |   | 8    |
| Windthrow  | Including storms, cyclones, hurricanes... | 9    |
| Not known  |   | 90   |
| Others   |   | 99   |

- **Fire occurrence (85):** the presence or absence of fire evidence in the sub-plot. To be indicated according to a list of options.

| Options             | Description/definition                                 | Code |
|---------------------|--|------|
| No evidence of fire | There is no evidence of fire in the sub-plot           | 1    |
| Recent fire         | Fire evidence occurring during the current season/year | 2    |
| Old fire            | Fire evidence occurring during the last season/year    | 3    |

- **Fire area (86):** surface of fire damaged sub-plot. To be indicated in m<sup>2</sup>.

- **Fire type (87):** to be indicated according to an option list.

| Options          | Description/definition  | Code |
|------------------|---|------|
| Not applicable   |   | 0    |
| Underground fire | Fire propagating under the surface through the roots or any other underground means   | 1    |
| Surface fire     | Fire propagating on the ground cover of the forest where it consumes the dead cover, the small vegetation without reaching the crown of trees | 2    |
| Crown fire       | Fire propagating through the crown of woody vegetation, a tree crown or nearby population.  | 3    |

- **Lianes (88) :** mark here if exist
- **Epiphytes (89) :** mark here if exist

## B. Forest management land structure

### B. Forest management and structure

|                     |                            |                            |                            |                             |
|---------------------|----------------------------|----------------------------|----------------------------|-----------------------------|
| 90. Stand origin*   | <input type="checkbox"/> N | <input type="checkbox"/> P | <input type="checkbox"/> C | <input type="checkbox"/> nk |
| 91. Stand structure | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/> C  |
| 92. Canopy coverage | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/> C  |
| 93. Management plan | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/> C  |
| 94. Disturbances    | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/>   | <input type="checkbox"/> C  |

| 95. Timber exploitation     |                   | 96. Silviculture           |                                      | 97. Technology used         |                            |
|-----------------------------|-------------------|----------------------------|--------------------------------------|-----------------------------|----------------------------|
| <input type="checkbox"/> 0  | No felling        | <input type="checkbox"/> 0 | o practice                           | <input type="checkbox"/> 0  | Not Applicable             |
| <input type="checkbox"/> 1  | Clearing          | <input type="checkbox"/> 1 | Improvement                          | <input type="checkbox"/> 1  | Manual                     |
| <input type="checkbox"/> 2  | Selective felling | <input type="checkbox"/> 2 | Release of desirable superior tree   | <input type="checkbox"/> 2  | Chainsaw                   |
| <input type="checkbox"/> 3  | Group felling     | <input type="checkbox"/> 3 | Release of limas and tropical plants | <input type="checkbox"/> 3  | Mechanised (tractors etc.) |
| <input type="checkbox"/> 4  | Strip felling     | <input type="checkbox"/> 4 | Enrichment                           | <input type="checkbox"/> 90 | Not known                  |
| <input type="checkbox"/> 99 | Other             | <input type="checkbox"/> 5 | Sanitary cutting                     | <input type="checkbox"/> 99 | Other (oxen etc.)          |

\* N=Natural regeneration; P=Plantation; C=Coppices; nk= not known

- **Stand origin (90):** to be indicated according to an option list

| Options                | Description/definition                         | Code      |
|------------------------|--|-----------|
| <b>Natural (seeds)</b> | Natural regeneration of stand by seed          | <b>N</b>  |
| <b>Plantation</b>      | Artificial regeneration by seeding or planting | <b>P</b>  |
| <b>Coppice</b>         | Natural regeneration by shoot or root shot     | <b>C</b>  |
| <b>Not known</b>       |  | <b>nk</b> |

- **Stand structure (91):** the canopy structure of the stand. To be indicated according to an option list

| Options                       | Description/definition  | Code      |
|-------------------------------|---|-----------|
| <b>Not applicable</b>         | Non forest area   | <b>0</b>  |
| <b>Single layer</b>           | Stand with one layer of trees (only one well-defined level, formed by the crown cover )   | <b>1</b>  |
| <b>Two-layer vegetation</b>   | stand with two distinct layers of trees, an upper level (or dominant layer where the crown cover is two thirds above the first one, forming a clearly defined layer with at least 20% cover) and a lower layer (under storey)   | <b>2</b>  |
| <b>Three-layer vegetation</b> | Stand with three distinct layers of trees: an upper layer (or dominant layer where the crown cover is two thirds above the others, forming a clearly defined layer with at least 20% cover), an intermediate layer (of trees where the crown cover is from one to two thirds above the lower layer, forming a clearly defined layer, with at least 20% cover) and a lower level (under storey, or group of trees growing at a maximum height of one third of the dominant layer, forming a clearly defined layer with at least 20% cover) | <b>3</b>  |
| <b>More than three layers</b> | Stand consisting of three distinct layers of trees (more than three well defined layers, forming a crown cover at different height)   | <b>4</b>  |
| <b>Not known</b>              |   | <b>90</b> |



- **Canopy coverage (92):** ground surface covered by the vertical projection of the crown cover perimeter, expressed in percentage of the total ground area. To be indicated according to an option list :

| Options               | Description/definition | Code     |
|-----------------------|------------------------|----------|
| <b>Not applicable</b> | Non forest area        | <b>0</b> |
| <b>&lt;10%</b>        |                        | <b>1</b> |
| <b>10-40%</b>         |                        | <b>2</b> |
| <b>40-70%</b>         |                        | <b>3</b> |
| <b>&gt;70%</b>        |                        | <b>4</b> |

- **Management plan (93):** any existing forest management plan. To be indicated according to an option list:

| Options          | Description/definition                            | Code      |
|------------------|---|-----------|
| <b>Formal</b>    | Forest management plan formulated and implemented | <b>1</b>  |
| <b>Not known</b> |   | <b>90</b> |

- **Disturbances (94):** impact level of human disturbance in the forest stand.

| Options                        | Description/definition   | Code     |
|--------------------------------|--|----------|
| <b>Not applicable</b>          | non forested area  | <b>0</b> |
| <b>Not disturbed forest</b>    | Protected areas, all resources conserved   | <b>1</b> |
| <b>slight disturbed forest</b> | slight disturbed ( exploitation of products according to management plans)   | <b>2</b> |
| <b>moderately disturbed</b>    | Many product collected without confirming to management plans, notion of sustainability not respected  | <b>3</b> |
| <b>Heavily disturbed</b>       | Heavily disturbed (removal of products at rates higher than MAI, biodiversity degradation due to high pressure on selected species, encroachment of agriculture leading to high rate of deforestation) | <b>4</b> |

- **Timber exploitation (95):** applied exploitation system. To be indicated according to an option list

| Options                  | Description/definition   | Code      |
|--------------------------|--|-----------|
| <b>No felling</b>        |  | <b>0</b>  |
| <b>Clear felling</b>     | Felling of most of commercial size trees in a stand  | <b>1</b>  |
| <b>Selective felling</b> | Selective felling that does not take into account silvicultural needs, whether aware or not of them, but extracts only trees of a few species dimension, and value, etc. | <b>2</b>  |
| <b>Group felling</b>     |  | <b>3</b>  |
| <b>Strip felling</b>     |  | <b>4</b>  |
| <b>Other</b>             |  | <b>99</b> |

- **Silviculture (96):** visible silvicultural practices (cutting). To be indicated according to an option list :

| Options                                     | Description/definition  | Code     |
|---|---|----------|
| <b>No practice</b>                          |   | <b>0</b> |
| <b>Improvement</b>                          | Operation that reduces the tree density or deficiency with the aim of improving the yield and quality of the commercial use stand volume. It also includes regeneration by natural or artificial seeding. | <b>1</b> |
| <b>Release of desirable superior trees</b>  | Extraction of higher and larger and intermediate diameter trees It also includes selective felling.   | <b>2</b> |
| <b>Release of lians and tropical plants</b> | Intervention aimed at clearing trees of harmful climbers  | <b>3</b> |
| <b>Enhancement</b>                          | Plantation by seeding of indigenous species to improve natural regeneration.  | <b>4</b> |
| <b>Sanitary cutting</b>                     | Elimination of dead, ; damaged or vulnerable trees, with the aim of stopping the propagation of predators or diseases   | <b>5</b> |

- **Technology used (97):** technology used for tree exploitation. To indicate according to an option list:

| Options                           | Description/definition         | Code      |
|-----------------------------------|--------------------------------|-----------|
| <b>Not applicable</b>             |                                | <b>0</b>  |
| <b>Manual</b>                     | manual saw, axe etc.           | <b>1</b>  |
| <b>Chainsaw</b>                   | chainsaw                       | <b>2</b>  |
| <b>Mechanized (tractors etc.)</b> | Tractors, mechanization, etc.  | <b>3</b>  |
| <b>Not known</b>                  |                                | <b>90</b> |
| <b>Other</b>                      | including animal drought power | <b>99</b> |

**Notes (98):** general notes concerning the whole page

4.5 F6 Form: SUB-PLOT (Products / Services)

D. Table including the products and services provided by the forest and trees in the sub-plot

1. NFI Philippines

2. Tract No ..... 3. Plot No  4. Sup-plot No

10. Products / Services

| C 99. Product/Service | 100. Rank | 101. End use* |       |     |                             |                    |                         | 102. Harvester** | C 103. User right | C 104. User conflicts | C 105. Demand Trend | C 106. Supply Trend | Harvesting/Activity |                        |                      |              | 111. Species** |
|-----------------------|-----------|---------------|-------|-----|-----------------------------|--------------------|-------------------------|------------------|-------------------|-----------------------|---------------------|---------------------|---------------------|------------------------|----------------------|--------------|----------------|
|                       |           | Children      | Women | Men | Local organizations & comp. | National companies | International companies |                  |                   |                       |                     |                     | Other               | C 107. Reason activity | C 108. Last activity | C 109. Trend |                |
|                       |           | d             |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | n             |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | nk            |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | d             |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | n             |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | nk            |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | d             |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | n             |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |
|                       |           | nk            |       |     |                             |                    |                         |                  |                   |                       |                     |                     |                     |                        |                      |              |                |

- **Product and service (99):** products and services categories provided by the forest and the trees present in the plot. To be indicated according to an option list

| Options                                    | Description/definition                                     | Code       |
|--|--|------------|
| <b>Wood</b>                                | Hardwoods, softwoods                                       | <b>1</b>   |
| <b>Fuel wood</b>                           | Wood and charcoal  | <b>2</b>   |
| <b>Food</b>                                | Legumes, fruits, nuts, mushrooms etc.                      | <b>101</b> |
| <b>Fodder</b>                              | Herbs, leaves  | <b>102</b> |
| <b>Medicines</b>                           | Medicines deriving from forest plants                      | <b>103</b> |
| <b>Essential oils</b>                      | oils, soap and cosmetics                                   | <b>104</b> |
| <b>Tannins</b>                             | Tannins, dyes  | <b>105</b> |
| <b>Spices, herbs</b>                       |  | <b>106</b> |
| <b>Exudates</b>                            | Gum, resin, latex, etc.                                    | <b>107</b> |
| <b>Utensils, handicrafts</b>               | Utensils, non wood handicrafts                             | <b>108</b> |
| <b>Construction materials</b>              | Non wood construction materials                            | <b>109</b> |
| <b>Ornamentals</b>                         | Plants used for ornamental purposes                        | <b>110</b> |
| <b>Seeds</b>                               |  | <b>111</b> |
| <b>Bio fertilisers, insecticides, etc.</b> | Natural fertilisers or insecticides made of organic matter | <b>112</b> |
| <b>Other non wooded plant products</b>     | To be indicated  | <b>199</b> |
| <b>Living animals</b>                      | Including the birds and insects                            | <b>201</b> |
| <b>Bush meat</b>                           | Big mammals, rodents                                       | <b>202</b> |
| <b>Honey, beeswax</b>                      |  | <b>203</b> |
| <b>Other animal non edible products</b>    | Trophies   | <b>299</b> |
| <b>Employment (salary)</b>                 |  | <b>301</b> |
| <b>Hunting</b>                             |  | <b>302</b> |
| <b>Grazing</b>                             |  | <b>303</b> |
| <b>Exploration of natural resources</b>    | Scientific research  | <b>304</b> |
| <b>Conservation</b>                        |  | <b>305</b> |
| <b>Agricultural functions</b>              | Windbreak barriers or shade                                | <b>401</b> |
| <b>Water and soil conservation</b>         |  | <b>402</b> |
| <b>Recreation</b>                          | Recreation   | <b>403</b> |
| <b>Religious /spiritual</b>                |  | <b>404</b> |

- **Rank (100):** classification of the most important three products and services, to be indicated according to an option list :

| Options  | Description/definition                             | Code     |
|----------|--|----------|
| <b>1</b> | Classified as the product having the highest value | <b>1</b> |
| <b>2</b> | Classified as the second most important product    | <b>2</b> |
| <b>3</b> | Classified as the third most important product     | <b>3</b> |

- **End use (101):** end use of product, to be indicated according to an option list

| Options           | Description/definition  | Code      |
|-------------------|---|-----------|
| <b>Domestic</b>   | Non commercial Use (home consumption)                         | <b>d</b>  |
| <b>Commercial</b> | Products sold in the local, national or international markets | <b>c</b>  |
| <b>Not known</b>  |   | <b>nk</b> |

- 
- **Harvester (102):** group of people who collect the product/service. Case to be indicated according to an option list

| Options                                  | Description/definition  | Code |
|--|---|------|
| <b>Children</b>                          | Children from the local area                                      |      |
| <b>Women</b>                             | Women from the local area   |      |
| <b>Men</b>                               | Men from the local area   |      |
| <b>Local organisations and companies</b> | Groups such as hunting associations and local fruit company, etc. |      |
| <b>National companies</b>                | External national company   |      |
| <b>International companies</b>           | Transnational companies, for instance                             |      |
| <b>Other</b>                             |   |      |

- **User rights (103):** collector rights to collect the product. To be indicated according to an option list:

| Options                   | Description/definition  | Code      |
|---------------------------|---|-----------|
| <b>Not applicable</b>     | Inland water  | <b>0</b>  |
| <b>Exclusive right</b>    | User rights based on tradition, habit, or to a formal agreement. The owner has the right to exclude others from using or collecting the product | <b>1</b>  |
| <b>No exclusive right</b> | As indicated above, but the owner cannot exclude the others from using the product  | <b>2</b>  |
| <b>No right</b>           | Applicable to categories I, II and III of IUCN  | <b>3</b>  |
| <b>Not known</b>          |   | <b>90</b> |

- **Use conflicts (104):** existing conflict between different product users. To be indicated according to an option list

| Options               | Description/definition                                 | Code      |
|-----------------------|--|-----------|
| <b>Not applicable</b> | Inland water, etc.                                     | <b>0</b>  |
| <b>Yes</b>            | Conflicts due to use/collection of products identified | <b>1</b>  |
| <b>No</b>             | No conflicts due to use/collection of product          | <b>2</b>  |
| <b>Not known</b>      |  | <b>90</b> |

- **Demand trends (105):** product demand during the last 5 years. To be indicated according to an option list

| Options        | Description/definition | Code |
|----------------|------------------------|------|
| Not applicable |                        | 0    |
| Increase       |                        | 1    |
| Decrease       |                        | 2    |
| No change      |                        | 3    |
| Not known      |                        | 90   |

- **Supply trends (106):** stock/supply evolution of product during the last 5 years. To be indicated according to an option list

| Options        | Description/definition | Code |
|----------------|------------------------|------|
| Not applicable |                        | 0    |
| Increase       |                        | 1    |
| Decrease       |                        | 2    |
| No change      |                        | 3    |
| Not known      |                        | 90   |

### Harvesting Activity

- **Season activity (107):** period during which the product is collected or the activity is practised. To be indicated according to an option list:

| Options        | Description/definition | Code |
|----------------|------------------------|------|
| Not applicable |                        | 0    |
| Dry season     |                        | 1    |
| Rainy season   |                        | 2    |
| All the year   |                        | 3    |
| Other          |                        | 99   |

- **Last activity (108):** last time the product was collected. To be indicated according to an option list:

| Options              | Description/definition | Code |
|----------------------|------------------------|------|
| Not applicable       |                        | 0    |
| Yesterday            |                        | 1    |
| Last week            | 1-7 days               | 2    |
| Last month           | 8-30 days              | 3    |
| Last year            | 2-11 months            | 4    |
| More than a year ago | > 12 months            | 5    |
| Not known            |                        | 90   |
| Other                |                        | 99   |

- **Trend (109):** evolution of the extraction trend during the last 5 years. To be indicated according to an option list :

| Options        | Description/definition | Code |
|----------------|------------------------|------|
| Not applicable |                        | 0    |
| Increase       |                        | 1    |
| Decrease       |                        | 2    |
| No change      |                        | 3    |
| Not known      |                        | 90   |

- **Change reason:** main reason for increasing or decreasing extraction frequency during the last 5 years. To be indicated according to an option list:

| Options   | Description/definition | Code |
|---|------------------------|------|
| Decreasing benefits                                   |                        | 1    |
| Market change   |                        | 2    |
| Substitution by other products/services               |                        | 3    |
| Change in the quantity of product in the surroundings |                        | 4    |
| Change in the access to the resource                  |                        | 5    |
| No change   |                        | 6    |
| Not known   |                        | 90   |
| Other   |                        | 99   |

- **Species (111):** List of species collected according to the product category, in order of importance.

#### 4.6 F4a form: NESTED PLOTS

This form contains the information related to the circular and rectangular nested plots, as well as measurement points of edaphic variables.

##### Plot identification

- **Tract number (2) and Plot number (3)** (1 to 4): Identification code

##### A. Topography and Soil

These variables are collected in three fix measurement points located in the centre of each nested plot (edaphic measurement points).

This form includes three boxes corresponding to three measurement points.

| 1. NFI Philippines <input style="width: 50px;" type="text"/>   |                        | - F4a -      |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
|--|------------------------|--------------|---|--|---|--|--|--|---|--|---|--|--|--|---|--|--|------------------------|--|---|--|---|--|--|--|---|--|---|--|--|--|---|--|--|------------------------|--|---|--|---|--|--|--|---|--|---|--|--|--|---|--|
| 2. Tract No ..... 3. Plot No <input style="width: 30px;" type="text"/>   |                        | NESTED PLOTS |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| A. Topography and soil   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center; padding: 2px;">Measurement point No 1</th> </tr> <tr> <td style="padding: 2px;">4a. Sub-Plot No <input style="width: 40px;" type="text"/></td> <td></td> </tr> <tr> <td style="padding: 2px;">70a. Aspect <input style="width: 20px;" type="text"/> °</td> <td></td> </tr> <tr> <td style="padding: 2px;">71a. Slope <input style="width: 20px;" type="text"/> %</td> <td></td> </tr> <tr> <td style="padding: 2px;">72a. Relief <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">73a. Soil texture <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">74a. Soil drainage <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">75a. Organic matter <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> </table> | Measurement point No 1 |              | 4a. Sub-Plot No <input style="width: 40px;" type="text"/> |  | 70a. Aspect <input style="width: 20px;" type="text"/> ° |  | 71a. Slope <input style="width: 20px;" type="text"/> % |  | 72a. Relief <input style="width: 20px;" type="text"/> C |  | 73a. Soil texture <input style="width: 20px;" type="text"/> C |  | 74a. Soil drainage <input style="width: 20px;" type="text"/> C |  | 75a. Organic matter <input style="width: 20px;" type="text"/> C |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center; padding: 2px;">Measurement point No 2</th> </tr> <tr> <td style="padding: 2px;">4b. Sub-Plot No <input style="width: 40px;" type="text"/></td> <td></td> </tr> <tr> <td style="padding: 2px;">70b. Aspect <input style="width: 20px;" type="text"/> °</td> <td></td> </tr> <tr> <td style="padding: 2px;">71b. Slope <input style="width: 20px;" type="text"/> %</td> <td></td> </tr> <tr> <td style="padding: 2px;">72b. Relief <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">73b. Soil texture <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">74b. Soil drainage <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">75b. Organic matter <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> </table> | Measurement point No 2 |  | 4b. Sub-Plot No <input style="width: 40px;" type="text"/> |  | 70b. Aspect <input style="width: 20px;" type="text"/> ° |  | 71b. Slope <input style="width: 20px;" type="text"/> % |  | 72b. Relief <input style="width: 20px;" type="text"/> C |  | 73b. Soil texture <input style="width: 20px;" type="text"/> C |  | 74b. Soil drainage <input style="width: 20px;" type="text"/> C |  | 75b. Organic matter <input style="width: 20px;" type="text"/> C |  | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center; padding: 2px;">Measurement point No 3</th> </tr> <tr> <td style="padding: 2px;">4c. Sub-Plot No <input style="width: 40px;" type="text"/></td> <td></td> </tr> <tr> <td style="padding: 2px;">70c. Aspect <input style="width: 20px;" type="text"/> °</td> <td></td> </tr> <tr> <td style="padding: 2px;">71c. Slope <input style="width: 20px;" type="text"/> %</td> <td></td> </tr> <tr> <td style="padding: 2px;">72c. Relief <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">73c. Soil texture <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">74c. Soil drainage <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> <tr> <td style="padding: 2px;">75c. Organic matter <input style="width: 20px;" type="text"/> C</td> <td></td> </tr> </table> | Measurement point No 3 |  | 4c. Sub-Plot No <input style="width: 40px;" type="text"/> |  | 70c. Aspect <input style="width: 20px;" type="text"/> ° |  | 71c. Slope <input style="width: 20px;" type="text"/> % |  | 72c. Relief <input style="width: 20px;" type="text"/> C |  | 73c. Soil texture <input style="width: 20px;" type="text"/> C |  | 74c. Soil drainage <input style="width: 20px;" type="text"/> C |  | 75c. Organic matter <input style="width: 20px;" type="text"/> C |  |
| Measurement point No 1   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 4a. Sub-Plot No <input style="width: 40px;" type="text"/>  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 70a. Aspect <input style="width: 20px;" type="text"/> °  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 71a. Slope <input style="width: 20px;" type="text"/> %   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 72a. Relief <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 73a. Soil texture <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 74a. Soil drainage <input style="width: 20px;" type="text"/> C   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 75a. Organic matter <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| Measurement point No 2   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 4b. Sub-Plot No <input style="width: 40px;" type="text"/>  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 70b. Aspect <input style="width: 20px;" type="text"/> °  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 71b. Slope <input style="width: 20px;" type="text"/> %   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 72b. Relief <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 73b. Soil texture <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 74b. Soil drainage <input style="width: 20px;" type="text"/> C   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 75b. Organic matter <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| Measurement point No 3   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 4c. Sub-Plot No <input style="width: 40px;" type="text"/>  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 70c. Aspect <input style="width: 20px;" type="text"/> °  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 71c. Slope <input style="width: 20px;" type="text"/> %   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 72c. Relief <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 73c. Soil texture <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 74c. Soil drainage <input style="width: 20px;" type="text"/> C   |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |
| 75c. Organic matter <input style="width: 20px;" type="text"/> C  |                        |              |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |  |                        |  |   |  |   |  |  |  |   |  |   |  |  |  |   |  |

##### Measurement point N°

- **Sub-Plot N° (4a):** identification code, sub-plot number (from 1 to number of sub-plots) where the tree/stump is found
- **Exposition / Aspect (70):** slope orientation at measuring point level. To be indicated in bearing °.
- **Slope(71):** the average altitude variation per length unit collected at the measuring point level, in percentual figures. To be indicated in %.
- **Relief (72):** topographic position of nested plot. Characterized by micro relief. To be indicated according to an option list:



| <b>Options</b>  | <b>Description/definition</b>  | <b>Code</b> |
|---|--|-------------|
| <b>Flat terrain</b>   | Flat position of a plateau or plain, with $\leq 5\%$ slope   | <b>0</b>    |
| <b>Summit</b>   | crest of any kind, sharp, rounded crest or escarpment  | <b>1</b>    |
| <b>Upper valley slope</b>   | Upper valley slope   | <b>2</b>    |
| <b>Middle valley slope</b>  | Middle valley slope (slope $>5\%$ )  | <b>3</b>    |
| <b>Bench</b>  | Horizontal zone of average width over 30 m interposed by a hillside (slope $\leq 15\%$ ), berm or terrace over 6 m width | <b>4</b>    |
| <b>Lower valley slope</b>   | Lower valley slope   | <b>5</b>    |
| <b>large valley or bottom of a small valley</b>                           | Large valley or very wide depression in the bottom of a small valley   | <b>6</b>    |
| <b>Depression, at the bottom of a small, narrow, or anticlinal valley</b> | Enclosed depression or confinement situation at the bottom of a small, narrow or anticlinal valley                       | <b>7</b>    |

- **Soil texture (73):** texture class (grain or basic particles of the soil dimensions) of a soil sample collected at the measurement point level (centre of the circular plot). To be described according to an option list:

| <b>Options</b>    | <b>Description/definition</b>  | <b>Code</b> |
|-------------------|--|-------------|
| <b>Sand</b>       | a wet sample does not stain hands  | <b>1</b>    |
| <b>Loamy sand</b> | slightly sticky, but no ribbons can be formed  | <b>2</b>    |
| <b>Sandy loam</b> | makes a sound, when rubbed between the fingers close to the ear. Allows to be formed into a stick of cigarette size.   | <b>3</b>    |
| <b>Loam</b>       | only a relatively thick ribbon can be formed which will break soon after formation from its own weight. Rubbing between fingers makes a very light sound only. | <b>4</b>    |
| <b>Clay loam</b>  | forms a thin ribbon which will readily break from its own weight when about 2-4 cm long. No sound when rubbed between fingers.                                 | <b>5</b>    |
| <b>Clay</b>       | highly plastic and slippery when handled. Allows to be formed into a thin string   | <b>6</b>    |

- **Soil drainage (74):** average soil drainage within the circular nested plot. To be described according to an option list:

| <b>Options</b>         | <b>Description/definition</b>  | <b>Code</b> |
|------------------------|--|-------------|
| <b>Dry</b>             | The water does not stay in the soil during several weeks or months       | <b>1</b>    |
| <b>Temporary wet</b>   | Inundated land by water during the wet season and part of the dry season | <b>2</b>    |
| <b>Permanently wet</b> | Land with water all year around, such as swamps and mangroves, etc.      | <b>3</b>    |

- **Organic matter (75):** is defined by the thickness of the organic matter stratum of a sample collected in the centre of the nested plot. To be indicated according to an option list:

| Options | Description/definition | Code |
|---------|------------------------|------|
| < 1 cm  |                        | 1    |
| 1-3 cm  |                        | 2    |
| > 3 cm  |                        | 3    |

**B. NESTED PLOTS LEVEL 2 - Tree measurements (0 cm < Dbh < 10cm)**

(trees with DBH under 10 cm and above 1, 30 m height)

As in previous cases, this section must be filled for each nested plot. When one nested plot overlaps with two or more subplots (land use/forest type sections), the nested plot area overlapping with any of those sections and the trees present in that nested plot section, that reach the standard size, must be counted. The table includes separate columns for the circular nested plot, the sub-plot and a given tree species.

| B. NESTED PLOTS LEVEL 2 – Tree measurements (0cm < Dbh < 10cm) |               |  |                  |                      |             |                   |
|--|---------------|--|------------------|----------------------|-------------|-------------------|
| 6. L2 No (1-3)   | 4. Sub-plot N | 76. Area (<50m <sup>2</sup> )<br>(m <sup>2</sup> ) | 77. Species      |                      | 78a. Counts | 78b. Total number |
|  |               |  | 77a. Common name | 77b. Scientific name |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |
|  |               |  |                  |                      |             |                   |

- **L2 N° (1-3) (6):** Identification code of the circular nested plot, numbered from 1 to 3
- **Sub – Plot No (4):**, Sub-plot identification code, sub-plot number (from 1 to the number of sub-plots) where the tree is located;
- **Area (<50m<sup>2</sup>) (76):** estimation in square meters of the circular nested plot area present in the subplot under consideration (land use/forest type sections);
- **Species (77):**
  - Common name (77a) and Scientific name (77b):**
- **Counts (78a):** allows to determine the number of individuals, per species, present in the circular nested plot and subplot under consideration;
- **Total number (78b):** number of trees with a DBH fewer than 10 cm and over 1, 30 m height of the species present in the circular nested plot and subplot.

## 5. Annexes

### 5.1 land cover class definition

| Categories                              | Code     | Definition   |
|---|----------|--|
| <b>Total area<sup>1</sup></b>           |          | Total area (of country), including area under inland water bodies, but excluding offshore territorial waters.  |
| <b>Forest</b>                           | <b>F</b> | <p>Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 hectares (ha). The trees should be able to reach a minimum height of 5 meters (m) at maturity <i>in situ</i>. May consist <u>either</u> of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground; <u>or</u> open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest.</p> <p><u>Includes:</u> forest nurseries and seed orchards that constitute an integral part of the forest; forest roads, cleared tracts, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and width of more than 20 m; plantations primarily used for forestry purposes, including rubberwood plantations and cork oak stands.</p> <p><u>Excludes:</u> Land predominantly used for agricultural practices</p> |
| Broadleaved forest                      | •••F     | Forest with a predominance (more than 75 percent of tree crown cover) of trees of broadleaved species.   |
| Coniferous forest                       | •••C     | Forest with a predominance (more than 75 percent of tree crown cover) of trees of coniferous species.  |
| Bamboo/palms formations                 | •••A     | Forest on which more than 75% of the crown cover consists of tree species other than coniferous or broadleaved species (e.g. tree-form species of the bamboo, palm and fern families).   |
| Mixed forest                            | •••M     | Forest in which neither coniferous, nor broadleaved, nor palms, bamboos, account for more than 75 percent of the tree crown cover.   |
| Natural forests                         | NF       | Natural forests are forests composed of indigenous trees, not planted by man. Or in other words forests excluding plantations.   |
| Regeneration of recently cleared forest | NF1      | Land belonging to forest areas that have temporarily been cleared by human or natural causes, and that must turn to forest again.  |
| Open forest (10-<40%)                   | NF2      | Formations where trees form a discontinuous layer covering between 10 to 40 percent of ground. This forest usually includes a continuous grass layer allowing grazing activities and the spreading of fires. (Examples are the different types of «cerrado» and «chaco» in Latin America, wooded savannas and woodlands in Africa).  |
| Medium closed forest (40-<70%)          | NF3      | Formations where trees in the various storeys and the undergrowth cover a high proportion (40 < 70 percent) of the ground. These formations do not have a continuous dense grass layer (managed or unmanaged forests, primary or in advanced state of reconstitution and may have been logged-over one or more times, having kept their characteristics of forest stands, possibly with modified structure and composition. Typical examples of tropical closed forest formations include tropical rain forest and mangrove forest.  |

|  |            |  |
|--|------------|--|
| Closed forest ( ≥ 70%)                                 | <b>NF4</b> | <p>Natural forest where trees in the various storeys and undergrowth cover 70 percent of the ground. These formations do not have a continuous dense grass layer. They are either managed or unmanaged forests primary or in an advanced state of reconstitution and may have been logged-over one or more times, having kept their characteristics of forest stands, possibly with modified structure and composition. Typical examples of tropical closed forest formations include tropical rain forest and mangrove forest .</p> <p>Forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either:</p> <ul style="list-style-type: none"> <li>• of introduced species (all planted stands), or</li> </ul> |
| Forest plantation                                      | <b>FP</b>  | <ul style="list-style-type: none"> <li>• intensively managed stands of indigenous species, which meet all the following criteria: one or two species at plantation, even age class, regular spacing.</li> </ul>  |
| Young forest plantation                                | <b>PB0</b> | Forest plantation where the trees have not yet reached a height of 5 m.  |
| Open broad leaved forest plantation ( 10- <40%)        | <b>PB1</b> | Forest plantation where the crown cover is between 10 and 40 percent of the area.  |
| Medium closed broad leaved forest plantation( 40-<70%) | <b>PB2</b> | Forest plantation where the crown cover is at least 40 percent of the area and less than 70 percent.   |
| closed broad leaved forest plantation ( ≥ 70%)         | <b>PB3</b> | Forest plantation where the crown cover is above or 70 percent of the area.  |
| <b>Other wooded land</b>                               |            | Land either with a crown cover (or equivalent stocking level) of 5-10 percent of trees able to reach a height of 5 m at maturity <i>in situ</i> ; or a crown cover (or equivalent stocking level) of more than 10 percent of trees not able to reach a height of 5 m at maturity <i>in situ</i> (e.g. dwarf or stunted trees); or with shrub or bush cover of more than 10 percent.  |
| Shrubs   | <b>Sh</b>  | Refers to vegetation types where the dominant woody elements are shrubs i.e. woody perennial plants, generally of more than 0.5 m and less than 5 m in height on maturity and without a definite crown. The height limits for trees and shrubs should be interpreted with flexibility, particularly the minimum tree and maximum shrub height, which may vary between 5 and 7 meters approximately.  |
| Fallow   | <b>Fa</b>  | It encompasses forest fallow where the woody vegetation is under 5 m. Height. It refers to woody vegetation deriving from the clearing of natural forest for shifting agriculture. It is part of a forest fallow consisting of a mosaic of various reconstitution phases. The vegetation does not reach a height of 5 m.   |
| Wooded grasslands ( 5-<10%)                            | <b>WGL</b> | Land where the trees cover between 5 to 10 percent of the area and their height may reach 5 m at maturity.   |
| <b>Other land</b>                                      |            | Land not classified as forest or other wooded land, as described above. Including cultivated land, grasslands and pastures,built-up areas, barren land etc.  |
| Natural  | <b>N</b>   | Land not classified as forest or other wooded land not used by man.  |
| Barren land  | <b>BL</b>  | Barren land  |
| Grasslands   | <b>GL</b>  | Natural grasslands   |
| Marshland  | <b>ML</b>  | Marshland  |
| Cultivated land  |            | Land not classified as forest or other wooded land used by man for agriculture or pastures.  |
| Annual crop  | <b>AC</b>  | Annual crops   |

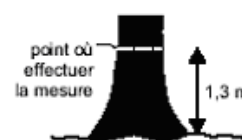
|                                 |            |  |
|---------------------------------|------------|--|
| Perennial crop                  | <b>PC</b>  | Perennial crops                                      |
| Pastures                        | <b>Pa</b>  | Pastures   |
| Built-up areas (urban or rural) | <b>BUA</b> | Built-up areas                                       |
| <b>Inland water</b>             | <b>IW</b>  | Area occupied by major rivers, lakes and reservoirs. |

## 5.2 Tree height and diameter measurements

### A) Tree (DBH) measurement

Tree diameter is measured over bark, at 1,30 breast height above the ground (see Figure 5) with the exception of particular cases mentioned below. Measurement may be carried out with the help of a diameter tape (tape whose diameter unit is in centimetres), or with the use of a calliper. In order to avoid overestimation of the volume and to compensate measurement errors, diameter is measured in cm, and adjusted in a decreasing sense (example: 16,8 cm become 16 cm).

**Figure 5. Measurement position for diameter measurement at breast height (DBH) on flat terrain.**



Measurement point 1,30

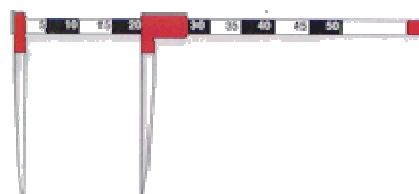
*Notes: After Dallmeier 1992. One single dotted line indicates the place for DBH measurement. If there are two lines on the stem because of a defective tree, the appropriate place to do the measurement is thus indicated.*

The calliper usually has two sides (see Figure 6) :

- One side of the main axe, shows a graded scale in diameter centimetres
- On the other side, it shows a diameter category (compensated calliper). This side is mainly used in silviculture to carry out inventories.

The side on cm will be used.

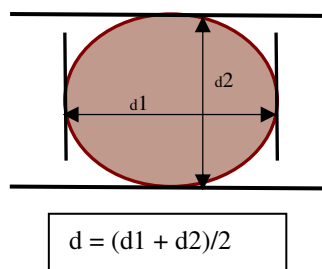
**Figure 6. Calliper.**



Some preventive measures must be taken into account:

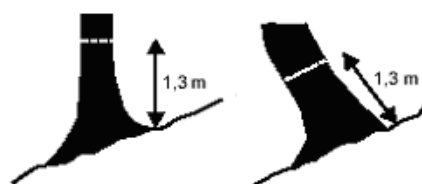
- Measurement instruments are kept in a position that perpendicularly cuts the tree axe at 1,30 m ;
- Make sure the calliper tightly holds the stem, in order to prevent the calliper clasps from grasping without compressing the bark ;
- If the diametric tape is used, make sure it is not twisted and is well stretched around the tree in a perpendicular position to the stem. Nothing must prevent a direct contact between the tape and the bark of the tree to be measured.
- If the calliper is used, non circular trees are to be measured in two perpendicular diameters located as close as possible to the largest and the smallest diameter in that point, the average of these two is thus retained.

Figure 7. Non circular tree measurement with calliper



- **On inclined terrain**, DBH tree measurement at 1,30 m is taken from an uphill position (see Figure 8).

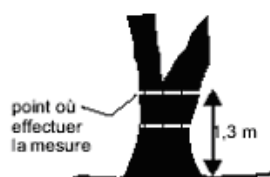
Figure 8. DBH measurement position for a tree on steep terrain



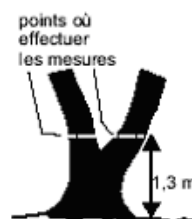
Note: see Figure 5.

- **Fork tree:** Several cases exist, according to the point where the fork divides the stem.
  - If the fork begins (the point where the core is divided) below 1,30 cm height, each stem having the diameter required ( $\geq 20$  cm in the whole plot,  $\geq 10$  cm for rectangular nested plots) will be considered as a tree and will be measured. Diameter measurement of each stem will be taken at 1,30 m height.
  - If the fork begins between 30 cm and 1,30 m, each stem will be considered as separate tree and will be measured. The diameter measurement will be taken at 1 meter above the fork origin.
  - If the fork begins at 1,30 m or a little higher, the tree will be counted as a single tree. The diameter measurement is thus carried out below the fork intersection point, just below the bulge that could influence the DBH.

Measurement point



measurement points

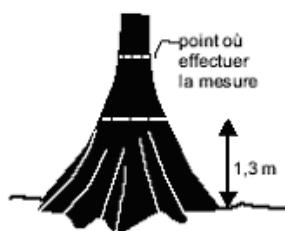


Note: see Figure 5.

- **Coppice:** Coppice shoots originate between ground level and 1,30m on the stem of a dead or cut tree. These are considered in the same way as forked trees, except that the coppice shoots do not necessarily reach 1/3 diameter of a dead tree. Coppice shoots originating below 30 cm are measured at 1,30 m above the ground; those that originate between 30 cm and 1,30 m are measured at 1 meter above the originating point.
- **Trees with an enlarged stem base or buttressed tree:** diameter measurement is made at 30 cm above the enlargement or main width of buttress, if the buttress/enlargement reaches more than 90 cm height above the ground (see Figure 9).

**Figure 9. DBH measurement position for buttressed tree**

Measurement point

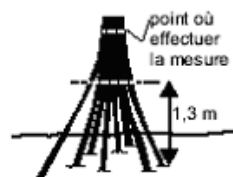


Note: see Figure 5.

- **Trees with aerial roots:** diameter measurement is done at 1, 30 m from the limit between the stem and roots (see Figure 10).

**Figure 10. DBH measurement position for a tree with aerial roots**

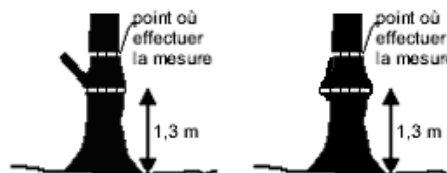
Measurement point



Note: see Figure 5.

- **Trees with irregular stem at 1,30m:** trees with bulges, wounds, hollows and branches, etc. at breast height, are to be measured just above the irregular point, there where the irregular shape does not affect the stem (Figure 11).

**Figure 11. DBH measurement position for a tree with branch enlargement at 1, 30 m**



Note: see Figure 5.

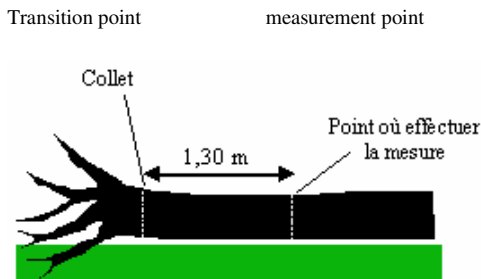
- **Inclined trees:** diameter measurement is made at 1, 30 m. The stem height is measured where the stem base and the ground meet forming an angle (see Figure 12).

**Figure 12. DBH measurement position for an inclined tree.**

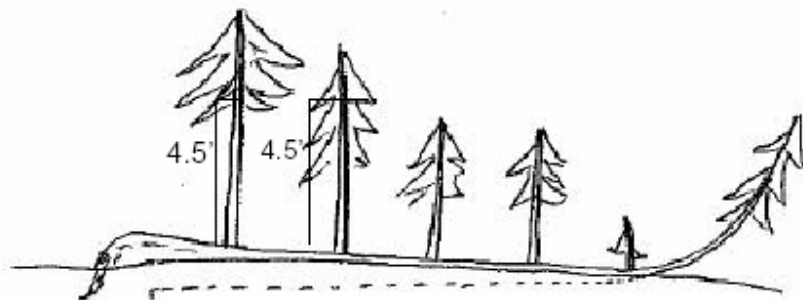
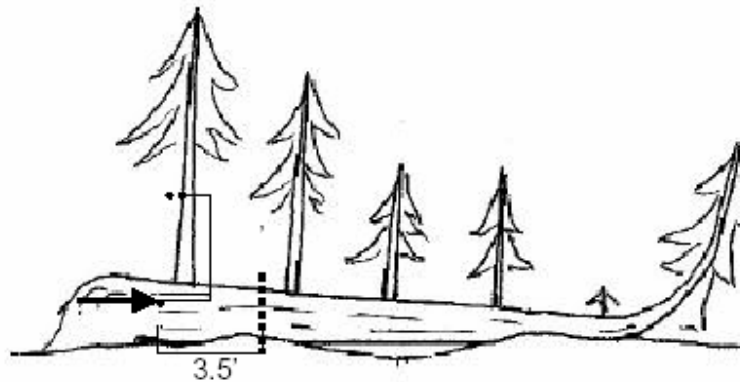


- **Fallen tree:** diameter measurement is made at 1; 30 m from the transition point between the stem and the root (see Figure 13).

**Figure 13. DBH position for a fallen tree.**



- **Living tree lying on the ground with branches in the shape of a vertical tree.** When a living tree is laying on the ground and its vertical branches (at  $<45^\circ$  vertical position) grow from the main stem, it is recommended to determine first if the main stem is above the litter or not. If this is the case, use the same rules applied to a forked tree, if the pith of the main stem is under the litter, do not take the main stem into account and treat each one of the branches in the shape of a tree, as a separate tree. DBH may be measured (and its height too) at 1, 30 m from the ground, but not from the top of the laying stem. If the top of the laying stem forms a vertical curve, compared to the ground, treat this tree portion as if it was an individual tree, beginning at the point where the pith detaches from the litter

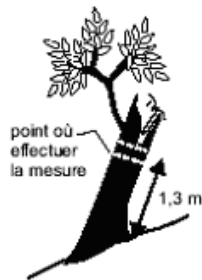




- If the DBH is not measured at 1, 30 m from the ground, indicate the height where it was measured. Measure and separately indicate the branch DBH that originates at a lower height than 1, 30 m.

**Figure 14. DBH measurement position for other trees.**

Measurement  
Point



*Note: see Figure 5.*

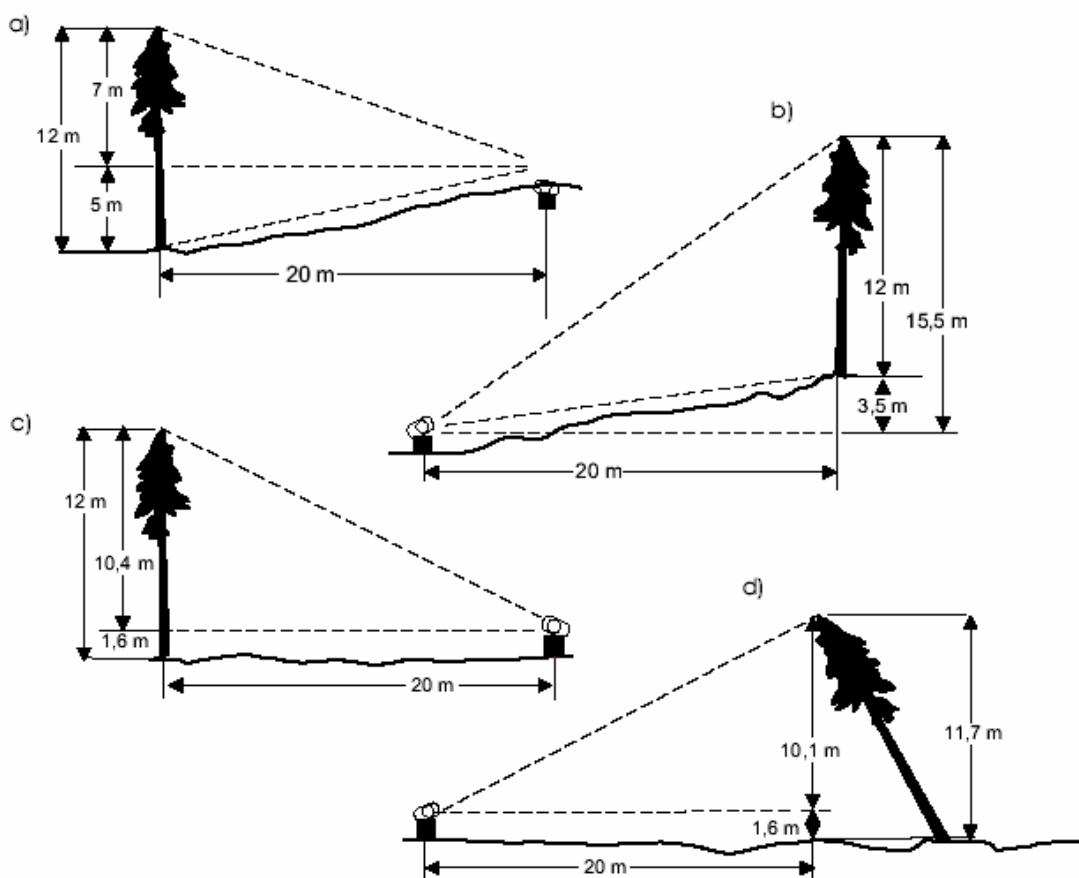
### **B) Tree height measurement**

Tree height measurement may be carried out by means of several instruments such as: dendrometric table, Blume-Leiss, Suunto, Haga, Blitterlich Relascope

Height measurement is made during several stages:

1. Tree distance (at 15, 20, 30 or 40 meters). To avoid measurement errors, the distance from the tree must be equivalent to the tree height
2. Observation of the tree crown
3. Observation of the tree base
4. Addition or subtraction of the two observation results according to the case: addition if the operator is standing uphill (see Figure 15a), subtraction if the operator is standing downhill in relation to the tree (see Figure 15b)
5. Slope correction

Figure 15. Tree height calculation



Note: You may find out the height of a tree (12 m for a, b, and c, and 11, 7 m for d):

- a) By adding the results above and under the horizontal measurement
- b) By subtracting from the total, the distance between the base of the tree and the horizontal line
- c) By adding to the height of the instrument from the ground, the distance measured above the horizontal line
- d) By adding the instrument measurement from the ground, to the distance measured from the crown of the tree up to a point located just below on the horizontal (use the telescopic rod).

**Measurement with a Blume-Leiss dendrometer.**

This dendrometer is mainly composed of:

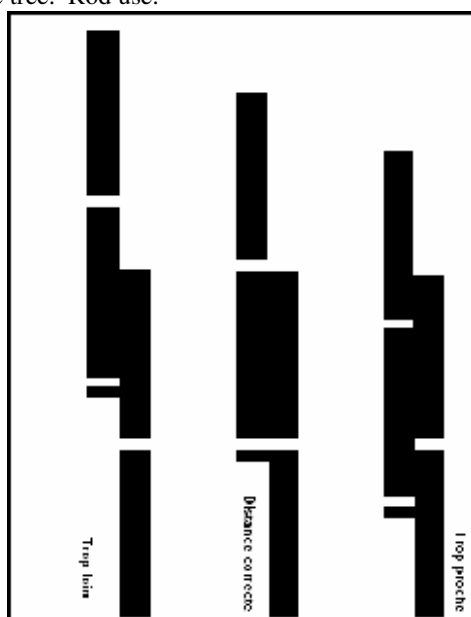
- A dioptric viewer providing two shifted images.
- Four height scales and one angle scale (the height scales correspond to a tree distance to measure at 15, 20, 30, and 40 m).
- An oscillating pendulum placed in front of the scales. The pendulum may be stopped as required with the help of a trigger or button to read the measure. A more recent model has two oscillating pendulums that may be stopped by means of two different triggers.

The instrument includes a rod with landmarks corresponding to different height scales. In order to carry out the measurements, the operator proceeds as follows:

**On slight slope terrain:**

1. He/she chooses the scale at 15, 20, and 30 or 40 m, the scale should approximate as much as possible to the estimated height of the stem.
2. He/she places the rod: the rod is fixed on the tree in order for the scale mark chosen is in front of him/her.
3. Distance positioning from the tree: with the help of a dioptic viewer, the operator looks at the landmark placed on the rod, in correspondence with the scale selected. If the distance from the tree is not correct, the operator will notice two shifted images. In order to achieve a correct positioning the operator will, either go forwards or go backwards, in order to see on his viewer two images aligned on the same line.

Figure 16. Distance from the tree. Rod use.



*Note: the first figure (on the right), shows that the operator is too distant; the second one shows that the distance is correct; and the third one shows that the operator is too close.*

4. **Observation angles:** in order to measure the height of a tree, the operator tries two observation angles. The first one at the crown level and a second one at the base of the tree.
5. **Determining the height:** after each sighting, the operator reads the measure indicated on the scale which corresponds to the landmark chosen in the rod, and then he adds the results of the two measurements. The result of this addition corresponds to the height of the tree.
6. For the new model, the operator will read the measurements after the second sighting because each pendulum allows determining a separate measurement.

**On inclined terrain:**

1. The operator carries out the same operations indicated above, with the exception of the height calculation. If the operator is standing uphill, the results of the two measurements are adjusted. If the operator is standing downhill, the sighting will be directed to the base of the tree and the result will be subtracted from the one directed at the crown of the tree.
2. Then, a slope coefficient must be applied to the height result.
3. Carry out the observation of a tree point located at the same height where your eye is positioned in relation to the ground).
4. Check the angle's measurement in the appropriate scale.

5. Then check the table located on one side of the instrument, on top of which you will find a coefficient table that helps in making the necessary corrections.
6. Apply y such coefficient following the formula below :  
$$h' = h - hk$$
 in which  $h'$  = is the real height  $h$  = measured height  $k$  = coefficient correction

**Height measurement with a Suunto :**

1. **Distance:** in order to carry out this measurement, a rod is fixed to the tree in a vertical position and at operator's eye height. The Suunto must be held firmly in vertical position.
2. **Height determination:** target the tree crown, read the height measurement result, target the tree base, add or subtract, according to the case. If the distance between the tree and the operator is 30 or 40 m, it is convenient to repeat the measurements carried out, on a 15 or 20 m scale.
3. **Slope measurement and height correction:** measure the slope by targeting the point corresponding to the same height your eye is positioned in. If the Santo does not include a scale in degrees or in percentage, make a conversion (printed text in the back, or calculator), then, multiply the height you obtained by **the angle cosine**.

In case the estimation is simply done by direct observation, it is necessary to calibrate from the beginning of the inventory, and when the stand type changes.

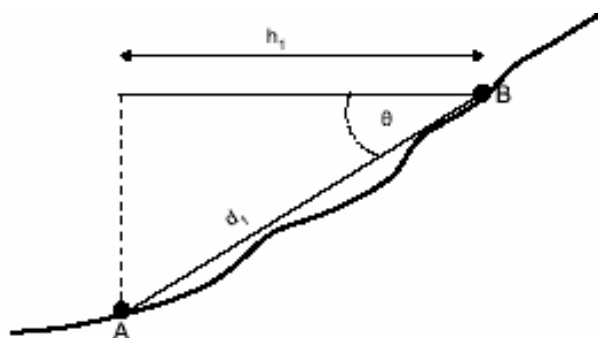
**5.3 GPS Use**

See separate manual.

**5.4 Horizontal distance measurements**

Reference distances: such as plots and sub-plot dimensions, tree coordinates, are all of them, horizontal distances. When the terrain is flat, these distances may be measured directly. Nevertheless, in steep terrain, horizontal distances differ from distances covered, measured in the field (see Figure 17). A correction factor must be applied in order to find out the distance to cover in the field, in order to reach a given point. Corrections will be made for all slopes above or equal to 15 percent.

**Figure 17. Slope correction.**



*Note: The distance between two points, measured along one slope ( $d1$ ) is always longer than an equivalent horizontal distance ( $h1$ ). On slope terrain, the horizontal distance must be multiplied by a factor that corresponds to the inclination, in order to obtain a corrected distance.  $\theta$  is the angle between the horizontal and the right A-B.  $d1 = h1/\cosine(\theta)$ .*

1. With the help of a clinometer (or other slope measuring device) measure the slope of landmark A in direction of point B. When the slope angle has been determined, it is important to make sure that the measurement is taken along one parallel observation line to the average slope of the ground: the instrument must be located at the same height level of the target.

2. Find out the corrected distance d1 which corresponds to the desired horizontal distance, by using the slope correction table (see Table 6).
3. Go to point B, and measure the slope again, in direction of point A. If the result is different from the first measurement, repeat the operation

**Table 6. Slope correction table.**

| Slope<br>% | De-<br>gree<br>° | Factor<br>Fp | Horizontal distances |      |      |      |      |      |      |      |
|------------|------------------|--------------|----------------------|------|------|------|------|------|------|------|
|            |                  |              | 5                    | 10   | 15   | 20   | 25   | 30   | 40   | 50   |
| 15         | 9                | 1,0112       | 5,1                  | 10,1 | 15,2 | 20,2 | 25,3 | 30,3 | 40,4 | 50,6 |
| 20         | 11               | 1,0198       | 5,1                  | 10,2 | 15,3 | 20,4 | 25,5 | 30,6 | 40,8 | 51,0 |
| 25         | 14               | 1,0308       | 5,2                  | 10,3 | 15,5 | 20,6 | 25,8 | 30,9 | 41,2 | 51,5 |
| 30         | 17               | 1,0440       | 5,2                  | 10,4 | 15,7 | 20,9 | 26,1 | 31,3 | 41,8 | 52,2 |
| 35         | 19               | 1,0595       | 5,3                  | 10,6 | 15,9 | 21,2 | 26,5 | 31,8 | 42,4 | 53,0 |
| 40         | 22               | 1,0770       | 5,4                  | 10,8 | 16,2 | 21,5 | 26,9 | 32,3 | 43,1 | 53,9 |
| 45         | 24               | 1,0966       | 5,5                  | 11,0 | 16,4 | 21,9 | 27,4 | 32,9 | 43,9 | 54,8 |
| 50         | 27               | 1,1180       | 5,6                  | 11,2 | 16,8 | 22,4 | 28,0 | 33,5 | 44,7 | 55,9 |
| 60         | 31               | 1,1662       | 5,8                  | 11,7 | 17,5 | 23,3 | 29,2 | 35,0 | 46,6 | 58,3 |
| 70         | 35               | 1,2207       | 6,1                  | 12,2 | 18,3 | 24,4 | 30,5 | 36,6 | 48,8 | 61,0 |
| 80         | 39               | 1,2806       | 6,4                  | 12,8 | 19,2 | 25,6 | 32,0 | 38,4 | 51,2 | 64,0 |
| 90         | 42               | 1,3454       | 6,7                  | 13,5 | 20,2 | 26,9 | 33,6 | 40,4 | 53,8 | 67,3 |
| 100        | 45               | 1,4142       | 7,1                  | 14,1 | 21,2 | 28,3 | 35,4 | 42,4 | 56,6 | 70,7 |
| 110        | 48               | 1,4866       | 7,4                  | 14,9 | 22,3 | 29,7 | 37,2 | 44,6 | 59,5 | 74,3 |
| 120        | 50               | 1,5620       | 7,8                  | 15,6 | 23,4 | 31,2 | 39,1 | 46,9 | 62,5 | 78,1 |
| 130        | 52               | 1,6401       | 8,2                  | 16,4 | 24,6 | 32,8 | 41,0 | 49,2 | 65,6 | 82,0 |
| 140        | 54               | 1,7205       | 8,6                  | 17,2 | 25,8 | 34,4 | 43,0 | 51,6 | 68,8 | 86,0 |
| 150        | 56               | 1,8028       | 9,0                  | 18,0 | 27,0 | 36,1 | 45,1 | 54,1 | 72,1 | 90,1 |

*Note: The table provides corrected distances for some horizontal distances, in function of the slope. For instance, the distance correction for a horizontal distance of 20 meters, with a slope of 30% is 20, 9 m. For other horizontal distances, not included in the table, it is possible to get a corrected distance by multiplying the horizontal distance by the slope correction factor scf. For instance, on a terrain with a 25% slope, if the aim is to find the horizontal distance of 7, 5 meter, it is necessary to carry out the following operation:  $7,5 * 1,0308 = 7,73$  meters*

When the operator cannot see the position of the next point or when the slope is not constant, one or several intermediate measurements become necessary. The horizontal distance is corrected by segments.

## 5. Interviewing and group-discussions techniques

### A) Advice and recommendations

Interviewing is very important for the data collection, and it is not easy. Good interview techniques are achieved through experience, training and by following certain procedures. There is specific advice and tools developed suggesting how to approach people. The following section tries to advice as well as to foresee difficult situations.

- **Preparations:** Background information through literature review and secondary data increases knowledge of the area and people, and is important for interviewing.
- **Plan** which variables you need to know from the different key informants and focus groups etc.
- **Building Rapport:** A good working relationship with the local people is easier to establish when the interviewer is well prepared, shows respect, and also remembers that it is the fieldworkers who are there to learn from the forest users on how they are using and benefiting from their local forest.
- **Scheduling interviews:** Respect of people's time can be demonstrated by trying to make appointments with informants and select a time and location where the interview is less likely to be disturbed. It is also important to be aware of when it is correct to an end interview.. So called unscheduled interviews are also important. They may take the form as informal dialogue with people that are meet when walking in the forest, buying drinks in the local shop etc.
- **Interpreter:** Although by far the best is to be able to interview in the original language, there might be occasions where the use of an interpreter is necessary. If using an interpreter it is important to use simple language, and ensure that there is a good mutual understanding about procedures and what information is needed to be obtained. It must be remember that the role of the interpreter is to interpret, not to interview. Asking the same question in different ways (a form for cross-checking) is a way to check that communication is working. Other hints suggested are: have the translator sit behind you, maintain eye-contact with the respondent, even though you do not understand what exactly is being said. Often mentioned as most important, is to take time. Make sure that you understand what was being said and what this means, and that the interpreter understands what you mean. Interviewing with translators is, of necessity even slower, more difficult and more sensitive process than if in original language.
- There are different opinions on **taking notes and filling out field forms or questionnaires in front of the respondents**. In semi-structured interviews many argue that one should never pull up an official-looking questionnaire form. And it is often recommended not to take note until rapport has been built (ask permission) as people are often reluctant to talk freely if notes are taken. If you take notes explain clearly for what use they are, and after an interview sum up what you have written. Doing visual exercises, such as RRA is a way where the noting or drawing is shared by all. Pre-noting some of the variables and topics to ask about in a small notebook as one gets familiar with the procedure is good practice and recommended.
- **Rural women** are often busy, and are often shy with strangers, regardless of whether the stranger is a man or a woman. Fieldworkers should be sensitive to the constraints facing women when undertaking interviews. Preferably a woman should interview the women respecting the female space.
- **Avoid asking questions** that are beyond the knowledge or experience of informants. Avoid giving opinions or using questions that may adversely affect the answers given. To be polite, local people will often agree with the opinions of field workers, even if they do not really agree or know.

- **Modifications:** Be prepared to modify the question or how you ask for information as new issues emerge and old issues become less critical. Issues should be explored as they arise in the conversation.
- **Use open-ended questioning** style that seeks explanations and opinions rather than yes-or-no-answers. Ask, for example, “where do you collect fuelwood?” Rather than, “do you cut fuel wood from the government forest?”(IUCN, 1998). To relate it to the sample site, follow up with “Do you also collect in this part of the forest” (pointing on a map at the sample site).
- **Probing and the use of non-leading ‘helper questions’:** Probing is an art that is learned through careful practise and means delving into a subject. Often topics are not easily comprehended at first; thus several questions around a sub-topic might be useful to ensure understanding (both yours and the participants’). Use such non-leading helper questions as: “Who?” “What?” “Where?” “When?” “Why?” “How?” “How many?” “How often?” And so forth. What are the implications, aims, intent, significance, or explanations of something? Ask yourself frequently – are you on the right track? (Messerschmidt, 1995). But it is also important to bear in mind that we do not need more information than the objectives have set out.
- **Tract and sub-plot specific:** It is important to always be clear about relating the question to the site or the stand. Geographic reference is possible. If people say that they collect fuelwood in the forest, but they are referring to the general forest or another part clearly outside the sample site, a follow up question can be: “Do you then also collect fuelwood in this [specific] area”? And at the same time show the area visually, describe it, etc.
- The persons being interviewed might feel a reason to hide information on some of their usual practices, or at least not talk openly about these issues, especially if he/she perceives the interviewer being a representative of organizations or authorities that are preoccupied with hunting endangered species, entering national parks for foraging fuelwood, etc. It is therefore crucial with an atmosphere of understanding between the interviewer and respondent. However, if they perceive you as already aware of these practices, you will be able to learn more about the extent of these practices than if they perceive you as unaware. One technique is just to assume that the practice exist and directly move to the question of the relative importance for their livelihood: “In the neighbouring village they explained us that they hunt almost every week, how often do you need to go to feed your family?/or how often do you hunt?” This type of question shows that you understand the reality in which they live. Whether you can use such a direct approach depends on the rapport you have established and needs careful consideration of the “mood” of the situation. In other circumstances a much more indirect approach is needed. The subject can be approached from different angles such as, for example, a conversation about foods and hunting practices of children. Often also, you might observe small things made of nwf’s while present in the community that may provide good starting points for a discussion on sensitive issues. Make use of these observations (AIDEnvironment, 1999).
- It is recommended adding a last question to the interview schedule which is, “Are there any questions that you would like to ask us?” This allows the interviewer to get information that might have been missed, puts the respondent(s) more at ease since the interview is not totally one-sided, and also provides a cross-check as to whether the respondent and interviewer understood what each was getting at. If the question is out of the blue, there is a good chance that the respondent did not really understand what the interview was about and the interviewer is unlikely to have elicited an accurate picture of the respondent’s behaviour or attitudes (Molnar, 1989).

## **B) Tool: Participatory analysis of aerial photographs and maps**

During the introductory meeting, or later, with the focus group gathered, the participatory analysis of aerial photographs or topographic maps will be an important initial exercise. It will provide important information on both the variables and also logistics on how the field team can get to the tract themselves. Looking at aerial photos and maps will stimulate discussion with both external key informants and focus groups, as well as acting as a good icebreaker (pocket stereoscopes, magnifiers etc.). Aerial photos are known to be especially useful for recording spatial information (IUCN, 1998). This can include information that is not readily available such as local names and land use.

When looking together at the **aerial photos** or maps it is natural to start to discuss aspects of access to the sample site, land use of the area of the sample site and the surroundings. If various aerial photos from different times (years, seasons) are available it is possible to explore the changes occurred. It is also a chance to obtain information on landmarks, location and names, administrative boundaries, forest products and in what seasons they are available. If possible try to mark the site on the photo with a transparency overlay. By noting on the photo, or sketching another map on another piece of paper one can record the information that comes out of the group discussion. It is recommended that the sample site is marked on the photo.

Contrary to sketched maps, aerial photographs represent a *true* image (however interpretation may be biased) of an area at a point in time. When adding local information to this it provides very important data. This information can also be relatively easy to transform to a conventional map or produce a sketch map based on the photo.

**Topographic maps** are indispensable whether or not aerial photographs are available in order to discuss and relate the sample site to a bigger geographic area.

**Another exercise that opens for a lot of discussion and analysis is community mapping.** In a **community** mapping exercise, the local people draw their community and surrounding. Often a facilitator might help to start off the work by drawing one reference point, a road, etc. But during the rest of the exercise the people should draw their own map with as little interference as possible. During the drawing exercise, there is a lot of time for discussions on ownership, what is harvested in different parts, etc. A drawback, however, for this study, is that the sample site which is where we are collecting the data from, might not be physically close to the area where people live. In a GFS context it will be important to focus the mapping exercise as much as possible to the sample site (tract) and to the variables related to it. What is possible to do is to locate the sample site on the community map, if this is possible in the scale that is made.

It is also important that the field team is prepared to give good answers to curious questions from people about the aerial photo, changes and discusses potentially environmental predictions etc.

## **C) Tool: Cross-checking and triangulation**

This technique is important for interviewing. When doing any study, the researcher must be aware of bias. If a study is biased, it means that the results do not reflect the reality because one situation, or perspective was favoured. A study that fails to include the perspective of women may be gender biased. A study that fails to probe issues deeply may be subject to a bias of “politeness” if people tell only what they think the interviewer wants to hear. Triangulation also known as cross-checking is a way to ensure that the results of a study are as accurate and unbiased as possible.

Date and perceptions, for example may be explored using different methods, each exploration building a more comprehensive understanding of complex local realities. Similarly, by using a single method with several different groups (men, women, children etc.), the different perspectives surrounding a particular issue can be revealed. Trustworthiness of data is strengthened through community verification of the findings (IIED, 1997).



Triangulation means looking at any problem or issue from as many perspectives as possible, but at least three (Freudenberger, 1995).

1. Triangulation of the perspectives on the team by having at least three people with different points of view (women/men, social scientist/technical specialist, insiders/outsideers, youth/elders etc.).
2. Triangulation of the perspectives of informants by ensuring that a wide range of people are interviewed and all information is verified by at least three different sources (women/men, old/young, diverse ethnic groups, etc.).
3. Triangulation of information gathering methods by addressing the same issue using several different tools (historical interviews, spatial maps, seasonal calendars, etc.). Does the direct observation or mapping exercise coincide with what people inform later during the fieldwork?

It is necessary to keep good records on where information came from and whether the interviewer is confident on its accuracy. Cross-checking can be a time-consuming process and requires patience.

#### **D) Tool: Direct Observation**

Direct observation might seem obvious, but it is nevertheless very important. The field team must be attentive and observe the sample site and surroundings noting the general land-use, facilities such as shops, schools and markets as well as housing and infrastructure. Observing these traits may clarify discrepancies and information gaps that occur during data collection. Additional questions can be asked to address these information gaps. Often misunderstandings and contradicting information can occur if local people have not completely understood what was being asked. This usually happens because the questions were poorly phrased, too complex, or too general from the outset. The understanding of concepts may also be unclear across languages and culture.

Direct observation can increase the accuracy and reliability of information and also reduce the number of questions that need to be asked of local people. For example, there is no need to ask whether people use wood to build houses if all the houses that can be observed are built of wood.

#### **E) Tool: Transect walk to the sample site**

If the conditions and circumstances permit organizing such a walk, this is highly recommendable. A transect walk can be defined as a walk designed to follow a specific route, often along a contour line of different elevations and different ecological zones etc. If a map is a bird's eye view of an area, a transect cuts across the same territory in order to get an idea of the diverse micro-ecological zones found in the landscape. In the GFS context, it is useful to go to the centre of the sample site (tract), or sometimes better, to a high point in the tract from which there is a good view. It is often possible to see boundary markers, different land use practices etc. Both members of the field-team as well as local forest users participate (and also key-informants if needed). Being able to discuss the forest and the forest products at the sample site with the forest users helps to tie the data-collection to the site.

Examples of directing questions:

- How do local people divide the area in different micro-ecological zones/types of forest etc.
- Are the different land uses in different micro-ecological zones?
- As the different land uses are crossed, questions should be asked to get a sense of what kind of tenure arrangements exist. Is the land owned? Borrowed? Subject of conflict? Is it farmed by women? Men? Outsiders?
- Are there some areas that are more in demand than others? How is this land allocated?

- What is the significance of any fences or boundaries that are observed? Are there more in some areas than another? Why? (Fences are often indicators that there is a competition for land or competing uses such as grazing and cultivation).
- “What was the use of the land here ten years ago?”
- “Where we are standing now, what are the forest products that you/your family extract?”
- “That fruit we see over there- does anyone harvest that? Who? – Do you eat that? Etc”.
- Uses of various trees should be investigated. Who is allowed to use the trees and for what purpose? Are the rules the same for all tree species? Do they vary depending on where the tree is located?
- Is the group passing through any land that is borrowed? If so it is useful to begin to find out about borrowing practices?
- Is the group crossing through any communally owned areas? If so, it is an opportunity to begin to find out how they are managed.

One of the advantages of doing a transect is that often people are more willing to address sensitive issues such as land ownership patterns or conflicts, when they are away from the community. If a question is related to the things being observed, it can seem less intrusive than if the same question is asked in a more formal interview situation (Freudenberger, 1995).

In addition, a transect walk will give the inventory-team a chance to show what they are doing, and also a chance to clarify queries after observations from the field measurements. If it is not possible to carry out transect walk with forest users, using maps and aerial photos are even more important.

### **Protected areas – IUCN Categories**

| <b><i>Protected Areas – IUCN categories for nature protection</i></b> |  |
|---|--|
| <b>I – Strict nature reserve / wilderness area.</b>                   | <b>Protected area managed mainly for science or wilderness protection.</b> These areas possess some outstanding ecosystems, features and/or species of flora and fauna of national scientific importance, or they are representative of particular natural areas. They often contain fragile ecosystems or life forms, areas of important biological or geological diversity, or areas of particular importance to the conservation of genetic resources. Public access is generally not permitted. Natural processes are allowed to take place in the absence of any direct human interference, tourism and recreation. Ecological processes may include natural acts that alter the ecological system or physiographic features, such as naturally occurring fires, natural succession, insect or disease outbreaks, storms, earthquakes and the like, but necessarily excluding man-induced disturbances. |
| <b>II – National Park</b>   | <b>Protected area managed mainly for ecosystem protection and recreation.</b> National parks are relatively large areas, which contain representative samples of major natural regions, features or scenery, where plant and animal species, geomorphological sites, and habitats are of special scientific, educational and recreational interest. The area is managed and developed so as to sustain recreation and educational activities on a controlled basis. The area and visitors' use are managed at a level which maintains the area in a natural or semi-natural state.   |
| <b>III – Natural monument.</b>  | <b>Protected area managed mainly for conservation of specific natural features.</b> This category normally contains one or more natural features of outstanding national interest being protected because of their uniqueness or rarity. Size is not of great importance. The areas should be managed to remain relatively free of human disturbance, although they may have recreational and touristic value.   |
| <b>IV – Habitat/species</b>   | <b>Protected area managed mainly for conservation through management intervention.</b> The areas covered may consist of nesting areas of colonial bird species, marshes or lakes, estuaries, forest or grassland habitats, or fish spawning  |

|   |  |
|---|--|
| <b>management area.</b>                       | or seagrass feeding beds for marine animals. The production of harvestable renewable resources may play a secondary role in the management of the area. The area may require habitat manipulation (mowing, sheep or cattle grazing, etc.).   |
| <b>V – Protected landscape/seascape</b>       | <b>Protected areas managed mainly for landscape/seascape conservation and recreation.</b> The diversity of areas falling into this category is very large. They include those whose landscapes possess special aesthetic qualities which are a result of the interaction of man and land or water, traditional practices associated with agriculture, grazing and fishing being dominant; and those that are primarily natural areas, such as coastline, lake or river shores, hilly or mountainous terrains, managed intensively by man for recreation and tourism. |
| <b>VI – Managed resource protection area.</b> | <b>Protected area managed for the sustainable use of natural ecosystems.</b> Normally covers extensive and relatively isolated and uninhabited areas having difficult access, or regions that are relatively sparsely populated but are under considerable pressure for colonization or greater utilization.   |

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## 7. Acronyms and abbreviations

|     |   |
|-----|---|
| RRA | Rapid Rural Appraisal                       |
| FRA | World Forest Resources Assessment Programme |
| GPS | Global Positioning System                   |
| NGO | Non governmental organization               |
| SS  |   |
|     |   |