



NATIONAL FOREST INVENTORY

LEBANON

Field Manual

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Abbreviations

cc	canopy cover	GPS	Global Positioning System
CSP	Circular SubPlot	LUS	Land use/forest type section
DBH	Diameter at Breast Height	NGO	Non Governmental Organization
FAO	Food and Agricultural Organization	RRA	Rapid Rural Appraisal
FRA	Forest Resources Assessment programme		

Introduction

This field manual contains definitions and procedures used to plan and perform a national forest inventory and assessments following the approach developed by the Forest Resources Assessment programme (FRA) of the FAO. The methodology has been tested and implemented in several countries since year 2000 (Costa Rica, Guatemala, Philippines, Cameroon and Lebanon).

The purpose of the national forest inventory (NFI) is to assess forest resources and tree resources outside forest and to provide new qualitative and quantitative information on the state, use, management and trends of these resources.

The first part of the manual describes the sampling design adopted and distribution of the tracts where measurements are carried out, and their configuration. The second part deals with the forest type/land use classification adopted to carry out the inventory. Recommendations to undertake data collection in the field are presented in the third part. In part four the field forms are described in detail.

The Appendices provide some tools and methods for measuring the variables such as diameter, height, horizontal distance and a guide for the use of Global Positioning System receivers, GPS, as well as techniques and recommendations to carry out interviews and group discussions.

1. Sampling design

1.1 Tract selection and distribution

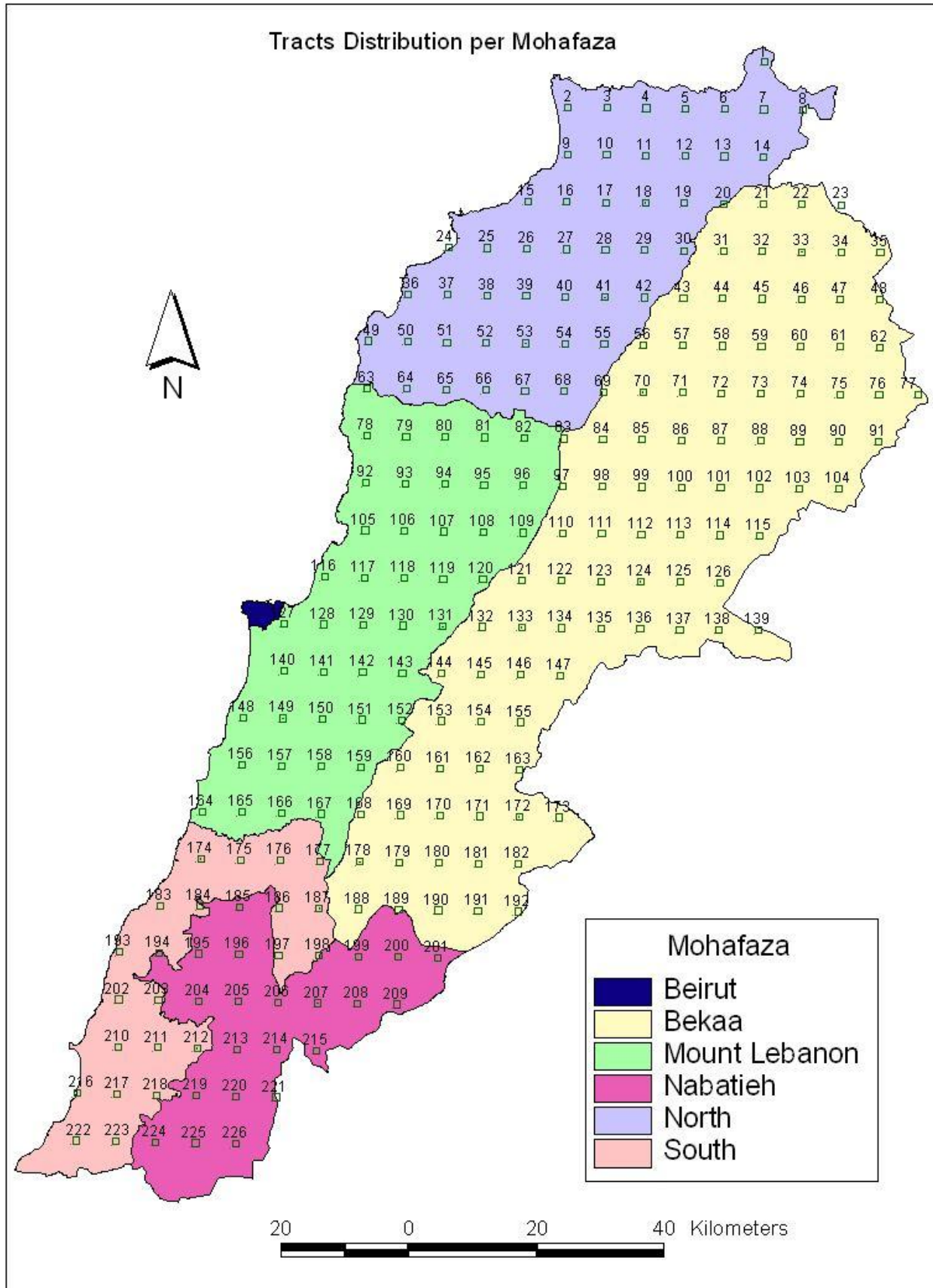
The sampling design adopted for the national forest resources assessment is systematic. Tracts are selected at least at the intersection of every degree of the latitude/longitude grid. Depending on country's situations and information needs, higher sampling intensity may be applied. Stratification may be adopted in situations where stable strata such as ecological zones are deemed to improve the design.

The example of the sample design in Lebanon is shown in Table 1 and Figure 1. The systematic sampling design applied, resulted in the selection of 226 tracts nation-wide.

Table 1. Tract density in Lebanon

Stratum	Distance between tracts	
	(lat ' x long ')	(km N) x (km W)
Lebanon	4 ' x 4 '	7.4 km x 6.15 km

Figure 1. Distribution of tracts for the national forest inventory of Lebanon



1.2 Tract description

Forest and tree inventory data is exclusively collected within the limits of the **tract**. Data is collected through observations, measurements and interviews within the tracts, which represents the highest level, and in the smaller sub-units (plots), demarcated within the tracts.

One **tract** is a square of 1km x 1km (see figure 2). The co-ordinates of the south-west corner of the tracts correspond to those of the points selected in the systematic sampling frame. Each tract contains four field plots.

The **plots** are rectangles 20 m wide and 250 m long. They start at each corner of the inner square (500m x 500m) (see figure 2), and are numbered clockwise from 1 to 4. The location and orientation of the 4 plots are given in Table 2

Table 2: Plot location and orientation

Plot	Location of the starting point of the plot, within the cluster	Orientation	Bearing
Plot 1	South-West corner	South-North	0 / 360 degrees
Plot 2	North-West corner	West-East	90 degrees
Plot 3	North-East corner	North-South	180 degrees
Plot 4	South-East corner	East-West	270 degrees

Each plot is divided into land use/forest type sections (LUS) representing homogenous land use or forest type units, with variable size and shape that have been identified in the field. The classification system adopted to identify the different land use classes and forest types is described in chapter 2. Most of the data related to forest characteristics, management and resources use and users are collected within the LUS.

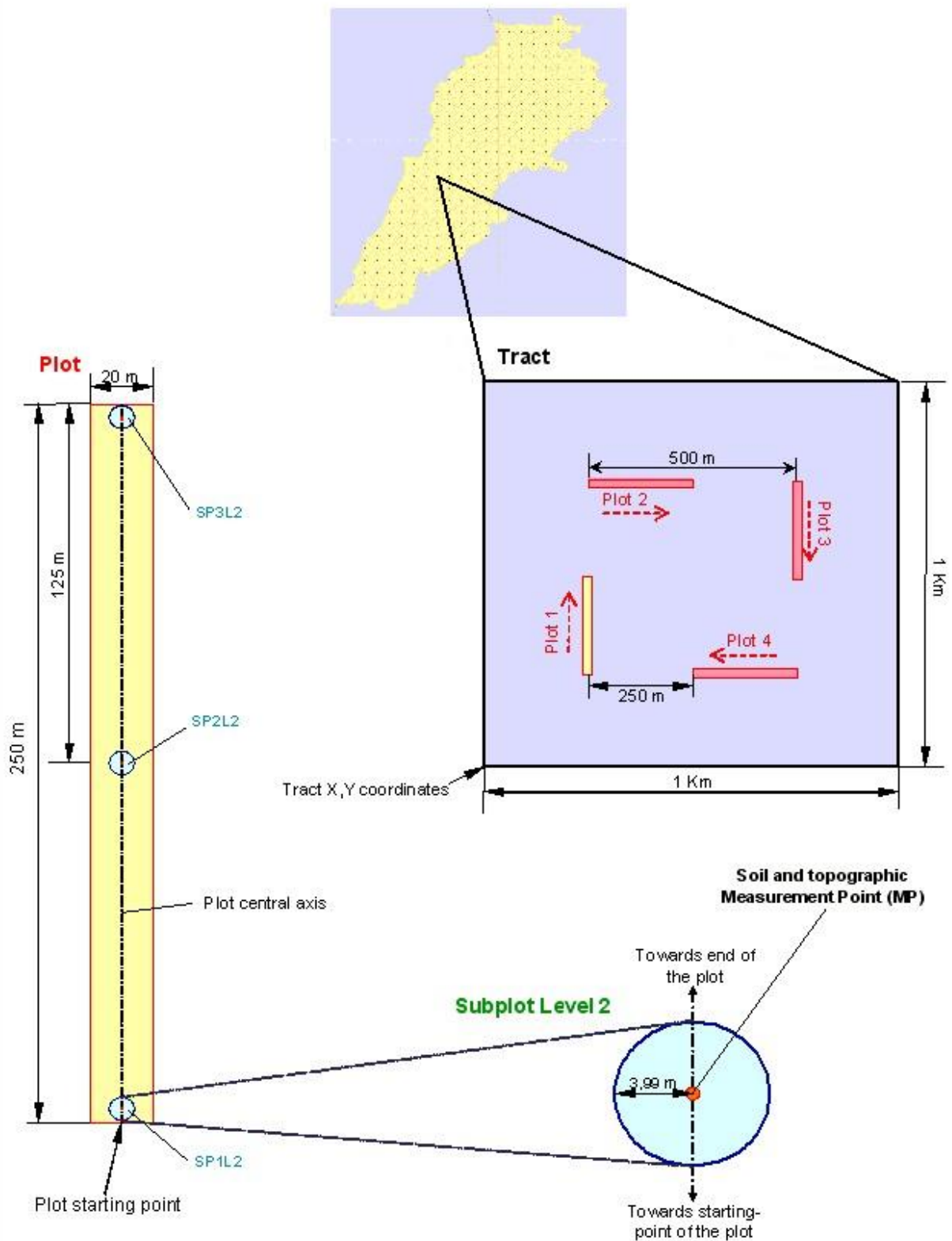
Three circular **subplots** (SPxL2) are delimited within each plot and will have a radius of 3.99 m corresponding to level 2. The subplots are numbered from 1 to 3, starting at the starting point of the plot. The subplots serve to measure tree regeneration and small diameter trees (DBH<10cm). An edaphic and topographic measurement point is established at the centre of each subplot. **When the location of the subplots falls in land use classes other than woodland (FRA Global Classes Forest and Other Wooded Land), they must not be demarcated.**

Table 3. Survey unit specifications

Unit	Shape	Size * (area)	Number
Tract	Square	1000 m x 1000 m (1km ²)	1
Plot	Rectangle	250 m x 20 m (5000 m ²)	4/tract
Land use/forest type sections (LUS)	Variable	Variable	Variable
Subplot Level 2	Circle	Radius r = 3,99 m (50 m ²)	3/plot

* All distances indicated are measured horizontally.

Figure 2. Tract, plot and subplot design



2. Land use/forest type classification

The classification system used to define land use/forest type classes is based on a dichotomous approach and includes two levels:

- The first level is composed of the global classes designed for the assessment of forest and tree resources at the global level;
- The second level is country specific, and includes additional classes integrated to take into account national and sub-national information needs.

The global classes were developed within the framework of the Forest Resources Assessment 2000 (FRA 2000) of FAO. Such classes are described in detail in the FRA working paper 1 in *Terms and Definitions*. The terms and definitions used in national assessments are chosen to harmonize national with global level forest assessments. The global classes include:

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

The Subsequent subdivision and desegregation of the global classes into more detailed and country specific ones is done to assure harmonised classification for sequential inventories in the country and for comparative assessments between countries for regional or global assessments. The second level of classification is designed to meet specific country needs of information.

Alphanumeric codes with 2 to 4 characters has been assigned to each class in order to facilitate data collection and input.

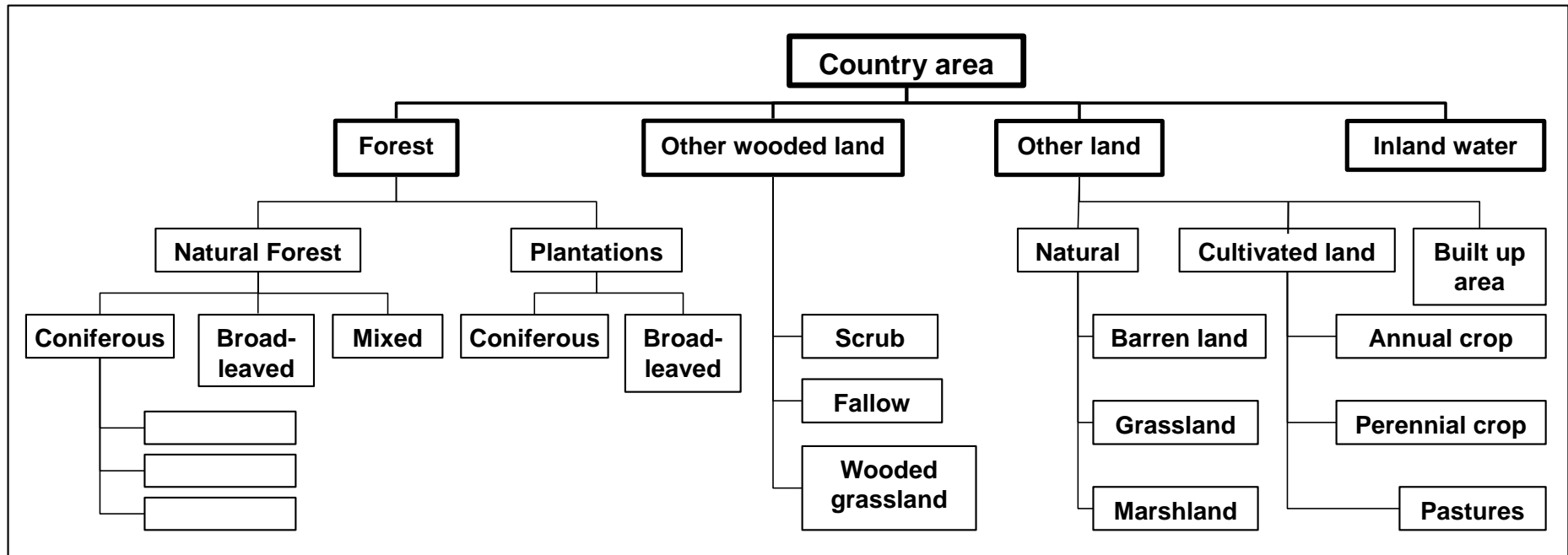
The classes and related codes used in the inventory are shown in Table 4.

Figure 3 shows the dichotomous approach and the class subdivision. Classes are further defined in Annex (section 5.1).

Table 4. Land Use / Forest Type Classification Lebanon				Trees			Shrubs		Grass	Code	
				>10 %	5 - 10 %	<5 %	>10 %	<10 %	>10 %		
Forest	Coniferous	Pines	Pinus Pinea	X						FCPP	
			Other Pines	X						FCOP	
		Cedars	X							FCCL	
		Juniper	X							FCJ	
		Fir	X							FCF	
		Cypressus	X							FCCS	
		Mixed coniferous *	X							FMC	
	Broadleaved	Evergreen	X							FBE	
		Deciduous	X							FBD	
		Mixed *	X							FMB	
Mixed *		X							FMCB		
OWL	Coniferous Shrublands	With trees (crown cover 5-10%)			X		X			SC1	
		without trees (crown cover < 5%)				X	X			SC2	
	Broadleaved Shrublands	Deciduous	With trees (crown cover 5-10%)			X		X			SBD1
			without trees (crown cover < 5%)				X	X			SBD2
		Evergreen	with trees (crown cover 5-10%)			X		X			SBE1
			without trees (crown cover < 5%)				X	X			SBE2
		Mixed *	with trees (crown cover 5-10%)			X		X			SMB1
			without trees (crown cover < 5%)				X	X			SMB2
	Mixed Shrublands	With trees (crown cover 5-10%)			X		X				SMCB1
		without trees (crown cover < 5%)				X	X				SMCB2
	Grassland With trees (Woodlots < 0,2 ha)					X			X	X	GL1
	Woodlots (0.2 -0.5 ha)	Riparian			X						RIP
Others			X						OTH		
Other Land	Grassland					X		X	X	GL2	
	Cultivated Land	Annual crops									CL1
		Perennial crops									CL2
	Artificial Area	Built-up									BUP
		Non-built up									NBUP
	Wetlands					X		X			WETL
	Barren Land					X		X			BARL
Inland Water										WATE	

* **Mixed Forest:** Is a forest which contains at least 25 % of one component and 75% at most of the other component (Mixes can be between Coniferous and Broadleaved,, between Deciduous and Evergreen broadleaved, and between two species of coniferous).

Figure 3. Forest Inventory land use classification



3. Field work: preparation and data collection

This part includes recommendations to prepare and carry out fieldwork activities. The fieldwork is described step by step for a tract, together with recommendations on the data collection techniques.

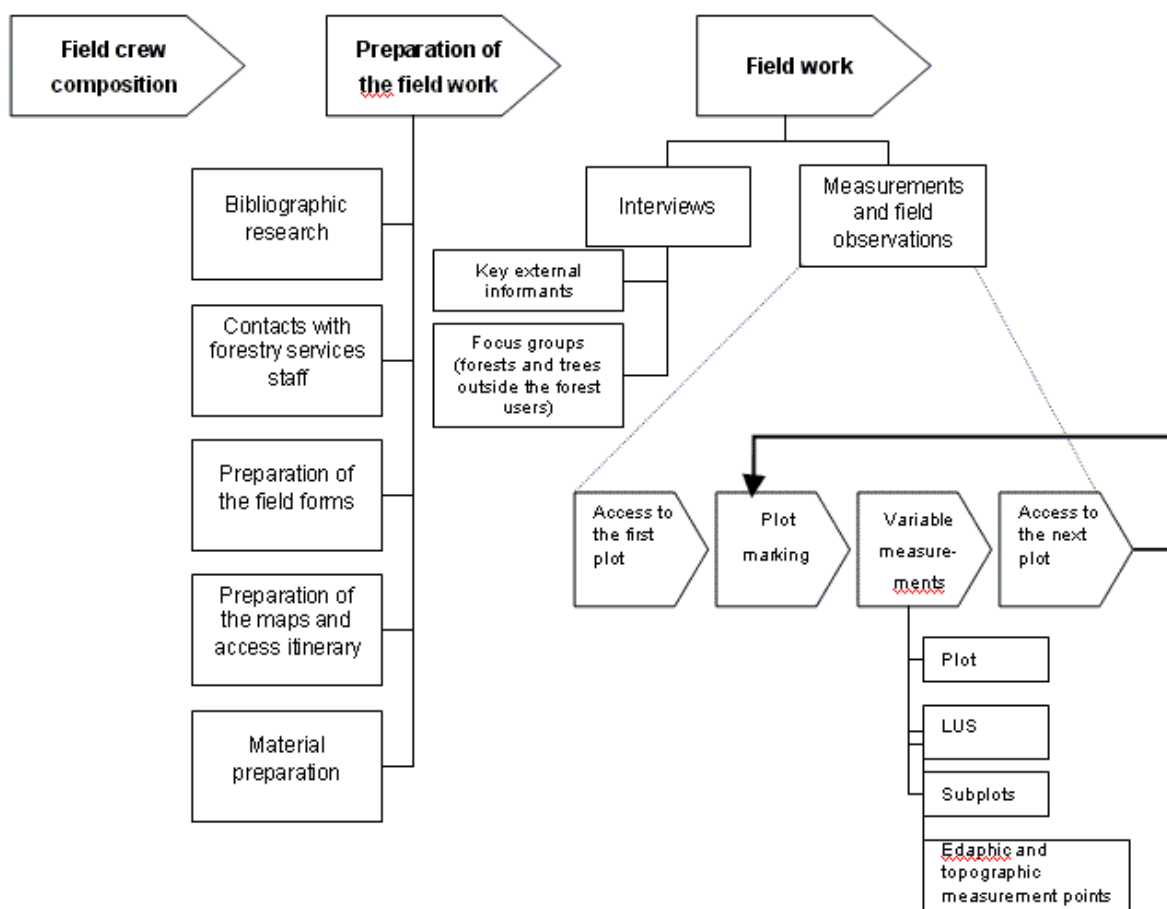
3.1 Fieldwork

Data are collected for tracts, plots, subplots and LUS. The values for the biophysical and management/uses variables are collected by the field crews through measurements and observations and also through interviews of local people and other key informants. The two main information sources for the inventory are:

- Field measurements and observations.
- Interviews with local people, land owners or users, key external informants such as foresters responsible for the area where the tract is located;

Those two sources of information imply the use of different methods and approaches that complement each other. One of these two approaches will be used as the main source, according to the type of and access to information. As much as possible, field observations should be applied to confirm the information obtained from interviews. The process is summarized in figure 4.

Figure 4. Field work stages



3.2 Field crew composition

The composition of a forest inventory field crew, taking into account the amount of information to be collected and the tasks of each individual, is at least four members. Additional persons may be included to improve performance of the field crews when conditions require greater resources. It is desirable that some in the field crews are hired locally and act as guides in the field. The crew leader and/or his assistant should be experienced in participatory interview techniques to collect socio-economic data from local people. One of the crew members must be experienced in tree species identification. It is preferable that the field crews include both men and women to facilitate the interviews and it is also advised to include forestry students for capacity building.

The responsibilities of each crew member must be clearly defined and their tasks are proposed as follows:

- The **crew leader** is responsible of organizing all the phases of the fieldwork, from the preparation to the data collection. He/she has the responsibility of contacting and maintaining good relationships with the community and the informants and has a good overview of the progress achieved in the fieldwork. He/she will specifically:
 - prepare the fieldwork: carry out the bibliographic research, prepare field forms and maps;
 - plan the work for the crew;
 - contact local forestry services, authorities and the community. Introduce the survey objectives and the work plan to the local forestry service staff and authorities, and request their assistance to contact the local people, identify informants, guides and workers;
 - administrate the location of tracts and plots;
 - take care of logistics of the crew: organize and obtain information on accommodation facilities; recruit local workers; organize access to the tracts;
 - interview external informants and local people;
 - take notes of the collected information;
 - ensure that field forms are properly filled in and that collected data are reliable;
 - organize meetings after fieldwork in order to sum up daily activities;
 - organize the fieldworks safety.
- The assistant of the crew leader will:
 - help the crew leader to carry out his tasks ;
 - take necessary measurements and observations;
 - make sure that the equipment of the crew is always complete and operational;
 - supervise and orient the workers.
- The workers are assigned the following tasks, according to their skills and knowledge of local species, language and practices :
 - help to measure distances ;
 - open ways to facilitate access and visibility to technicians;

- provide the common/local name of forest species;
- inform about access to the tract;
- provide information about the forest uses and management;
- carry the equipment.

Training of the crews on the survey methodology should be undertaken in theoretical and practical sessions in the beginning of the fieldwork where techniques of different forest and tree measurements, tally of data and techniques of interviews will be explained and practised.

The names and addresses of the crew members must be written down in field form F1 part B.

3.3 Preparation for the fieldwork

A) Bibliographic research

In forest inventories auxiliary information is necessary to prepare the field survey and carry out the interviews. Existing reports on forest inventory, national policy and forestry community issues, local people, etc. have to be studied to enable the crew members to understand and to build better knowledge on the local realities.

B) Contacts

Each crew, through its leader, should start its work by contacting staff of the local forestry services in charge of the area where the tracts are located. These local staff may help contacting the authorities, community leaders and forest owners in order to introduce the field crew and its programme of work in the area. The local forestry 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 inform the local people about the project.

Depending on the social context in the country/region, the forest owners may be requested to provide the crews with a written authorization for their access to the property where the tract is located.

A recommendation letter written by the Forestry Department, asking for support and assistance to the field crew members should be issued to facilitate the work.

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

C) Preparation of the field forms

The Technical Unit of the project will prepare and print for each crew the necessary field forms to cover the tracts assigned to it. For each tract 5 field forms, of one or more pages, are needed. The forms are further described in the following section (section 4).

Some information will be filled in before going out in field: sections for **identification of the tract** and plots (header of each page), general information related to tract location, (**form F1, section A**), coordinates of the starting point of the plot (**form F2, section A**).

The use of secondary data sources, particularly maps, is necessary to determine information such as names of administrative centres (administrative maps), ecological zones

(FAO/FRA 2000 global ecological zones map). Some sections in the form may be filled in 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 crew leader must ensure that enough forms are available to carry out the planned field data collection.

D) Preparation of maps

Maps covering the study area should be prepared to help the orientation in the field. These may be enlarged and reproduced, if necessary.

Prior to the field visit, each crew must plan the itinerary to access the tract, which should be the easiest and least time consuming. Advices of local informants (local forestry staff, for example) are usually valuable and help saving time in searching the best option to access the tract.

The tract and plot limits will be delineated on topographic maps and eventually on aerial photographs/satellite images, if available. The spots that correspond to the starting point of the plot in the tract are to be indicated together with their respective coordinates in the map projection system as well as in decimal degrees (latitude and longitude). The first system is more precise and easier to apply when using the maps, and will be used in GPS.

An enlarged section of the map corresponding to the area surrounding the tract will be prepared (photocopy or printed copy) and used to draw the access itinerary to the first plot.

The plot order for data collection will vary according to conditions of accessibility. It is determined during the preparation phase.

Reference objects (roads, rivers, houses) that contribute to better orient the team in the field are identified during the planning phase.

The theoretic starting points of the plots are entered into the GPS receiver according to following: (Tract number) + (P=Plot) + (Plot number) + (T=Theoretic), e.g. for tract 13, plot 3: 013P3T.

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

- Starting point of the plots: Tract code + “P” + Plot code + “C” (“Captured”) (e.g. for tract 13, plot 3: 013P3C)

E) Field equipment per team

The equipment needed to carry out the inventory is composed of:

- Compass (360°)
- GPS receiver (Geographic Positioning System) and extra batteries
- Measuring tape 30-50m (metric)
- Diameter tape alt. calliper (metric)
- Tree height and land slope measuring equipment: clinometers
- 50 meter rope, marked at every 10 meters

- Coloured flagging
- 50 cm (length) galvanized steel bars for plot marking
- Waterproof bags to protect measurement instruments and forms
- (Binoculars)
- (Radio /mobile phone)
- Waterproof boots and outfits
- Machetes
- Emergency kit
- Topographic maps
- Supporting board to take notes
- Data collection forms
- Field manual
- Permanent markers and pens
- Flora and species list (common and scientific names)
- Clipboard
- Flashlight

3.4 Data collection in the field

A) Introduction of the project to the local people

If the tract area is inhabited, the team must establish contacts with local people and on arrival to the site, meet with contacted persons and others; village representative, closest forestry service in place, owners and/or people living in the tract area. In many cases, it will be necessary to contact the local population 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 visit and study. A map or an aerial photograph, showing the limits of the tract, may be very useful to facilitate the discussion. It is important to ensure that both local people and the inventory team, 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 from local people are essential to carry out the fieldwork. It is easier to achieve this support if the first impression is good. Nevertheless, it must be stressed that the fieldwork consists just 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 on during the presentation of the project to the local people

- This project is part of a programme for tree and forest data collection over the whole world.
- An objective of this study is to support national training in forests inventories and data collection on forest use by interacting with the local forest users.
- The data are collected from two sources: (1) Measurements of 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 crew is equally interested in the local people's perception on forest changes, the main forest products, forest related problems, and will therefore interview forest users.
- The outside world has little information about the local use of forests and about the problems that might exist at the local level. The collected forest and tree information will be used by the country and the international community. The objective is to generate reliable information for improved forest policies that takes into account people's reality and needs. Hopefully, this can lead to forest and tree resources being managed in a sound and sustainable way.
- The tracts where the survey will be carried out are distributed systematically throughout the country.
- The results from the study will be shared with the local community.
- Some or all of the tracts surveyed in the country will be monitored in the future, with the aim of assessing forest and tree changes.

Besides the presentation of the project, this initial meeting aims at solving logistic matters. After the general introduction, access to the forest, interview schedule, and food and accommodation issues, will be discussed. This meeting should also give the opportunity to start the interviews to collect socio-economical information. The number of people included in the field crew must be reduced to avoid giving the impression that the interviewers dominate the group. Historical information related to the changes in the area (see participatory exercise using aerial photographs in annex, section 5.5B) is 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 informants and focus groups for interviews. It is recommended to schedule the interviews that fit with the daily work-schedule of the people.

All the persons interviewed and providing information on the tract must be mentioned in the list of persons involved in the inventory (**form F1, section B**).

B) Access to plot

The plots will be located with the help of the topographic maps (and aerial photographs/satellite images, if available), where the plots have been delineated. Some reference points that facilitate the orientation in the field will also be identified on the maps. A local guide will be useful to access the plots more easily. Orientation in the field will be assured with the help of a GPS where the starting points of each plot have been registered as waypoints.

The order of the plots for data collection, decided during the preparatory phase, should be followed and the plot code and orientation must be respected (the collection task must start at the plot starting point).

While accessing to the first plot, **Form F2, section D** must be filled in. The co-ordinates of the departure location on foot towards the first plot must be read on GPS (or on the map, if the GPS does not capture a signal). A sketch representing the itinerary covered will be drawn on the site map (to be attached to the field form), with indications of the reference objects that will facilitate the relocation of the plot. The co-ordinates of each reference point are read on the GPS, and a reference photograph may also be taken. Then, the film and photograph codes will be reported in the form. The flagging coloured tape will eventually be placed along the access path, on trees, visible enough to facilitate the return out of the tract.

C) Establishment of permanent Plot

When arriving to the starting point of the first plot, a permanent marker (galvanized metal tube/bar) is placed into the ground. The marker must be placed exactly on the position of the starting point of the plot. In cases where obstacles obstruct such exact location (tree, rock, river etc.), the permanent marker should be placed as close as possible to the starting point of the plot.

Marker location data must be collected together with a starting point description of the plot in order to enable relocation in the future:

- the distance and direction (compass bearing in degrees, 360°) of the plot starting point measured from the marker location, must be measured in case that these two positions do not coincide ;
- three prominent reference objects (rock, largest tree, houses etc.) must be identified and the direction (compass bearing in degrees starting from the marker location) and distance from the marker measured.

These indications are recorded on **section 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 also be provided in a table (the columns containing the bearing and the distance from the marker position may be filled in according to the sketch indications after the field work).

D) Data Collection in the plot

The data collection starts at the plot starting point and continues in predefined direction (see prepared maps and Figure 2. The progress along the central line will be made with the help of the compass. In order to facilitate the bearing, flagging coloured tape may be stretched along the central line and attached to trees, as the field team advances.

Measurements involve both sides from the central line on a 10m wide extension. Flagging coloured tape may also be placed on the corners and limits of the plot (at 10m from the central line) as the team advances, in order to easily identify the trees within the plot.

Different variables are collected according to the data collection level dealt with (Table 4):

- **Plot:** measurements of large trees ($D_{bh} \geq 10\text{cm}$). These data are to be recorded in form **F3a or b (one for each plot)**. A sketch of the plot must be completed in form **F2 (section C)**. All details of the plot must be indicated. In particular, the following characteristics will be drawn:
 - general characteristics such as crossing of water courses, roads, fences;
 - Limits between land use sections;
 - In addition, the sketch must also include all the information and observations that help interpreting the plot.

- **Land use/forest type section (LUS):** corresponds to the land use/forest type sections identified along the plot. Information collected at this level will be contained in the form **F5** (one for each LUS, thus there will be as many forms as there will be land use/forest type sections). Data collected at that level is general information related to the area (legal status, designation, environmental problems etc., in **section A**), stand management and structure (harvesting, silviculture, in **section B**). Information on forest and tree uses (forest products and services, is registered in the form **F6**.

- **Subplots (SP):** topographic and edaphic (soil) data together with small diameter tree and tree regeneration data are collected inside forest at this level. Data related to tree regeneration from subplots level 2 (SPL2), and topographic and edaphic information, collected at the three measurement points (MP), are registered in form **F4**. SP and MP are established only if they are located in a LUS classified as “forest” or “other wooded land”.

(i) Tree measurements

All trees over 10 cm of diameter at breast height (DBH) found within the plot are measured (Table 5) and these data are recorded on field form **F3a** or **F3b**. Trees located at the border of the plot will be considered as inside the plot if at least half of the stem diameter is inside at breast height.

For smaller diameters, measurements are carried out within the subplots, located at every 120 meters (see figure 2). The size of trees measured at subplot level 2 (SPL2) is between 0 and 10 centimetres Dbh (see Table 4).

Table 4. Trees measured per level and corresponding forms

Level	Measured trees		Form
	Forest	Outside forest	
Plot	$D_{bh} \geq 10\text{ cm}$	$D_{bh} \geq 10\text{cm}$	Form F3a or F3b
Subplot level 2 (SPL2)	Tree height $\geq 1,3\text{m}$ to DBH $< 10\text{ cm}$	None	Form F4 (section B)

Tree regeneration (tree height $\geq 1,3\text{m}$ and Dbh $< 10\text{ cm}$), within SPL2, are only counted by species. Only tree species (species reaching 5 m *in situ*) are recorded. For small diameter trees collected data are more complete and include, besides the species identification, height, diameter, health and tree quality. Indications on the diameter and tree height measurement methods are provided in appendix (see section 0).

(ii) Forest products and services

Data on forest products and services are collected at the LUS level. The information will essentially originate from interviews or from people accompanying the inventory crew in the field. At least two crew members should be committed to this task. Interview and group discussion techniques and instructions are included in section E). The information should also be verified 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 completed, the time is recorded on **form F2 (section B)** and the crew need to access to the second plot. If the forest cover allows it, it is possible to directly access to the plot with the help of the GPS. Otherwise it may be assured by measuring 250 m (horizontal distance) along the central line of the previous plot. If the starting point of the next plot to be reached is not accessible on a straight line, the obstacle must be bypassed using auxiliary methods that allow finding the original line.

E) Interviews

Two major user groups should be interviewed:

- external key informants;
- forest and tree users (considered as individuals or focus groups).

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

Table 5 shows an overview of people/groups of people that may provide information.

Table 5. Interviews

Groups/individuals to be interviewed	How to contact, identify them?	Where?	When?	Information
Key external informants: local forest services, organizations and local administration representatives etc.	By phone, correspondence or visit	At office	During the planning phase of the fieldwork or/and before reaching the site	Logistics, access to the plot, general information on the population, information on silviculture and land tenure, tree and forest resources uses etc.
Focus groups or individuals: tree and forest resources users, forest dependant people (owners, women, men, hunters, residents...)	Recommended by external key informants Rapid rural appraisal to identify the stakeholders	At their house/ or in the village On the studied site (transect walk, persons working in the field work) Met close to or within the site	Introduction meeting with the local people Previously fixed meeting (group or individual meeting)	Forest and trees management and uses, forest products and services. Data on population (history etc.)

(i) Identifying external Key informants and focus groups and individuals

• **Identifying external key informants:**

Key informants are external individuals with particular knowledge about the area, the forest and the people. They don't have to be local forest users themselves.

How to identify external key informants? In the process of planning of the fieldwork, local foresters, representatives from local development organizations and local administration will be contacted for logistics and planning activities. Some of these people may provide very useful background information and they will be selected as key informants.

Key informants may sometimes be interviewed before going to the sampling site. Often the key informants have knowledge about conditions of the accessibility to the site. They may also provide literature and other existing data.

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

• **Identifying focus groups and individuals**

The focus groups are defined as people who relate and use the forests on a frequent basis. These people might live in or close to the tract, they may be foresters or forest owners. They may be interviewed in groups (focus groups), or individually.

How to identify focus groups? Upon arrival of the field team 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, or through a RRA exercise on identifying key stakeholders.

Representative character 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 share common characteristics and are classified within the same group, for analytic purpose. Nevertheless, wide variations in cultural and social factors (sex, age, health, status, religion, etc.) often exist and should be taken into account. Therefore, it is recommended to identify stakeholders together with local participants in order to appropriately define the forest user groups. Many groups might be identified but the study must emphasise on the individuals and groups that use forest products and services.

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

(ii) Data collection from interviews

Data collection from interviews may be organized as follows:

- First, data may be collected from external key informants **before going to the field** (planning phase). 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 tract may be collected from external key informants and cross-checked with the focus groups;
 - o Variables related to the use of forest products and services at the level of the LUS.

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

General explanations on the data collection techniques and group discussions and interview recommendations are provided in an annex (section 5.5). Among the tools and techniques that may be adopted there are:

- **Participatory analysis of aerial photographs and 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, with identified focus groups. This work allows collecting essential information both on the variables (what forest and tree resource uses, who uses, where, etc.) and on the logistics, in order to find out how the field crew can access to the tract.
- **Direct observation**, shown in annexes, is a very important tool for data collection and cross-checking of information from the interviews;
- **To carry out interviews within the tract itself**, by organizing, for instance, a transect walk (see annexes, section) or by collecting information from locally recruited workers who participate to the plot measurement work. This will allow to better link collected data with the location of the tract/LUS in the field.

- **Stakeholder identification analysis exercise** (see below), might be a good opportunity to discuss the use of forest products and services.
- Cross-checking may be applied as much as possible (see annexes).

A list of variables and formulated questions to address these variables during the interviews are suggested below (see annexes). These questions are clear and simple in order to be easily understood by the interviewee. Nevertheless, it must be stressed that a lot of flexibility is necessary when addressing the questions. These are not pre-formatted and are only suggestions. Questions will be asked in the order that is the most natural and should not be repeated. When formulating the questions, interviewee's culture and language must be taken into account.

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

- Background information on the tract and access to it (form F1, section A) :**

- **Administrative division (7-10):** “ *What is the name of the administrative/ province/village and the local name of the area?* ”

- Information on the people living in the tract or in the surroundings (form F1, section C) :**

- **Population on tract (21) :** “ *How many people live in the tract?* ”
- **Population dynamics (23) :** “*Have most people in the area been living here a long time?* ” or “*Have you seen a lot of changes the last 10 years in people coming or going?* ”. If there have been changes “*Why?* ”
- **Main activity (24):** “*How would you describe the main occupation of the people living in the tract?*”. Cross-checking of direct observations and information provided by the interviewees may 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 **(26-31):** “*What is the distance from the tract to the closest permanent road, etc.?* ”

External key informants may also have an opinion on variables that should be asked to the focus groups, such as: most important forest products and services, ecological problems, rights and conflicts. One should 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 is provided by the focus groups, it must be cross-checked with the data provided by the key informants and observations (see annex, section 5.5C).

- **Data provided by the focus groups**

Some questions related to the tract (**Form F1, part C**) may also be asked to the focused groups, when analysing the maps, especially:

- **Population dynamics (23):** “*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 a family of their own or do they go to the city? Who are the people that stay and those who leave?* ”

The focus groups will essentially provide data on the **forest uses and forest products and services (form F6)**.

Several exercises may be organized to identify the various forest products and services, as well as their use and to rank them according to their importance.

Products and services identification exercise and their use:

It is important to clarify with the users in which LUS they collect the various products. The different stages of such exercise are as follows:

- 1) Make a list of the Land use/forest types (if necessary);
- 2) Ask which are the forest products and services used in the tract: *“Here, where we are standing (if in the tract) – or in this area on the aerial photograph/map (point it), what are the forest products that your family (/you/the village) extract?”*, *“What do you use the product for?”*, *“What is the local name?”*
- 3) Let the focus group think about the products they collect and note them down on a flipchart or paper. If you feel that some are left out, you might ask some indirect questions such as: *“are there any medicinal healers here ”* (if yes, does this mean that they must be extracting medicine plants etc.), *“What do you usually cook with? Firewood, electricity or gas?”*
- 4) Remember gender issues and try to organize focus groups by groups of men and women separately. At least when discussing preference and importance of the products and services.
- 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.

The different uses will be noted afterwards in the appropriate column of **form F6** and, if possible, an attempt must be done to find the species in the field.

Variables that can be explored and related questions (suggestions):

- **Products and services (99):** *“Which are the products that you collect in this part of the forest?”*
- **Frequency of activity/extraction (108) :** *“How often do you you harvest this product/practise this activity?”*
- **Trend (109):** *“Did you (or your family) extract as much of this product now as 5 years ago?”*
- **Change reason (110):** if there has been any change in the quantity of extraction/activity, *“Why is it so?”*
- **Demand trend (105):** *“Do you need more of this product?”* or *“Is the quantity you extract nowadays enough to satisfy your need ? ”*

Forest products and services preference ranking

When all the forest products and services are listed, a discussion may start about which products are considered most important. Be aware that the criteria for ranking may vary between groups: *Is time an important factor? Is economic value important? May this product be bought or replaced by another one?* If a disagreement exists in the ranking, it should be noted because it is a finding in itself.

Some exercises to provide an overview of local importance of forest products and services are given in Appendix.

Other variables related to the forest products and services:

- **Harvester (101):** *“Which are the user groups that harvest and use this product/practise this activity?”*
- **User rights (103):** *“Who has the right to harvest/use this product/ to practice the activity? 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?”*
- **User conflicts (104):** *“Related to the product that we have discussing about, do you feel that there exist any disagreements, either with other local people or externals, about harvesting or using this product?”*

4. Description of field forms

There are 6 different forms, as indicated in the below table.

Table 6. Field forms description and corresponding information level

Form no.	Information
F1 Form	Tract
F2 Form	Plot: Marker position and plot scheme
F3a/b Form	Plot: Trees and stumps ≥ 10 cm diameter measurements
F4 Form	Subplots: Edaphic and topographic measurement points and tree measurements within the circular sub-plots (DBH < 10 cm)
F5 Form	LUS: General information, stand structure and management. forest products and services
F6 Form	Forest products and services

4.1 F1 Form: Tract

This form will be filled for each tract (1km x 1km). It contains general information related to the tract location and identification; information on the people living in the surrounding area of the tract and on the distance to the main infrastructures. The name list of persons involved in the inventory is also included.

Headline: identification of the tract

1. NFI Lebanon

- F1 -

2. Tract N°

TRACT

- **Country name (1)**
- **Tract N° (2):** identification number of the tract (from 1 to total tract number). See map with tracts (Figure 1).

A. Tract location

7. Mohafaza	11. GEZ	C	<i>Coordinates Tract south-west corner</i>
8. Caza	12. Altitude Tract centre	m	14a. Latitude _ _ , _ _ _ _ ° N
9. Village	13. Map Name, N°		14b. Longitude _ _ , _ _ _ _ ° E
10. Locality.....	13c. Aerial photo, N°		13d. Projection.....

- **(ADM1) Mohafaza (7)** : name of the mohafaza where the tract is located
- **(ADM2) Caza (8)** : name of the caza where the tract is located
- **(ADM3) Village (9)**: name of the village where the tract is located
- **(ADM4) Locality (10): Other administrative divisions**
- **Global Ecological Zone (GEZ) (11):** name of the ecological zone where the tract is located, based on the FRA ecological zones map. The various classes are as follows :

GEZ class	Code
Tropical rain forest	Tar
Tropical moist deciduous forest	Tawa
Tropical dry forest	Tawb
Tropical shrub land	TBSH
Tropical desert	TBWh
Tropical mountain	TM
Subtropical humid forest	SCf
Subtropical dry forest	SCs
Subtropical steppe	SBSH
Subtropical desert	SBWh
Subtropical mountain	SM
Temperate oceanic forest	TeDo
Temperate continental forest	TeDc
Temperate steppe/prairie	TeBSk
Temperate desert	TeBWk
Temperate mountain	TeM
Boreal coniferous forest	Ba
Boreal tundra woodland	Bb
Boreal mountain	BM
Polar	P

- **Altitude (12):** altitude in meters above the sea level of the central point of the tract.
Can be determined from a topographic map or from GPS.
- **Map name, N° (13):** reference of maps (name, number)
- **Aerial photograph, name and N° (13c):** aerial photographs (orthophoto), or satellite images used (date, co-ordinates)
- **Co-ordinates tract south-western corner (14 a and 14b):** latitude (14a) and longitude(14b) in decimal degrees of the south-western corner of the tract.
- **Projection**

B. Crew/Owner/Informant list (15-20)

			18. Crew	18a Crew leader	19. Owner	20. Informant*				
B. Crew/Owner/Informant list										
15. Name	16. Address	17. Phone number				O	E	M	S	X

This table will include **name (15)**, **address (16)** and **telephone number (17)** of:

- **Crew members (18):** the crew members working in the tract. In this case, “crew” will be ticked.
- **Crew leader (18a):** the leader of the crew in current tract will be ticked.
- **Owner (19):** owner(s) of all, or part of the land where the tract is located. In this case, “owner” will be ticked.
- **Informant (20):** the persons interviewed in the tract referred by a code indicating existing relationship between the informant and the tract :

Options	Description/definition	Code
Estate owner	Owner of a plot within the tract	O
Employee	Person working in the tract	E
Manager of site	Person responsible for natural resources management in the tract	M
Settler	Person living in the tract	S
External	External key informant, with a knowledge about the tract	X

C. Population

21. Population on site	<input type="text"/>
23. Population dynamics	<input type="checkbox"/> C
24. Permanent population main activity	<input type="checkbox"/> C
24a. Overall population main activity	<input type="checkbox"/> C
25. Settlement history	<input type="checkbox"/> C

- **Population on site (21):** estimation of the number of people living in the tract
- **Population dynamics (23):** trend of the population living in or close to the tract, in the past 5 years. To be indicated according to an option list:

Options	Description/definition	Code
Not applicable	No inhabitants in the tract	0
Decreasing	The population living in the site decreased during the last 5 years	1
Not changing	The number of people living in the site remained stable during the last 5 years	2
Increasing	The population living in the site increased during the last 5 years	3
Not known	There is not enough information to estimate this trend	90

- **Permanent Population main activity (24):** income generation and employment sources of most of the permanent population living within the tract. The expression “income generation” refers to activities to satisfy basic needs such as food and housing, i.e. self-sufficient farmers or as workers in the town. These data are entered according to an option list:

Options	Description/definition	Code
Not applicable	No inhabitants in the tract	0
Agriculture	Farming activities	1
Livestock/Herding	Pasture, herding	2
Forestry	Livelihood and income generation provided by the forest and related activities, including processing and marketing of forest products	3
Urban/Peri-urban	Work in the town or in the industrial sector – income generated from services.	4
Tourism	Income generated from tourism or activities related to recreation.	5
Not known		90
Others	To be indicated. Includes subsidies, etc.	

- **Overall main activity (24a):** income generation and employment sources of most of the total population including both permanent and seasonal population living within the tract. These data are entered according to an option list:

Option list same as for 24, see previous.

- **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
Not applicable		0
Wars/conflicts		1
Land Tenure change		2
Agricultural expansion		3
Agricultural contraction	Abandoning of agriculture fields and pastures due to urbanisation etc.	4
Urban expansion	Electric line, road, channel, etc. recently installed in any plot	5
Socio-economic crisis	Change in consumption patterns due to drastic change in income generation	6
Others	To be indicated	

D. Proximity to infrastructure

<i>Distance from Tract centre to:</i>			
26. All-weather road	___, _ km	29. Hospital	___, _ km
27. Seasonal road	___, _ km	30. School	___, _ km
28. Settlement	___, _ km	31. Market	___, _ km

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

E. Activity presence

<input type="checkbox"/> 24b. Beehives
<input type="checkbox"/> 24c. Charcoal places

- **Beehives (24b):** Activity indicated in checkbox
- **Charcoal production (24c):** Activity indicated in checkbox

Reference points of access path: these points will be used to retrieve the tract in the future.

Reference points of access path

36. Description	37a. Latitude N	37b. Longitude E	36b. Photo #	40a. Bearing

The following data must be filled in for each tract:

- **Description (36):** Brief description of reference point (i.e. road, river, house, rock...)
- **Latitude (37a) and longitude (37b):** Position given by GPS (decimal degrees)
- **Photo ID (36b):** “Three-digit tract number” + “-0.” + ”running photo on the access path to tract” (e.g. the 3rd photo taken on the access path to of tract number 028 = 028-0.3)
- **Bearing (40a):** Compass bearing in which the photo is taken (from 0 to 360 degrees)

Notes (38): General notes concerning the whole page

38. Notes:

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

1. NFI Lebanon

2. Tract N^o 3. Plot N^o

- F2 -

PLOT

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

D. Plot Access

Position when leaving road	34i. Time when leaving road: ___:___ h
34e. Lat _____ N	34j. Time when arriving at plot: ___:___ h
34f. Long _____ E	

- **Position when leaving road - latitude (34e) and longitude (34f) (in decimal degrees):** at the closest road accessible by motor vehicle;
- **Time when leaving the road (34i):** time when leaving vehicle to access the tract by foot (hour : minutes);
- **Time when arriving at the plot (34j):** time when arriving at the plot (hour : minutes) including time for establishing plot start point.

A. Plot start point description:

Plot start point (calculated):	Marker coordinates (GPS reading):
39a. Lat _____ N	40a. Lat _____ N
39b. Long _____ E	40b. Long _____ E
	41. Distance from Marker to Plot start point <input type="text"/> m
	42. Bearing from Marker to Plot start point <input type="text"/> °

Central line bearing:
 Plt #1 = 0°
 Plt #2 = 90°
 Plt #3 = 180°
 Plt #4 = 270°

M = Marker position
 P = Plot start point, if P ≠ M for any reason

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

Plot start point (calculated)

- **Latitude (39a) and Longitude (39b):** the coordinates of the plot start point according to the geographic projection of the topographic map (in decimal degrees).

Marker position (GPS reading)

- **Latitude (40a) and Longitude (40b):** Longitude and Latitude in the geographic projection (in decimal degrees).
- **Distance from marker to plot start point (41):** distance in meters from the plot starting point to the marker (equal to “0” if the marker and the starting point are the same)
- **Bearing from marker to plot start point (42): compass bearing** (from 0 to 360 degrees) from marker to the plot starting point (equal to “0” if the marker and the plot starting point coincide)
- **Photo ID (36c):** “Three-digit tract number” + “-“ + ”plot number” + “.” + ”running photo number within plot” (e.g. the 3rd photo taken in the 2nd plot of tract number 028 = 028-2.3)

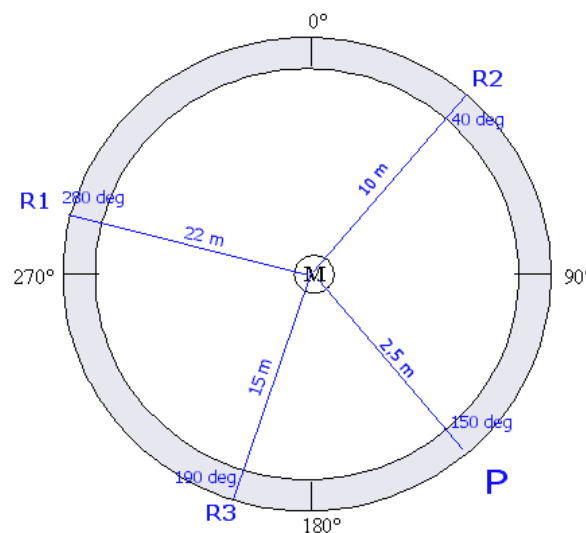
Plot start point plan (43):

Accurate, and if possible, permanent reference points must be described (45) in order to find the marker (i.e. rock, house, bridge, dominant/outstanding tree, etc.). The orientation, and distance of three reference points, from the marker should be measured. The three bearings should preferably be as different as possible and not in alignment.

The scheme centre corresponds to the marker (“ M ”). The plot starting point (“ P ”) and the reference points must be located, by indicating the distance (47) and bearing (46) (from 0 to 360 degrees) from the marker.

A recommendable supplement to the registration of reference points is to photograph each reference point from the marker position (36c).

Plot starting point plan - example



Reference points surrounding marker position - example

Reference points surrounding Marker position

44. ID	45. Description	Bearing* 46. (°)	Distance* 47. (m)	Photo# 36c
1	North side of rock	280°	22	028.1.1
2	West corner of house	40°	10	028.1.2
3	Big tree (Cedrus libani) Dbh=160 cm	190°	15	028.1.3

* From Marker position

B. Time record of work within Plot

Starting:		Ending:	
48. Date: __ / __ / __		50. Date: __ / __ / __	
49. Time: __ : __ h		51. Time: __ : __ h	
49b. Time2: __ : __ h		51b. Time2: __ : __ h	

- **Starting Date (48):** Starting date of measurement in the plot (day / month / year)
- **Starting Time (49):** Starting time of measurement in the plot (hour : minutes)
- **Starting Time2 (49b):** If measurement in the plot cannot be completed in one day “Starting Time2” indicates the starting time on the second day of measurements in the plot (hour : minutes)
- **Ending Date (50):** Ending date of measurement in the plot (day / month / year)
- **Ending Time (51):** Ending time of measurement in the plot (hour : minutes)
- **Ending Time2 (51b):** Ending time of measurement in the plot (hour : minutes) at second measurement day

C. Plot plan (52): Scheme displaying plot layout

The scheme represents the plot as a whole. The starting point is located at the bottom of the page. The central axis of the plot (X axis) at 0 m on the Y axis. The circular subplot centres (located on the central axis, at 5 m, 125 m and 245 m).

The following elements should be included:

- Borderlines of the LUS, including the codes of the land use classes in the corresponding polygons.
- The intersections with infrastructure (roads, paths, water courses etc., including the code of the road/water course).

Codes must be attached to the lines according to the legend included in the form (water course, road type).

In the plot plan, any explanatory notes may be written. When entering the fieldwork data in the database these notes must be entered in the field **52a** plot plan notes in the database.

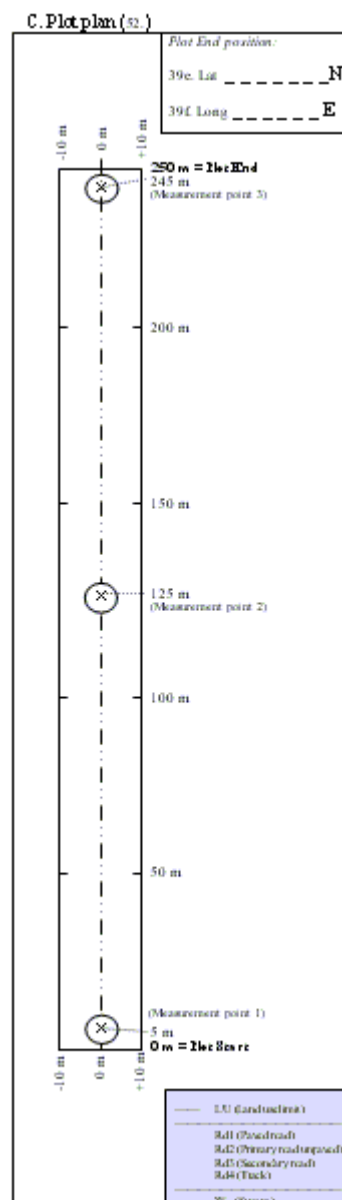
Notes(53): (general notes concerning the whole page).

53. Notes:

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4.3 F3 Form: Tree measurement - Plot

This form consists of a table where information related to all the trees and stumps measured in the plots will be entered. Exempt from this are trees of small diameters (height over 1,3m and D_{bh} under 10 cm), whose data, collected at subplot level will be reported in the F4 form.

The table in form F3 will therefore contain the data related to trees and stumps with $D_{bh} \geq 10$ cm present in the subplot. When a stump is lower than 1.3m the diameter is measured at stump height (D_{sh})

4. LUS Nº	55. Tree Nº	Species		Tree/Stump location			58. D_{sh}	59. D height	60. Year(s) since cut	61. Total height	Health	
		56a. Common name	56b. Scientific name	57a. Along Plot axis	57b. Left axis	57c. Right axis					64. Condition	65. Causing element
				(m)	(m)	(m)	(cm)	(m)	C	(m)	C	C

General data to identify and find the tree/stump

- **LUS No (4):** Identification code, LUS number (from 1 to number of land use sections) where the tree/stump is found
- **Tree No (55):** Tree identification number. Trees are numbered consecutively in the order they are measured.
- **Species**
 - **Common name (56a):** Common/Local name of tree species
 - **Scientific name (56b):** Scientific name of tree species
- **Tree/Stump location:** Tree/Stump location in plot
 - **Along plot axis (57a):** Horizontal distance in meters along the plot axis from plot starting point to the tree (from 0 to 250 m)
 - **Left or Right axis (57b):** Horizontal distance in meters from the plot central axis to the tree (from 0 to 10 m).

Variables to be measured

- **In the case of a tree**

- **D_{bh} (58):** Diameter at breast height (1,3m) in centimeters (see appendix section 5.2A)
- **D_{height} (59):** Diameter measurement height in meters (if different from breast height)
- **Total height (61):** Total tree height in meters (see appendix section 5.2B)

Health:

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

Options	Description/definition	Code
Healthy	A tree is healthy when it does not show symptoms of disease or presence of parasites that have any substantial affect on the tree's growth and vitality.	1
Slightly Affected	A tree is slightly affected when it shows symptoms of disease or presence of parasites that to some extent affect the tree's growth and vitality.	2
Severely Affected	A tree is severely affected when it shows symptoms of disease or presence of parasites that substantially affect the tree's growth and vitality without being lethal.	3
Dead/dying (standing) tree	A tree is dead when none of its parts are alive (leaves, buds, cambium) at 1,3m or above. Standing	4
Dead/dying (fallen) tree	A tree is dead when none of its parts are alive (leaves, bud, cambium) at 1,3m or above. Diameter of a fallen tree is measured at the estimated previous breast height. Fallen	5

- **Causing agent (65):** Causing agents that have been identified (diseases, insects, animals, etc.) according to option list:

Options	Description/definition	Code
Not applicable	Healthy tree, with no signs of disease, parasites, etc.	0
Insects	Traces of insect attacks	1
Disease/Fungi	Fungus or other disease	2
Fires	Burned	3
Animals	Damage due to wild or domestic animals	4
Humans	Human induced damage (cuttings, bark damage...)	5
Climate	Damage induced by climate (wind, snow, lightning, etc.)	6
Other	To be specified	

Branches: Up to four major branches (mean diameter > 25cm and length > 2m) per tree should be measured if the branches represent a relatively large proportion of the tree woody volume.

- Branch Diameter (66a-d): Mean diameter of measured part of branch
- Branch Length (67a-d): Length of measured branch

• **In the case of a stump**

- **D_{bh} (58):** Stump diameter (cm) at breast height
- **D_{height} (59):** Diameter measurement height (if different from breast height)
- **Year(s) since cut (60):** Estimated time since the tree was cut according to option list:

Options	Description/definition	Code
< 1 year		1
1 – 5 years		2
6 – 10 years		3
> 10 years		4

Total height (61): Stump height in meters, to be indicated only if stump is more than 1,3m.

Tree Notes (68): Notes concerning the trees

68. Notes:

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4.4 F4 Form: Tree regeneration and edaphic measurements - Subplots

This form contains the information on tree regeneration on the circular subplots as well as edaphic variables from the measurement points, MP. **Subplots are only established in forest and other wooded land.**

Plot identification

- **Tract N° (2):** identification number of the tract (from 1 to total number of tract).
- **Plot N° (3):** identification number of the plot (1 to 4):

A. Topography and Soil

These variables are collected in three fixed measurement points located in the centre of each subplot (edaphic measurement points).

This form includes three boxes corresponding to the three measurement points.

Measurement point N° 1	Measurement point N° 2	Measurement point N° 3																																																															
4a. LUS N° <input style="width: 40px;" type="text"/>	4b. LUS N° <input style="width: 40px;" type="text"/>	4c. LUS N° <input style="width: 40px;" type="text"/>																																																															
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Measurement point

- **LUS N° (4):** identification code, LUS number (from 1 to number of land use sections) where the subplot is located.
- **Exposition / Aspect (70):** slope orientation at measurement point. To be indicated as compass bearing based on **360°**.
- **Slope (71):** the average inclination at the measurement point. To be indicated in %.

Relief (72): topographic position of subplot. Characterized by micro relief. To be indicated according to option list

Options	Description/definition	Code
Flat terrain	Flat terrain with $\leq 5\%$ slope	1
Upper valley slope	Upper valley slope	2
Middle valley slope	Middle valley slope (slope $>5\%$)	3
Lower valley slope	Lower valley slope	4
Bench	Horizontal zone of average width over 30 m interposed by a hillside (slope $\leq 15\%$) or terrace over 6 m width	5
Valley depression	Enclosed depression or confinement situation at the bottom of a small, narrow or anticlinal valley	6
Summit	Crest of any kind, sharp, rounded crest or escarpment	7
Wide valley depression	Large valley or very wide depression in the bottom of a small valley	9

- **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 subplot). To be described according to option list:

Options	Description/definition	Code
Fine	No sound when rubbed between fingers. Plastic and possibly even slippery when handled. Can be formed into a string	1
Medium	Makes a (light) sound, when rubbed between the fingers close to the ear. Allows to be formed into a stick of cigarette size or possibly thinner.	2
Coarse	A wet sample does not stain hands or is only slightly sticky. Cannot be formed	3
Rock	Surface rock	4

- **Soil drainage (74):** average soil drainage within subplot. To be described according to option list:

Options	Description/definition	Code
Very dry	The water/humidity does not stay in the soil during several month	0
Dry	The water/humidity does not stay in the soil during several weeks	1
Temporarily wet	Land inundated during the wet and part of the dry seasons	2
Permanently wet	Land covered with water all year around, such as lakes, swamps and mangroves, etc.	3

- **Organic matter (75):** is defined by the thickness of the organic matter stratum at the centre of the subplot. To be indicated according to option list:

Options	Description/definition	Code
Absent		0
< 1 cm		1
1-5 cm		2
> 5 cm		3

- **Subplot Area (76a-c):** area of the subplot in square meters. The default area is 50m². Only the area covered by forest and other wooded land should be registered. If part of the subplot falls into “other land” or “inland water” this area should be reduced accordingly.

**B. SUBPLOTS - Tree regeneration
(trees above 1,3m height with D_{bh} <10 cm)**

As in previous cases, this section must be filled for each subplot that falls into forest or other wooded land. The table includes columns for the tree species and their numbers in each subplot.

B. SUBPLOTS – Tree regeneration measurements, Coppice and Shrub measurements (0cm < Dbh < 10cm)

77a. Species Name	78aa. Counts			78. Total number		
				R*1	R*2	R*3
Regeneration						
Coppice	78da. Stems/unit	78db. Diameter	78dc. Height			

For every shrub/coppice unit (i.e. woody plants with multiple stems):

- the name of the species (scientific and / or common) should be registered in **77a species name** (one line per shrub / coppice).
- number of stems per shrub/coppice unit should be registered in **78da Stems / unit**

- average diameter of stems in shrub/coppice unit should be registered in **78 db Diameter**
- average height of stems in shrub coppice unit should be registered in **78dc Height**
- **78aa Counts:** can be used while counting stems in regeneration and in coppice/shrub.
- In **78 Total number** for noting the number of shrub coppice is found in each subplot.

For woody plants with a single or well defined stems:

- name of the tree species (scientific and / or common) should be registered in **77a species name**
- total number of plants of every tree species (with a D_{bh} less than 10cm) present in subplot should be registered in **78 Total number** under the respective subplot number (one line per species)
- **78aa Counts** can be used while counting the number of individual plants by species
- **78da-c** do not apply to single stemmed trees

Non-Wood forest products:.

77c. NWFP	77d. Exploited			77e. Exploitable			78aa. Counts	78. Total number		
	N°1	N°2	N°3	N°1	N°2	N°3		N°1	N°2	N°3
<i>Ferula sp.</i>										
<i>Gundelia tournifolii</i>										
<i>Origanum sp.</i>										
<i>Rheum ribes.</i>										
<i>Salvia sp.</i>										
<i>Thymus sp.</i>										

- **Scientific name (77c):** names of herbs with checkboxes for each subplot if they are **Exploited (77d) (at least 30% exploited)** or **Exploitable (77e)**.
- **Counts (78aa):** allows to count individuals, per species, present in subplot;
- **Total number (78):** sum of the individuals of the species present in subplot

4.5 F5 Form: land use/forest type section (LUS)

This form will be filled in for each LUS and contains general data related to the LUS as well as data on forest structure and management and the use of forest and tree resources.

1. NFI Lebanon

- F5 -

2. Tract N° 3. Plot N°

LAND USE SECTION

4. LUS N°

A. General

80. Land use <input type="text"/> C	84. Environmental problems
81a. Width <input type="text"/> m	0 Not Applicable (urban areas...)
81b. Length <input type="text"/> m	1 Not existing
92. Tree canopy coverage <input type="text"/> C	2 Loss of water levels in rivers...
82. Designation/ prot. status <input type="text"/> C	3 Drought
83. Land tenure <input type="text"/> C	4 Inundation
Future Trees:	5 Poor water quality
88. Expected <input type="text"/> C	6 Pests
89. Desired <input type="text"/> C	7 Erosion
	8 Loss of soil fertility
	9 Burning
	10 Landslide
	11 Windthrow
	12 Overexploiting forest resources
	14 Overgrazing
	90 Not known
	Other

B. Woodland management and structure

90. Stand origin* <input type="text"/>	<input type="text"/> N <input type="text"/> P <input type="text"/> C <input type="text"/> nk	
91. Stand structure <input type="text"/> C	94. Disturbances <input type="text"/> C	85. Fire occurrence <input type="text"/> C
92a. Shrub coverage <input type="text"/> C	94a. Grazed <input type="text"/>	86. Fire area <input type="text"/> m ²
92b. Shrub height <input type="text"/> C	94b. Pruned <input type="text"/>	87. Fire type <input type="text"/> C
95. Timber exploitation	96. Silviculture	97. Technology used
1 No felling	1 No practice	0 Not Applicable
2 Clearing	2 Improvement	1 Manual
3 Selective felling	3 Release of desirable trees	2 Chainsaw
4 Group felling	4 Removal of undesirable veg.	3 Mechanised (tractors)
5 Strip felling	5 Enrichment	90 Not known
Other	6 Sanitary cutting	Other

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

98. Notes:

Plot identification

- **Tract number (2)** : from 1 to number of tracts in the country
- **Plot number (3)** : from 1 to 4
- **LUS number (4)** : from 1 to the number of LUS identified

A. General : This section should be filled out for all LUS

- **Land use (80)**: alphanumeric code describing the land use/forest type in the LUS, according to classification described in part 2.
- **Width (81a)**: average width of the LUS in meters
- **Length (81b)**: average length of the LUS in meters
- **Tree Canopy coverage (92)**: ground surface covered by the vertical projection of the tree canopies, expressed as percentage of the total ground area. To be indicated according to option list :

Options	Description/definition	Code
No trees		0
< 5%		1
5-10%		2
10-40%		3
40-70%		4
>70%		5

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

Options	Description/definition	Code
Production	Forest and other wooded land outside protected areas. Includes concessions, exploitation licenses, community forests, etc.	1
Conservation	Strictly protected area. It corresponds to category I , II and III of IUCN protected areas (see Annex)	2
Managed protected area	Conservation through active management. It corresponds to categories IV and V of IUCN protected areas. (see annex)	3
Not known	No information available	90
Other	to be specified	

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

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

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

Options	Description/definition	Code
Not applicable	Ex. Urban areas	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
Loss of soil fertility		8
Burning		9
Landslide		10
Windthrow	Including storms, cyclones, hurricanes...	11
Overexploitation of forest resources		12
Overgrazing		14
Not known		90
Other	To be specified	

Future Trees

- **Trees expected (88) :** Trend in tree density expected in LUS within 10 years. To be captured through interview and indicated according to option list:

Options	Description/definition	Code
Increasing	Increased tree density expected within 10 years	1
Decreasing	Decreased tree density expected within 10 years	2
Stable	No change in tree density expected within 10 years	3

- **Trees desired (89) :** Trend in tree density desired in LUS within 10 years. To be captured through interview and indicated according to an option list:

Options	Description/definition	Code
Increasing	Increased tree density desired within 10 years	1
Decreasing	Decreased tree density desired within 10 years	2
Stable	No change in tree density desired within 10 years	3

B. Woodland management and structure : This section should be filled out only for LUS within forest and other wooded land

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

Options	Description/definition	Code
Natural	Natural regeneration of stand	N
Plantation	Artificial regeneration by sowing or planting	P
Coppice	Regeneration by shoots from stump or roots	C
Not known		nk

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

Options	Description/definition	Code
Not applicable	Non forest area	0
Single layer	Stand with only one well-defined layer formed by the tree canopies	1
Two-layer vegetation	Stand with two distinct canopy layers, an upper layer (a dominant canopy layer with two thirds above the lower layer, forming a clearly defined layer with at least 20% cc) and a lower layer (under storey).	2

- **Shrub coverage (92a):** vertical projection of the shrub canopies as percentage of the total ground area. To be indicated according to option list:

Options	Description/definition	Code
<10%		1
10-40%		2
40-70%		3
>70%		4

- **Shrub height (92b):** average height of the shrubs expressed in meters

- **Disturbances (94):** impact level of human activity in the forest or other wooded land. To be indicated according to option list:

Options	Description/definition	Code
Not disturbed	Protected areas, all resources conserved	1
Slightly disturbed	Forest/other wooded land where exploitation of goods and services is carried out according to management plans	2
Moderately disturbed	Many products collected without support in management plans, concept of sustainability not respected	3
Heavily disturbed	Heavily disturbed (removal of products at rates higher than Mean Annual Increment (MAI), biodiversity degradation due to high pressure on selected species, encroachment of agriculture leading to high rate of deforestation)	4

- **Grazed (94a):** Activity indicated in checkbox
- **Pruned (94b):** Activity indicated in checkbox
- **Fire occurrence (85):** the presence of fire evidence in the LUS. To be indicated according to options list:

Options	Description/definition	Code
No evidence of fire	There is no evidence of fire in the LUS	1
Recent fire	Evidence of fire during the current season/year	2
Old fire	Evidence of fire during previous years but not during current season	3

- **Fire area (86):** Burnt area in LUS. To be indicated in **m²**.
- **Fire type (87):** to be indicated according to option list:

Options	Description/definition	Code
Not applicable		0
Underground fire	Fire spreading under the surface through roots or any other underground means	1
Surface fire	Fire spreading through the ground cover where it consumes litter and ground vegetation without reaching the tree canopies	2
Crown fire	Fire spreading through the canopies of woody vegetation	3

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

Options	Description/definition	Code
No felling		1
Clear-cutting	Felling of most commercial-sized trees in a stand	2
Selective felling	Selective felling extracting only trees of certain species, dimensions, value, etc., not taking into account silvicultural needs.	3
Group felling		4
Strip felling		5
Other	To be specified	

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

Options	Description/definition	Code
No practice		1
Improvement	Operation that aims at improving the yield and quality of the stand. It includes clearing, selective thinning and regeneration by natural or artificial seeding.	2
Release of desirable superior trees	Removal of higher and larger and intermediate diameter trees to allow for the development of desired future trees.	3
Removal of undesirable vegetation layer	Intervention aimed at clearing trees of disturbing vegetation layer	4
Enrichment	Supplementary planting or sowing of indigenous species to improve natural regeneration.	5
Sanitary cutting	Removal of dead, damaged or unhealthy trees, with the aim of stopping the spreading of insects and diseases	6

- **Technology used (97):** technology used for tree and shrub exploitation. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		0
Manual	manual saw, axe, machete etc.	1
Chainsaw	chainsaw	2
Mechanized	Tractors, mechanization, etc.	3
Not known		90
Other	To be specified (oxen, etc.)	

Notes (98): general notes concerning the whole page

4.6 F6 Form: Products / Services :

This form should be filled out for each plot by land use

C. Table for the products and services provided by the trees, other wooded land and forests

Products and services																					
4. Land Use	99. Product / Service	99a. Rank	103. Use rights	104. Conflicts	105. Demand trend	106. Supply/trend	101. Harvester / User		Enterprise			Gender		End Use		Extraction			111. Species		
							101a. Rank	101b. Rank	101b. Organised	101b. Spontaneous	101c. <30% women	101c. 30-70% women	101c. >70% women	101d. Children	102. Commercial	102. Domestic	108. Frequency	109. Trend		110. Change reason	101e. Legislation
C	C	C	C	C	C	C	C	C													
							O														
							C														
							X														
							O														
							C														
							X														
							O														
							C														
							X														

- **Products and services (99):** products and services provided by the trees, woodlands and forest present in the Plot. To be indicated according to option list

Options	Description/definition	Code
Timber	Hardwoods, softwoods	101
Fuel wood	Wood and charcoal	102
Food	Legumes, fruits, nuts, mushrooms etc.	201
Fodder	Herbs, leaves	202
Medicines	Medicines deriving from forest plants	203
Essential oils	oils, soap and cosmetics	204
Tannins	Tannins, dyes	205
Handicrafts	Utensils, non wood handicrafts	208
Ornamentals	Plants used for ornamental purposes	210
Seeds for regeneration purposes		211
Bio fertilisers, insecticides, etc.	Natural fertilisers or insecticides made of organic matter	212
Bush meat	Big mammals, rodents	302
Honey, bee wax		303
Employment (salary)		401
Hunting / Fishing		402
Grazing		403
Scientific studies		405
Protection		406
Recreation and tourism		407
Religious /spiritual		408
Water and soil conservation		409
Windbreaks		411
Shade		412

- **Product Ranking (99a):** ranking of the products and services according to importance in option list :

Options	Description/definition	Code
High	Products of high importance	1
Medium	Products of medium importance	2
Low	Products of low importance	3

- **User rights (103):** right to harvest the product. To be indicated according to option list:

Options	Description/definition	Code
Exclusive right	The use of the product/service is reserved for the land owner	1
Not exclusive right	The use of the product/service is a common right	2
No right	The use of the product/service is prohibited.	3
Not known		90

- **User conflicts (104):** existence of conflicts between different users of products/services. To be indicated according to option list

Options	Description/definition	Code
No	No conflicts due to use/collection of product	1
Yes	Conflicts due to use/collection of product	2
Not known		90

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

Options	Description/definition	Code
Not applicable		0
Decreasing		1
No change		2
Increasing		3
Not known		90

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

Options	Description/definition	Code
Not applicable		0
Decreasing		1
No change		2
Increasing		3
Not known		90

Harvesting Activity

- **Harvester / 1st user (101):** the harvester (first user) of the product /service the harvest according to user group in option list

Options	Description/definition	Code
Land owners or other groups with exclusive rights	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	O
Groups with shared rights	Communities, co-operatives, etc.	C
External groups		X

- **Harvester Rank (101a):** ranking of the user groups' importance for the harvesting of the product/service. To be indicated according to option list :

Options	Description/definition	Code
High	User group of high importance	1
Medium	User group of medium importance	2
Low	User group of low importance	3

- **Enterprise (101b) :** In which regime activity is carried out. To be indicated in check box according to below option:

Options	Description/definition	
Organized	Harvesting or collection is carried out by a company, cooperation or community in a coordinated manner. Harvester can be of local or non-local origin.	
Spontaneous	Harvesting or collection is carried out in a spontaneous, non organized manner.	

- **Gender balance (101c) :** Gender balance of harvesters. To be indicated in check box according to below option:

Options	Description/definition	
<30% women		
30 – 70% women		
>70% women		

- **Child labour (101d) :** If more than 30% of the work related to harvesting is done by children indication should be made in check box:

- **End use (102):** end use of product, to be indicated according to option list

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

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

Options	Description/definition	Code
Not applicable		0
Daily	Product is collected practically every day	1
Weekly	Product is collected practically every week	2
Seasonally	Product is collected every year during well defined seasons	3
Intervals larger than 1 year	Product is not collected every year	4
Not known		90
Other	To be specified	

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

Options	Description/definition	Code
Not applicable		0
Decreasing		1
No change		2
Increasing		3
Not known		90

- **Reason for change (110):** main reason for change in extraction during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		0
Decreasing benefits		1
Market	Change in market	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
Not known		90
Other	To be specified	

- **Legislation (101e) :** Awareness of restrictions and legislations regarding the product/service. When major parts of the user group are aware of the legal restrictions this should be indicated in checkbox.
- **Compliance with legislation (101f) :** If the majority of the user group act in compliance with the legislation this should be indicated in checkbox
- **Species (111):** species collected by the product/service category, in order of importance

5. Appendices

5.1 Land cover class definition

Categories	Code	Definition
Total area¹		Total area (of country), including area under inland water bodies, but excluding offshore territorial waters.
Forest	F	<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.
Forest plantation	FP	<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"> • of introduced species (all planted stands), or • intensively managed stands of indigenous species, which meet all the following criteria: one or two species at plantation, even age class, regular spacing.
Other wooded land	OWL	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.

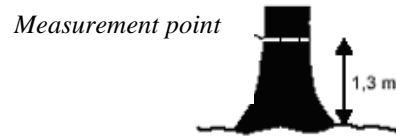
Shrubs	Sh	Refers to vegetation types where the dominant woody elements are shrubs i.e. woody perennial plants, generally of more than 0.5 m and less than 5 m in height on maturity and without a definite crown. The height limits for trees and shrubs should be interpreted with flexibility, particularly the minimum tree and maximum shrub height, which may vary between 5 and 7 meters approximately.
Fallow	Fa	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%)	WGL	Land where the trees cover between 5 to 10 percent of the area and their height may reach 5 m at maturity.
Other land	OL	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	N	Land not classified as forest or other wooded land not used by man.
Barren land	BL	Barren land
Grasslands	GL	Natural grasslands
Marshland	ML	Marshland
Cultivated land		Land not classified as forest or other wooded land used by man for agriculture or pastures.
Annual crop	AC	Annual crops
Perennial crop	PC	Perennial crops
Pastures	Pa	Pastures
Built-up areas (urban or rural)	BUA	Built-up areas
Inland water	W	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 1,3m 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. Position for diameter measurement at breast height in flat terrain.



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 in cm will be used.

Figure 6. Calliper.

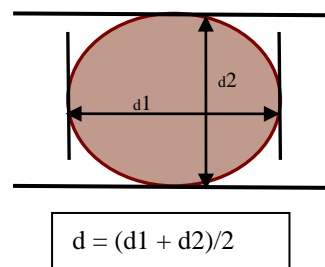


Some preventive measures must be taken into account:

- Measurement instruments are kept in a position that perpendicularly cuts the tree axe at 1,3 m, see **Figure 8. DBH measurement position for a tree on steep terrain;**
- 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.

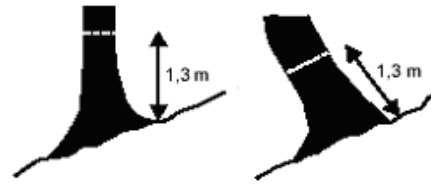
Figure 7. Non circular tree measurement with calliper

- 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.



- **On inclined terrain**, DBH tree measurement at 1,3 m is taken from an uphill position (see **Figure 8**).

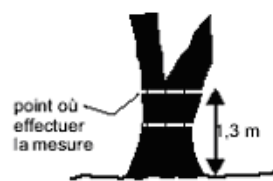
Figure 8. DBH measurement position for a tree on steep terrain



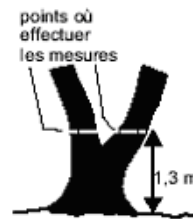
Note: see Figure 5.

- **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 1,3m height, each stem having the diameter required (≥ 20 cm in the whole plot, ≥ 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 1,3m height.
 - If the fork begins between 30 cm and 1,3m, 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 1,3m 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

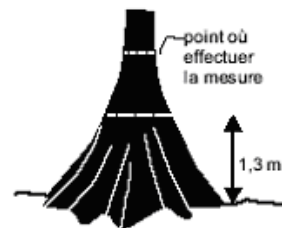


Note: see Figure 5.

- **Coppice:** Coppice shoots originate between ground level and 1,3m 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 1,3m above the ground; those that originate between 30 cm and 1,3m 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

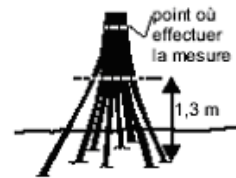


Note: see Figure 5.

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

- **Trees with aerial roots:** diameter measurement is done at 1,3m from the limit between the stem and roots (see Figure 10).

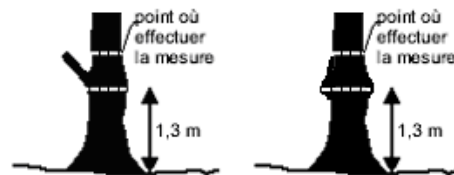
Measurement point



Note: see Figure 5.

- **Trees with irregular stem at 1,3m:** 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).

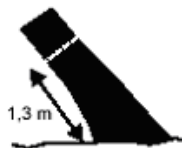
Figure 11. DBH measurement position for a tree with branch enlargement at 1,3m



Note: see Figure 5.

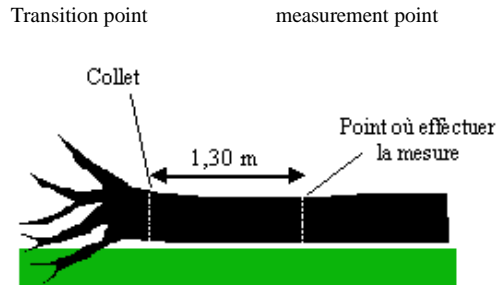
- **Inclined trees:** diameter measurement is made at 1,3 m. The stem height is measured where the stem base and the ground meet forming an angle (see Figure 12).

Figure 12. DBH measurement position for an inclined tree.

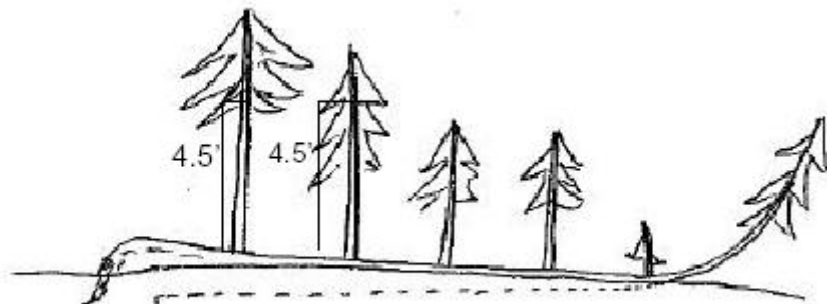
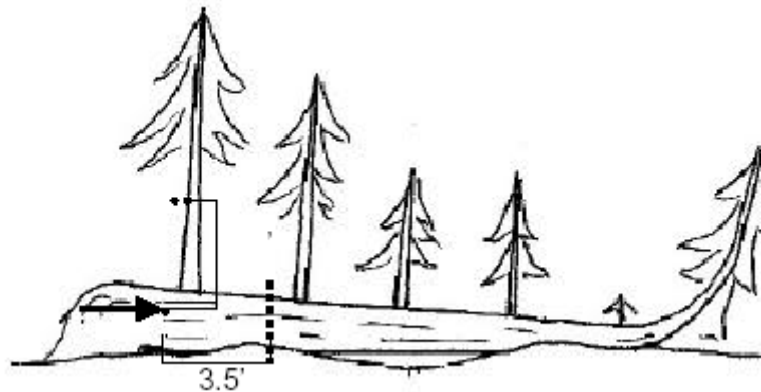


- **Fallen tree:** diameter measurement is made at 1,3 m from the transition point between the stem and the root (see Figure 13).

Figure 13. DBH position for a fallen tree.



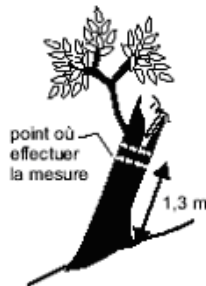
- **Living tree lying on the ground with branches in the shape of a vertical tree.** When a living tree is laying on the ground and its vertical branches (at $<45^\circ$ vertical position) grow from the main stem, it is recommended to determine first if the main stem is above the litter or not. If this 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 1,3 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 1,3 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 1,3 m.

Figure 14. DBH measurement position for other trees.

Measurement
Point



Note: see Figure 5.

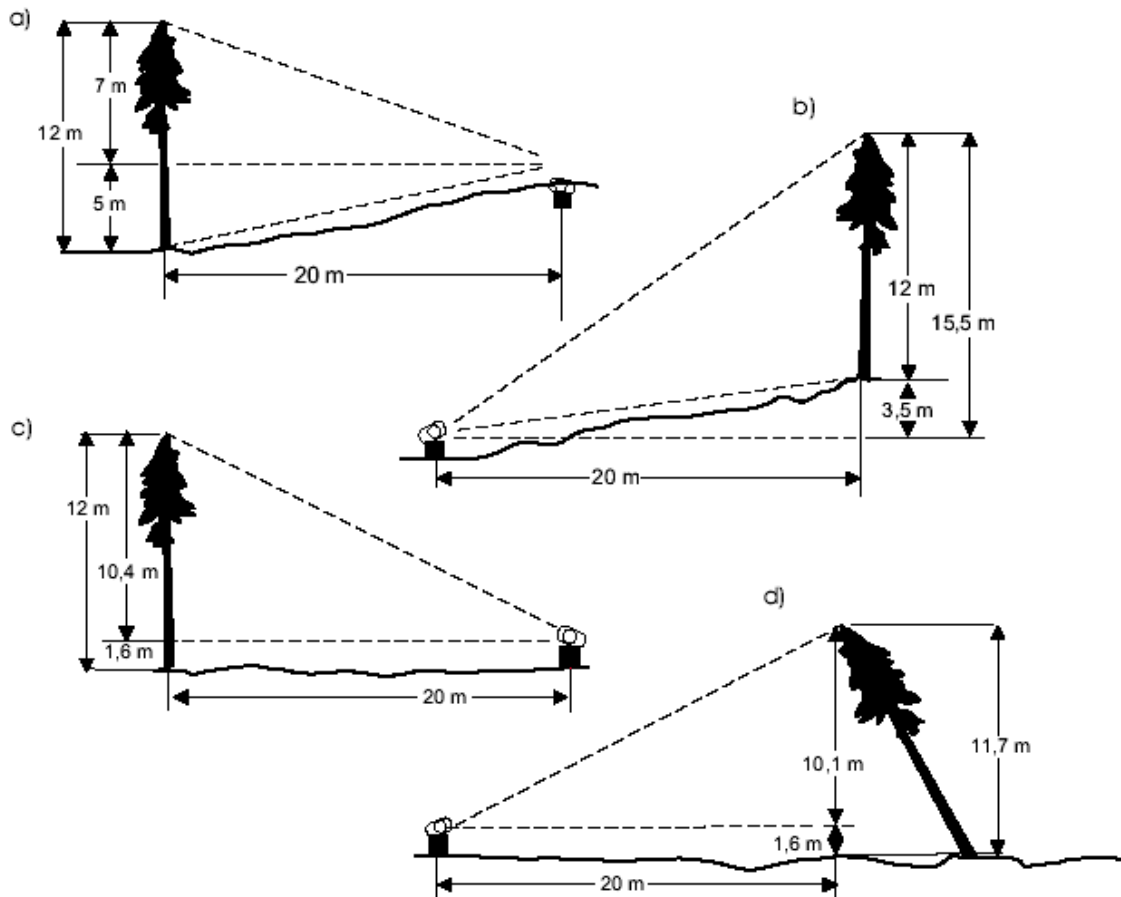
B) Tree height measurement

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 dioptic 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.

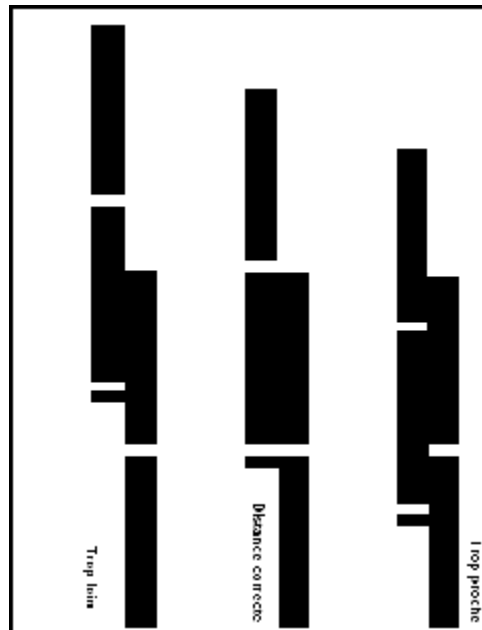
The instrument includes a rod with landmarks corresponding to different height scales. In order to carry out the measurements, the operator proceeds as follows:

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 such coefficient following the formula below :

$$h' = h - hk \text{ in which } h' = \text{is the real height } h = \text{measured height } k = \text{coefficient correction}$$

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.

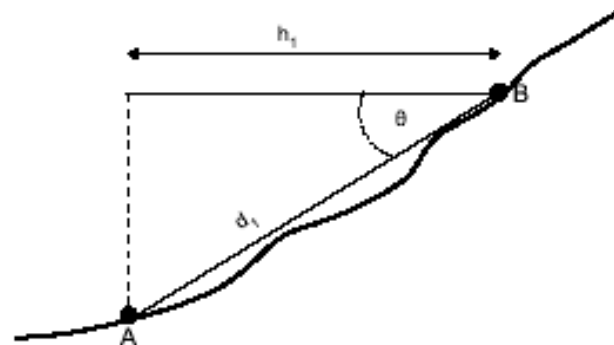
5.3 Use of receivers for Global Positioning Systems, GPS

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. . Θ is the angle between the horizontal and the right A-B. $d1 = h1/\text{cosine } (\Theta)$.

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

-).
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 7. Slope correction table.

Slope %	Degree °	Factor f _s	Horizontal distances										Slope %
			5	10	15	20	25	30	40	50	125	245	
15	9	1,0112	5,1	10,1	15,2	20,2	25,3	30,3	40,4	50,6	126,4	247,7	15
20	11	1,0198	5,1	10,2	15,3	20,4	25,5	30,6	40,8	51,0	127,5	249,9	20
25	14	1,0308	5,2	10,3	15,5	20,6	25,8	30,9	41,2	51,5	128,8	252,5	25
30	17	1,0440	5,2	10,4	15,7	20,9	26,1	31,3	41,8	52,2	130,5	255,8	30
35	19	1,0595	5,3	10,6	15,9	21,2	26,5	31,8	42,4	53,0	132,4	259,6	35
40	22	1,0770	5,4	10,8	16,2	21,5	26,9	32,3	43,1	53,9	134,6	263,9	40
45	24	1,0966	5,5	11,0	16,4	21,9	27,4	32,9	43,9	54,8	137,1	268,7	45
50	27	1,1180	5,6	11,2	16,8	22,4	28,0	33,5	44,7	55,9	139,8	273,9	50
60	31	1,1662	5,8	11,7	17,5	23,3	29,2	35,0	46,6	58,3	145,8	285,7	60
70	35	1,2207	6,1	12,2	18,3	24,4	30,5	36,6	48,8	61,0	152,6	299,1	70
80	39	1,2806	6,4	12,8	19,2	25,6	32,0	38,4	51,2	64,0	160,1	313,8	80
90	42	1,3454	6,7	13,5	20,2	26,9	33,6	40,4	53,8	67,3	168,2	329,6	90
100	45	1,4142	7,1	14,1	21,2	28,3	35,4	42,4	56,6	70,7	176,8	346,5	100
110	48	1,4866	7,4	14,9	22,3	29,7	37,2	44,6	59,5	74,3	185,8	364,2	110
120	50	1,5620	7,8	15,6	23,4	31,2	39,1	46,9	62,5	78,1	195,3	382,7	120
130	52	1,6401	8,2	16,4	24,6	32,8	41,0	49,2	65,6	82,0	205,0	401,8	130
140	54	1,7205	8,6	17,2	25,8	34,4	43,0	51,6	68,8	86,0	215,1	421,5	140
150	56	1,8028	9,0	18,0	27,0	36,1	45,1	54,1	72,1	90,1	225,3	441,7	150

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, 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.

5.5 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 end an interview. So called unscheduled interviews are also important. They may take the form as informal dialogue with people that are met 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 remembered 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 notes 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 practice 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 subplot 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 nwp'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

Protected Areas – IUCN categories for nature protection	
I – Strict nature reserve / wilderness area.	Protected area managed mainly for science or wilderness protection. 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.
II – National Park	Protected area managed mainly for ecosystem protection and recreation. 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.
III – Natural monument.	Protected area managed mainly for conservation of specific natural features. 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.
IV – Habitat/species management area.	Protected area managed mainly for conservation through management intervention. The areas covered may consist of nesting areas of colonial bird species, marshes or lakes, estuaries, forest or grassland habitats, or fish spawning 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.).
V – Protected landscape/seascape	Protected areas managed mainly for landscape/seascape conservation and recreation. 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.
VI – Managed resource protection area.	Protected area managed for the sustainable use of natural ecosystems. 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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