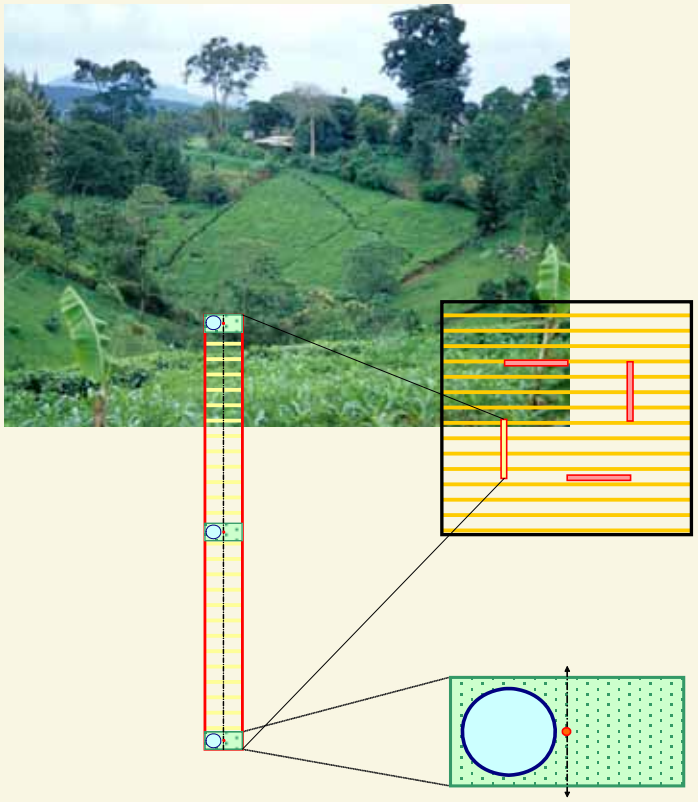
National Forest Monitoring and Assessment

Manual for integrated field data collection



National Forest Monitoring and Assessment

N F M A

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National Forest Monitoring and Assessment

Forests are crucial for the well being of humanity. They provide foundations for life on earth through ecological functions, by regulating the climate and water resources and by serving as habitats for plants and animals. Forests also furnish a wide range of essential goods such as wood, food, fodder and medicines, in addition to opportunities for recreation, spiritual renewal and other services.

Today, forests are under pressure from increasing demands of land-based products and services, which frequently leads to the conversion or degradation of forests into unsustainable forms of land use. When forests are lost or severely degraded, their capacity to function as regulators of the environment is also lost, increasing flood and erosion hazards, reducing soil fertility and contributing to the loss of plant and animal life. As a result, the sustainable provision of goods and services from forests is jeopardized.

In response to the growing demand for reliable information on forest and tree resources at both country and global levels, FAO initiated an activity to provide support to national forest monitoring and assessment (NFMA). The support to NFMA includes developing a harmonized approach to national forest monitoring and assessments (NFMA), information management, reporting and support to policy impact analysis for national level decision-making.

The purpose of the NFMA initiative is to introduce countries to an alternative approach designed to generate cost-effective information on forests and trees outside forests, including all benefits, uses and users of the resources and their management. Special attention is placed on monitoring the state and changes of forests, and on their social, economic and environmental functions. Another main objective is to build national capacities and harmonize methods, forest related definitions and classification systems among countries.

The support to National Forest Monitoring and Assessment is organized under the Forest Management Division (FOM) at FAO headquarters in Rome. Contact persons are:

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More information on FAO Support to National Forest Monitoring and Assessment can be found at:
www.fao.org/forestry/site/nfma

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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Rome 2008

National Forest Monitoring and Assessment

Manual for integrated field data collection

Version 2.1
(2nd Edition)

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Acknowledgements

The National Forest Monitoring and Assessment – *Manual for Integrated Field Data Collection* is a result of major effort and collaboration across FAO Forestry, Agricultural and Natural Resources Departments. It is also continuously improved with considerable inputs from national experts and consultants while being adapted and applied in countries. Also international experts have provided guidance and recommendations to the overall methodological development in expert consultations and technical meetings.

The National Forest Monitoring and Assessment Programme was initiated and designed by Peter Holmgren and Mohamed Saket. Many persons at FAO have notably contributed and supported the development of the methodology. In particular, all colleagues from Forest Resources Development Service (FOMR) and Global Forest Resources Assessment; Sally Bunning and Hubert George of the Land Tenure and Management Unit (NRLA); Tim Robinson, of the Livestock Information, Sector Analysis and Policy Branch (AGAL); Regina Laub of the Gender, Equity and Rural Employment Division (ESWD); Nadine Azzu, Bart Barten and Linda Collette, of the Seed and Plant Genetic Resources Service (AGPS).

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Abbreviations and Acronyms

cc	Canopy cover
CSP	Circular subplot
Dbh	Diameter at breast height
Dsh	Diameter at stump height
FAO	Food and Agricultural Organization of the United Nations
FRA	Forest Resources Assessment programme
GPS	Global Positioning System
HSA	Household survey area
HS	Number of households
ILUA	Integrated Land Use Assessment
LUCC	Land use/cover class
LUCS	Land use/cover section
MDGs	Millennium Development Goals
NFMA	National Forest Monitoring and Assessment
NGO	Non Governmental Organization
NPC	National Project Coordinator
NSC	National Steering Committee
NWFP	Non wood forest product
OWL	Other wooded lands
P/S	Products and services
PTU	Project Technical Unit
RSP	Rectangular subplot
RRA	Rapid rural appraisal
scf	Slope correction factor
SI	Sampling interval
SN	Starting number
SU	Sampling unit
THSD	Total household number
TOF	Tree outside forest
UTM	Universal Transverse Mercator

Introduction

This manual provides guidelines and descriptions of the methodology and procedures used to inventory and monitor forestry and other land use resources following the approach developed by the Support to National Forest Resources Monitoring and Assessment (NFMA) programme of the FAO. The methodology, based on countrywide sampling and field data collection, has been applied since 2000 in several countries through national forest resources assessments, including Bangladesh, Cameroon, Congo, Costa Rica, Guatemala, Honduras, Lebanon, Nicaragua and the Philippines. A NFMA typically covers not only forest resources or forest lands but also trees outside forests.

In 2005, the methodology was broadened to cover other land uses and natural resources in the assessment such as crops, livestock, soils, water and biodiversity features. Integrating the assessment and monitoring across forest, agriculture and other related sectors, offers a better understanding of ecosystem services and functions and creates possibilities for analysing land management as a whole. For example, conflicting objectives between sectors – such as subsidies to agriculture vs. efforts to reduce deforestation, may be analytically weighed against each other. This approach was applied to implement Integrated Land Use Assessments (ILUA) in Zambia and Kenya, and can be profitable when the country promotes intersectoral collaboration and when there is need for information on natural resources to be generated in an integrated manner.

The purpose of a NFMA is to assess and monitor forestry and other natural resources, land use and management practices, in order to provide new qualitative and quantitative information on the state, use, management and trends of these resources and the ecosystems. The assessment covers a wide range of biophysical and socio-economic variables, and thus provides a holistic view of land use and its impacts for the country as a whole. In particular, the information can be used to plan, design and implement national and international policies and strategies for sustainable use and conservation of natural ecosystems, and to understand the relationship between resources and users of resources. Periodic monitoring (such as every 5 years) will enable the development of more harmonised policies to ensure sustainable land management and its contributions to biodiversity conservation, and improved food security and livelihoods of rural populations. NFMA will thus help in monitoring progress towards the Millennium Development Goals especially in regard to food security, poverty alleviation and the environment (MDGs 1 and 7).

The field manual is addressed to field data collectors as well as to NFMA planners, trainers and field inventory supervisors. The methods, assessment variables and tools presented in this field manual template are not rigid. They have to be tailored and adapted to each individual country, taking into account national contexts, social and ecological environments, and information requirements at the national level. Involvement of all stakeholders is essential in this adaptation process to ensure that results will meet expectations of all national level information users. Some core variables to be assessed, definitions and options are selected in accordance to international standards, in order to facilitate country reporting to various international processes and encourage harmonisation between data collection initiatives among countries. However, most of the variables, their definitions and options as well as field forms (data collection record sheets) can (and need to) be modified according to country specifications.

As more information is required in an ILUA compared to a NFMA, additional data collection tools and methods were introduced but the overall approach and basic principles remain the

same. In particular, more emphasis is placed on collecting a wide range of socio-economic data. When a section applies only to ILUA, it will be specified by the symbol ILUA . Moreover, some groups of variables and corresponding field forms can be considered as modules that can be retained or excluded depending on information needs (for instance, water management, wildlife observations).

The first part of the manual describes the adopted sampling design, distribution of the SUs where measurements are carried out and their configuration. Part two deals with the Land Use/Cover classification adopted as a basis for the assessment. Part three presents organisational structure and responsibilities of field team members. Methods and procedures for data collection in the field are described in part four, while part five presents in detail the field forms that are used for recording data from field measurements, observations and interviews with land users.

The Annexes provide practical tools and methods for measuring the variables (tree and soil measurements), a guide for the use of Global Positioning System (GPS) receivers and techniques and approaches to carry out guided discussions and interviews with key informants and resource user groups.

1. Sampling design

1.1 Sampling unit selection and distribution

The sampling design adopted for the NFMA is systematic. Sampling units (SU) 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.

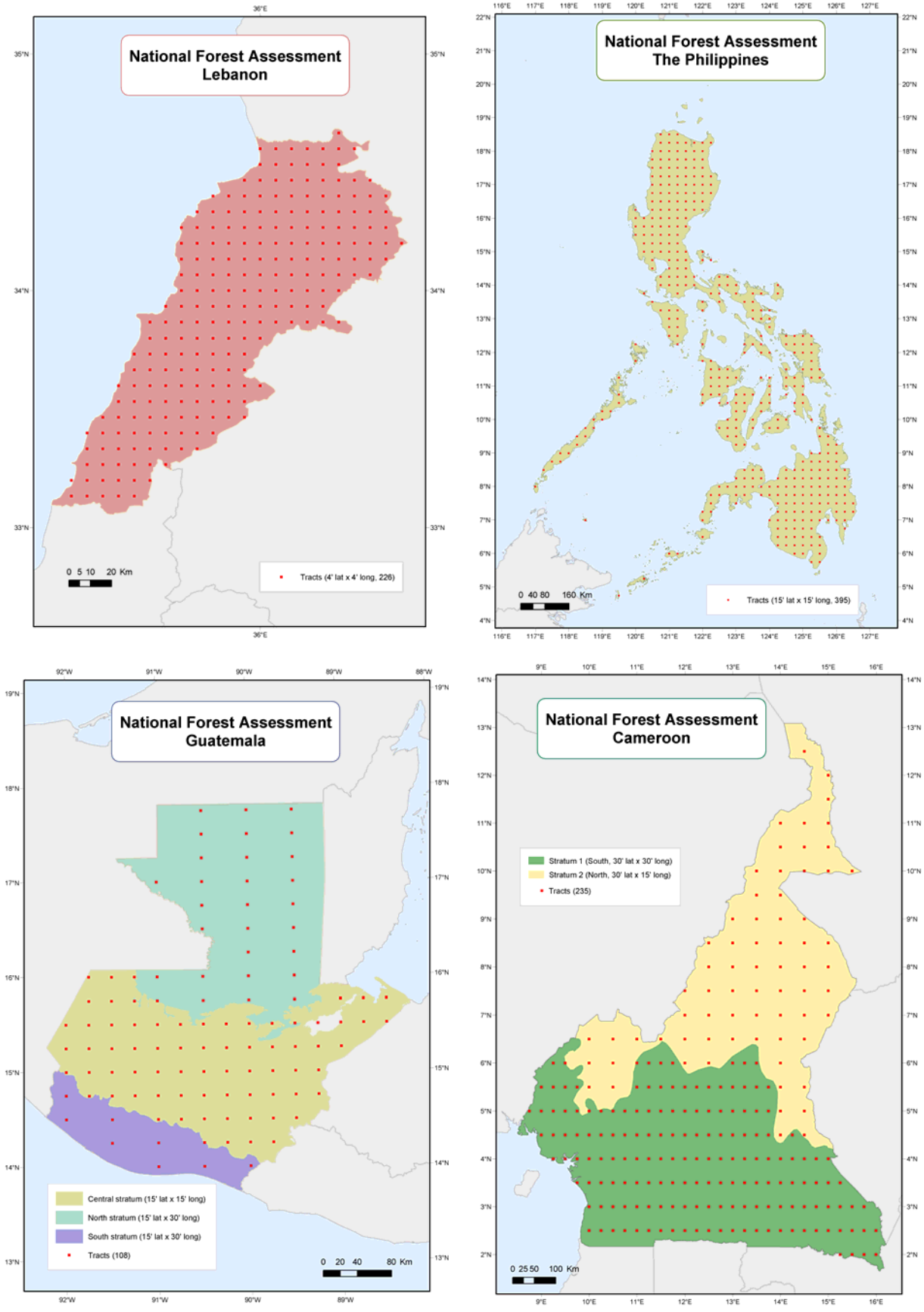
The number of sampling units (SU) or tracts to be surveyed is determined by the required statistical reliability of the data, the available financial and human resources for the assessment, and with a view to enabling periodic monitoring.

The example of the sampling design applied in a few countries is shown in Table 1 and Figure 1.

Table 1. Sampling density in several countries

Country	Stratum	Sampling unit (tract) number	Distance between sampling units	
			minutes (latitude x longitude)	km (latitude x longitude)
Lebanon	No stratification	226	4' x 4'	about 7 x 6 km
Philippines	No stratification	389	15'x 15'	about 25x 25km
Cameroon	1	167	30' x 15'	about 50 x 25 km
	2	69	30' x 30'	about 50 x 50 km
	TOTAL	236		
Guatemala	1	28	15 ' x 30 '	about 28 x 54 km
	2	71	15 ' x 15 '	about 28 x 28 km
	3	9	15 ' x 30 '	about 28 x 54 km
	TOTAL	108		

Figure 1. Distribution of Sampling Units (or Tracts) in several countries



1.2 Sampling unit description

Data is collected in the field through observations, measurements and interviews at different levels: within the limits of the sampling units (SU), and in smaller subunits, the plots, subplots, Land Use/Cover Section (LUCS) and Land Use/Cover Class (LUCC) demarcated within the sampling units (see Figure 2) and in the Household Survey Area (HSA ILUA).

- A **sampling unit (SU)** or "Tract" is a square surface area of 1 km x 1 km (see figure 2). The coordinates of the south-west corner of the SUs correspond to those of the points selected in the systematic sampling frame. Each SU contains four field plots.

- The **plots** are rectangles, with surface areas measuring 20 m wide and 250 m long within the SU. They start at each corner of an inner 500 m square (same centre as SU's), and are numbered clockwise from 1 to 4 as shown in figure 2. 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 500 m inner square	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

- Three pairs of **subplots** are delimited within each plot. They correspond to two different data collection levels:

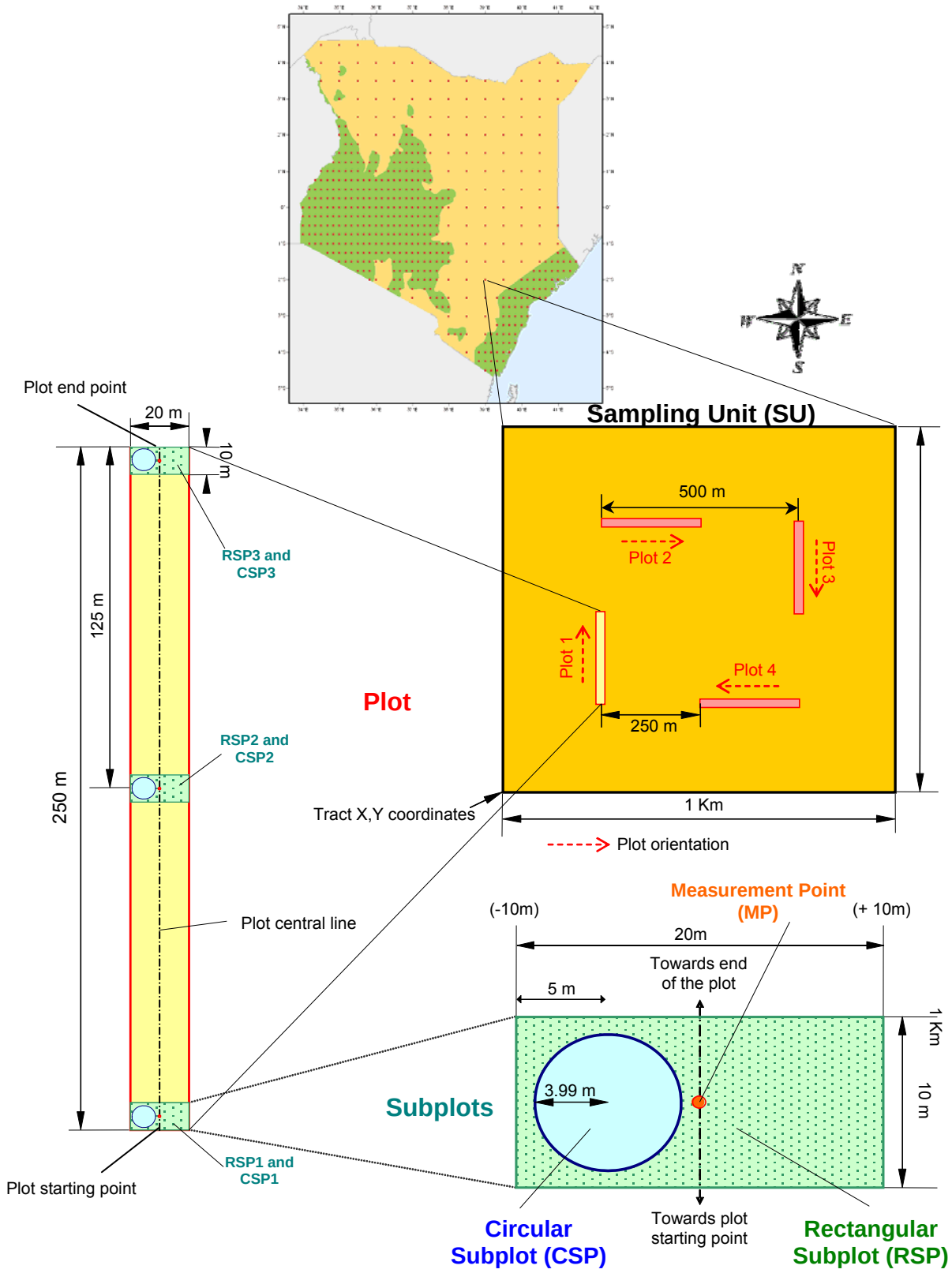
    - 3 **Rectangular Subplots (RSP**), 20 m x 10 m, corresponding to level 1; and

    - 3 **Circular Subplots (CSP)**, with a radius of 3.99 m (50m2), corresponding to level 2, located in the centre of the rectangular subplots.

  Both of these subplot categories are numbered from "1", at the starting point of the plot to "3", at the end of the plot.

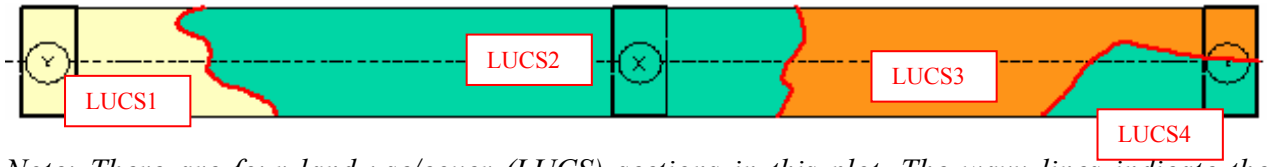
- An edaphic (soil) and topographic **measurement point (MP)** is established at the centre of each rectangular subplot.

Figure 2. Sampling unit, plot and subplot design



- Each plot is divided into **Land Use/Cover Sections (LUCS)** representing homogenous land use / vegetation cover units (forest, crops, grassland...), with variable size and shape that have been identified in the field. The classification system adopted to identify the different land use/cover classes is described in chapter 1. Data related to grazing, cropping and forest characteristics, management and resources use and users are collected within the LUCS.

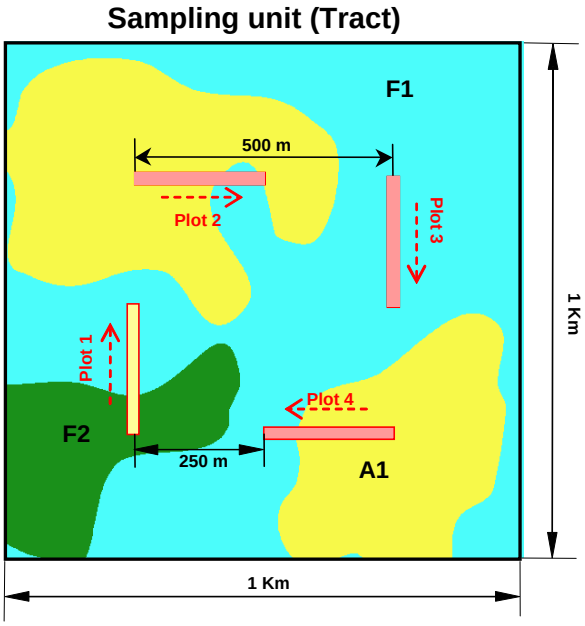
Figure 3. Example of Land Use/Cover Sections (LUCS) distribution within a plot



Note: There are four land use/cover (LUCS) sections in this plot. The wavy lines indicate the limits between them. LUCS2 and LUCS4 belong to the same Land Use/Cover Class (LUCC).

- Each **Land Use/Cover Class (LUCC)** found in the SU (in all 4 plots) will also be used to collect data on products and services (Figure 4).

Figure 4. Example of Land Use/Cover Classes (LUCC) distribution within a sampling unit

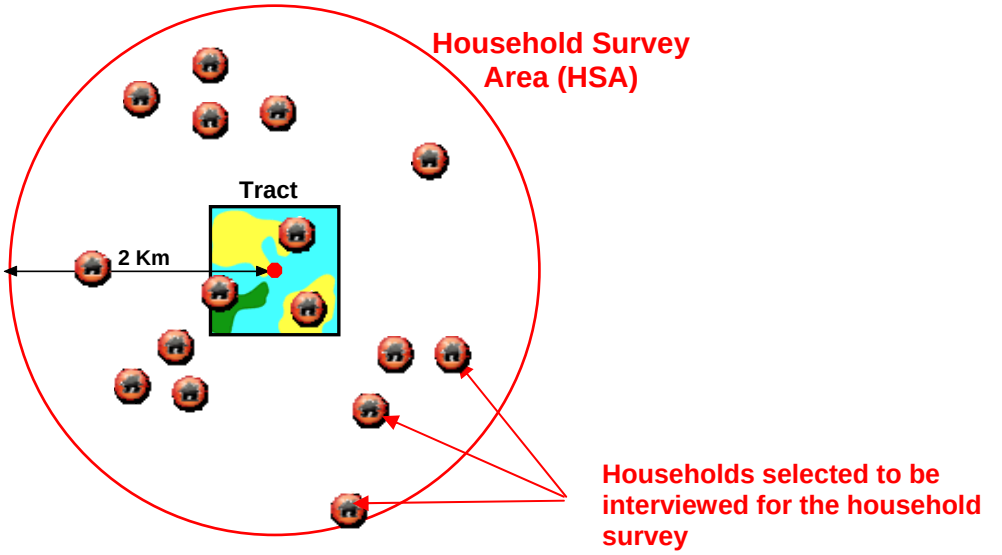


Note: In this example there are three different land use/cover classes in the sampling unit (coded A1, F1 and F2).

ILUA

- For the household survey (in an ILUA), the unit used to select the households to be interviewed is a 2-km radius circle from the SU centre (see Figure 5). It is called the **Household Survey Area (HSA)**.

Figure 5. Area used for selecting households for the household survey (HSA)



The specifications of the different units are summarized in Table 3. The distances indicated in the table below represent horizontal measurements. See the procedure of measuring horizontal distances in Annex 6.4, p. 161.

Table 3. Survey unit specifications

Unit	Shape	Size (area)	Number
Sampling Unit (SU) (or Tract)	Square	1000 m x 1000 m ($1km^2$)	1
Plot	Rectangle	250 m x 20 m ($5000 m^2$)	4/SU
Rectangular Subplot (RSP)	Rectangle	20 m x 10 m ($200 m^2$)	3/plot
Circular Subplot (CSP)	Circular	Radius r = 3.99 m ($50 m^2$)	3/plot
Land Use/Cover Sections (LUCS)	Variable	Variable	Variable
Land Use/Cover Class (LUCC)	Variable	Variable	Variable
Household Survey Area (HSA) ILUA	Circular	Radius r = 2km ($12.6 km^2$)	1

Note: All distances indicated are horizontal distances.

2. Land use/cover classification

The classification system used to define land use/cover classes (LUCC) is based on a dichotomous approach and includes different levels:

- **The first level** is composed of the global classes designed for the assessment of resources at global level and is based on the classification system developed by the FAO global Forest Resources Assessment (FRA) to ensure harmonisation between countries for regional or global assessments. The global classes include **Forests, Other wooded land**, **Other land** and **Inland water**;

- **The other levels** are country specific, and include additional classes designed to meet specific national and sub-national information needs. They can be applied to differentiate between land use/cover categories according to criteria such as species composition, phenology, vegetation canopy cover (closed/ open/ sparse), naturalness (primary/ secondary forest).

A code characters is assigned to each class in order to facilitate data collection and input.

An example of the classes and related codes used in NFMA is shown in Table 4. The diagram in Figure 6 shows the dichotomous approach and the class subdivision. Global classes are further defined in Annex (section 6.1, p. 151).

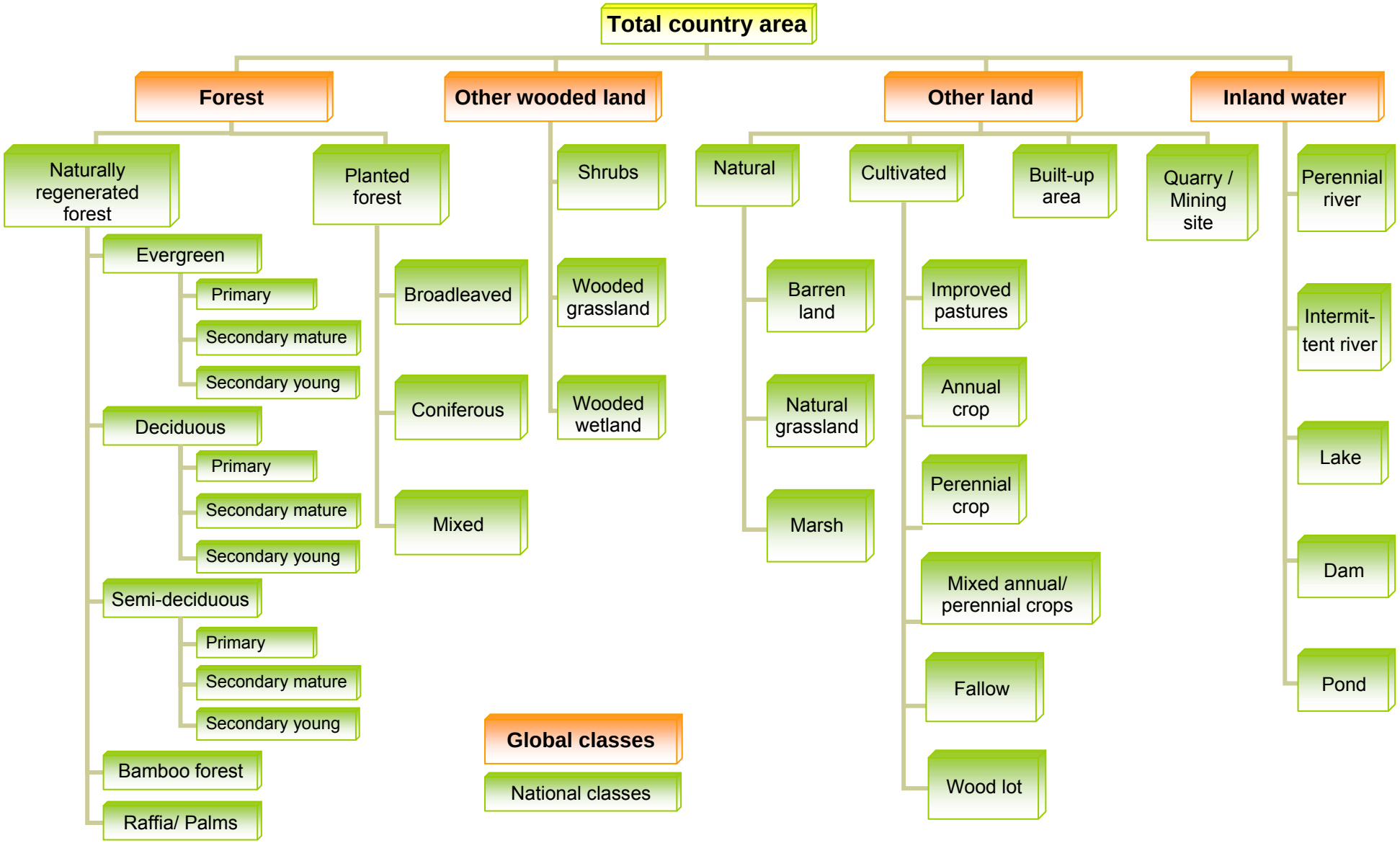
Table 4. Land use/cover classification in NFMA (example)

Land Use/Cover Classes (LUCC)				Brief description	Code
Global classes	National classes				
Level 1	Level 2	Level 3	Level 4		
Forest	*Area ≥ 0.5 ha; Tree canopy cover ≥10%; Tree height ≥ 5 m at maturity; Exclude land that is predominantly under agricultural or urban land use*				
	Naturally regenerated forest	*Forest predominantly composed of trees established through natural regeneration*			
		Naturally regenerated evergreen forest	*Naturally regenerated forest composed of more than 75% of evergreen trees species*		
			Primary evergreen forest	*Evergreen forests with native species where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed*	FEP
			Secondary mature evergreen forest	*Evergreen forests where there are clearly visible indications of human activities; most of the trees have reached maturity*	FEM
			Secondary young evergreen forest	*Evergreen forests where there are clearly visible indications of human activities; most of the trees are juvenile or growing*	FEY
		Naturally regenerated deciduous forest	*Naturally regenerated forest composed of more than 75% of deciduous trees species.*		
			Primary deciduous forest	*Deciduous forests with native species where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed*	FDP
			Secondary mature deciduous forest	*Deciduous forests where there are clearly visible indications of human activities; most of the trees have reached maturity.*	FDM
			Secondary young deciduous forest	*Deciduous forests where there are clearly visible indications of human activities; most of the trees are juvenile or growing*	FDY
		Naturally regenerated semi-deciduous forest	*Naturally regenerated forest where trees are at least 25% each of evergreen and deciduous species*		
			Primary semi-deciduous forest	*Semi-deciduous forests with native species where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed*	FSP
			Secondary mature semi-deciduous forest	*Semi-deciduous forests where there are clearly visible indications of human activities; most of the trees have reached maturity.*	FSM
			Secondary young semi-deciduous forest	*Semi-deciduous forests where there are clearly visible indications of human activities; most of the trees are juvenile or growing*	FSY
		Bamboo forest		*Naturally regenerated forest predominantly composed of bamboo vegetation.*	FB
		Raffia/Palms		*Naturally regenerated forest predominantly composed of palm or raffia vegetation*	FR
	Planted forest	*Forests predominantly composed of trees established through planting and/or deliberate seeding. Includes coppice from trees that were originally planted or seeded.*			
		Broadleaved planted forest		*Planted forest composed of more than 75% of broadleaved species*	FPB
		Coniferous planted forest		*Planted forest composed of more than 75% of coniferous species*	FPC
		Mixed planted forest		*Planted forest of at least 25% each of coniferous and broadleaved species*	FPM

Land Use/Cover Classes (LUCC)				Brief description	Code
Global classes	National classes				
Level 1	Level 2	Level 3	Level 4		
Other wooded lands	*Area ≥ 0.5 ha; Tree canopy cover 5-10% with trees >5m at maturity in situ or shrubs/bushes canopy cover ≥10% or combined cover of bush, shrubs and trees ≥10%; Exclude land that is predominantly under agricultural or urban land use*				
	Shrubs			*Land with shrubs/bushes canopy cover ≥ 10%. Shrubs and bushes are Woody perennial plants, generally of more than 0.5 m and less than 5-7 m in height on maturity and without a definite crown*	**WS**
	Wooded grassland			*Land covered by natural growth of graminea and herbaceous vegetation, with some scattered trees (tree canopy cover between 5-10%); Land not covered seasonally or permanently by water*	**WG**
	Wooded wetland			*Land seasonally or permanently covered by water with natural growth of graminea and herbaceous vegetation and some scattered trees (canopy cover between 5-10%)*	**WW**
Other land	*Land not classified as forest or other wooded land, as described above (Includes land with tree canopy cover <5% or with shrubs/bushes <10% or with predominant agricultural/urban land use or with shrubs/ trees<0.5ha)*				
	Natural	**Barren Land**		*Land where vegetation cover is less than 2%. Includes land covered of sand, soil and rocks*	**OX**
		Natural Grassland		*Land covered with natural growth of graminea and herbaceous vegetation*	**OG**
		Marsh		*Land seasonally or permanently covered by water and dominated by natural growth of graminea, reed and other herbaceous*	**OM**
	Cultivated	**Improved pastures**		*Land sown with introduced grass and leguminous for the grazing of livestock*	**OP**
		Annual crop		*Area covered by crops that are sown and harvested during the same production season/ agricultural year. Includes*	**OCA**
		Perennial crop		*Crops that are sown or planted once and need not to be replanted after each annual harvest. Includes trees (e.g. apples or other fruit trees), bushes and shrubs (e.g. berries, coffee...), palms (e.g. dates), vines (e.g., grapes), herbaceous stems (e.g. bananas) and stemless plants (e.g. pineapples)*	**OCP**
		Mixed annual and perennial crop		*Association of annual and perennial crops*	**OCM**
		Fallow		*Previously cultivated land kept free from crops or weeds during at least one growing season, where woody vegetation is and will not reach 5m height*	**OF**
		Wood lot		*Areas spanning between 0.2 and 0.5 ha , with trees >5m at maturity mainly used is for wood stock*	**OW**
	Built up area			*Populated areas with significant constructions. Includes homes scattered in the field. <u>Notes</u>: a road is considered as a distinct Land Use/Cover Section (built-up area) if wider than 15 meters (from bottom of ditch on one side to the bottom of ditch on the other side when ditches exists, otherwise the width of the road bank) and if not a forest road*	**OB**
	Quarry/Mining site			*Areas used for extraction of minerals, rocks, sands, clay... Includes: quarry, mining, extraction areas, oil/gas wells*	**OQ**

Land Use/Cover Classes (LUCC)				Brief description	Code
Global classes	National classes				
Level 1	Level 2	Level 3	Level 4		
Inland water	*Area occupied by major rivers (width >=15m), lakes, ponds and reservoirs*				
	Perennial River			*Rivers (width>= 15m) that maintains water in its channel throughout the year*	IRP
	Intermittent River (seasonal)			*Rivers (width>= 15m) that flows only at certain times of the year*	IRS
	Lake			*Large body of salt or fresh water surrounded by land*	IL
	Dam			*Reservoir created by a barrier constructed to hold back the water and raise its level*	ID
	Pond			*Small body of still water formed naturally or by hollowing or embankment*	IP
Outside land area	Outside Country			*If a plot or part of the plot (LUCS) falls outside country borders*	XC
	Ocean/ Sea			*If a plot or part of the plot (LUCS) falls in the ocean or in the sea*	XO
Unknown	*The team could not reach the land use/cover section*				90

Figure 6. Example of Land Use/Cover classification diagram

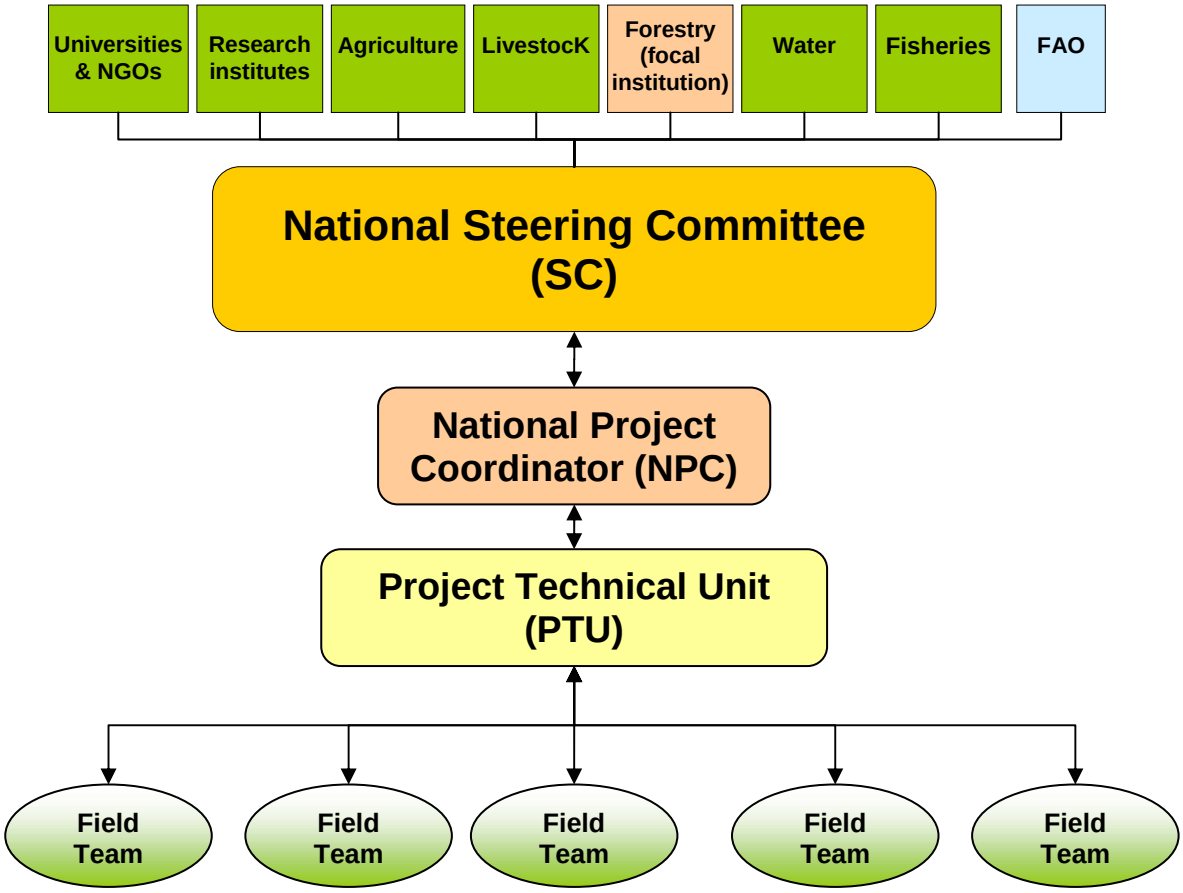


3. Organisational structure and responsibilities

3.1 Organisational chart

The organisation structure of NFMA varies from country to country. An example is provided in Figure 7. In this example the Forestry Department is designated as Focal Institution. The project is led by a full time National Project Coordinator (NPC). A Project National Technical Unit (PTU) whose members are drawn from participating National Institutions is created to coordinate, execute and monitor the project activities. The PTU is supervised by the National Steering Committee (SC) whose mandate is be to oversee the NFMA activities. Field teams work in collaboration with the PTU and are responsible to undertake field data collection.

Figure 7. Organisation chart for the NFMA (example)



- The **Project Technical Unit** (PTU) coordinates, executes and monitors the conduct of the NFMA at national level. This is done through:
    - Analysis and adaptation, if needed, of NFMA sampling design, inventoried variables and definitions;
    - Conducting training and hands-on training for Field Teams;
    - Setting up the Field Teams;
    - Mobilisation of resources, and preparation of necessary resources and equipment such as vehicles, allocation of sampling units (SUs) among field

teams; ensuring that all project requirements are procured timely for the project to be executed smoothly;

- Planning, organisation and coordination of fieldwork among districts and field teams;
- Monitoring and backstopping fieldwork, including technical and logistic support to field teams as well as field report checks, in order to ensure data quality and homogeneity among field teams;
- Control and validation of field forms;
- Data control and quality evaluation;
- Compilation of databases;
- Data processing and analysis;
- Report progressed to National Steering Committee; and
- Reporting and dissemination of results.

The PTU should ensure that there are mechanisms for effective participation of all key institutions that have direct valuable input in NFMA design and implementation. The PTU should also develop collaboration with relevant national projects involved in assessment and monitoring to enhance networking, coordination and use of findings.

- **Field Teams** are responsible for collection and recording of data in the field and transmission of the field forms to the Project technical Unit. Whenever it is possible, they are also responsible for data entry.

3.2 Field team composition

The composition of a NFMA field team may be from four to eight members, taking into account the amount of information to be collected on the various land uses and the division of tasks among individuals. One or two members of the field teams (temporary assistants) are hired locally and act as guides in the field.

The team should include at least one person specialized in each of the concerned key disciplines, depending on the type of information to be collected in the assessment: forestry, botanic, sociology, wildlife, crop, livestock, soil, fishery, water, etc.

Moreover, at least one of team members who will be more working on field measurements and observations should also have some skills in interviewing, to carry out interviews with key informants as well as with focus groups and individuals. As some interviews (in particular focus group interviews) often have to be gender separated, it is recommendable that one of the team members assigned to interview activities is female.

ILUA

In an ILUA, two of the team members will be dedicated to the household survey activities (i.e. acting as enumerators) and should therefore possess good skills and experience in interview techniques.

In addition the inclusion of a student in an appropriate discipline (forestry, agriculture, environment, ecology) is strongly recommended for capacity building. Additional persons may be included to improve performance of the field teams when conditions require greater resources.

In general team members must be experienced in tree, shrub and herbaceous species identification (using local and/or scientific names). It is also recommended that some of the team members speak the local language.

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

- The **team leader** is responsible for 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 monitoring and ensuring timely progress in the fieldwork. He/she will specifically:
    - Prepare the fieldwork: carry out the bibliographic research and gather required secondary data, field forms and maps at appropriate scales;
    - Plan the work for the team;
    - Establish contact and introduce the survey objectives and work plan to local authorities, local technical officers (forestry, agriculture, land, community development), and request their assistance to inform local communities and identify key informants, guides and assistants;
    - Administer the location and access of SUs and plots;
    - Take care of team logistics: obtain information and organise accommodation facilities and food (meals; cooking facilities); recruit local assistants; organize access to the SUs;
    - Plan /organise the interviews together with those team members assigned to undertake interviews;
    - Be responsible for ensuring accurate filling in of recording forms and taking notes and applying cross-checking procedures to insure reliable data;
    - Organize daily meetings after fieldwork in order to sum up the day's activities and plan the next day;
    - Make a report of the SU summarizing the data collection process;
    - Enter the data in the database (if possible);
    - Organize and ensure fieldwork safety (first aid kit, support of local authority/armed guards if required, reduce risk from wildlife);
    - Maintain good team spirit.
- The **assistant of the team leader** will:
    - Help the team leader to carry out his/her tasks;
    - Ensure easy access to the SU with a guide very familiar with the area;
    - Take necessary measurements and observations;
    - Make sure that the equipment of the team is always complete and operational;
    - Supervise and orient the temporary assistants;
    - Assist the team leader in the making of the SU report;
    - Take over if the team leader falls sick.

- **The technical field team members/enumerators** will carry out the field measurements and interviews.

- **The temporary assistants, who are recruited locally, should be** assigned the following tasks, according to their skills and knowledge of local species, language and practices:

    - Help to measure distances;
    - Provide the common/local name of tree, plants, and wildlife species;
    - Inform about access to the SU;
    - Open ways to facilitate access and visibility to technicians;
    - Provide information about the various natural resources uses and management (forest, soil, water, crop, livestock...);
    - Carry the equipment.

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

The names and addresses of the team members must be written down in field **form F1b**.

4. Fieldwork procedure

4.1 Overview of data collection process

Data are collected by the field teams for SUs, plots, subplots, measurement points, land use/cover section (LUCS), land use/cover class (LUCC) and households (ILUA). The main information sources for the assessment are:

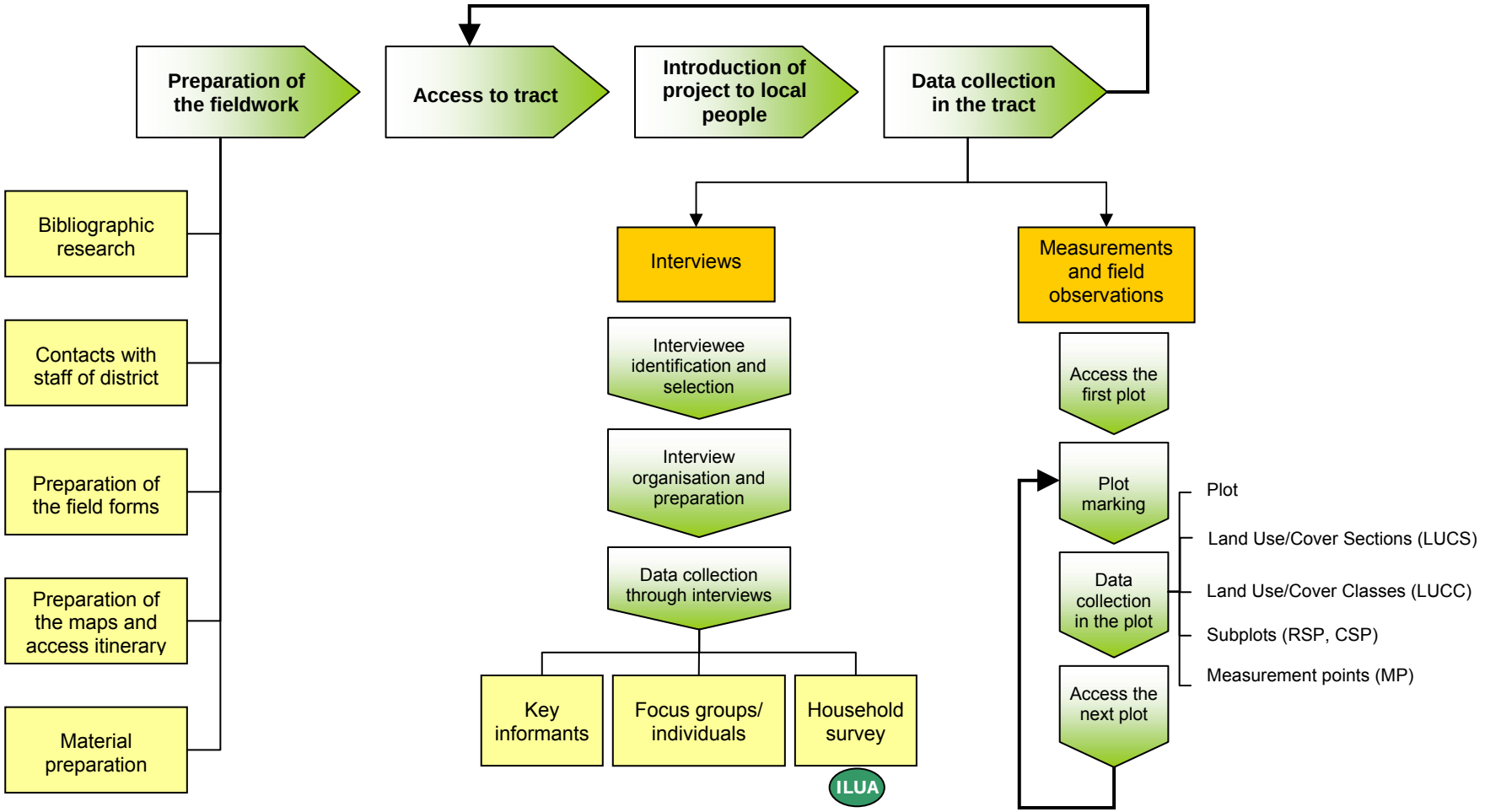
- Field measurements and observations.
- Interviews with key informants (external and internal), focus groups and individuals and randomly selected households (ILUA).

Those two main sources of information imply the use of different methods and approaches that complement and triangulate each other. Depending on the data to be collected and on the field conditions, one of the sources might dominate (e.g. high populated areas versus low populated). Additionally, field observations made by the field teams should be applied to confirm the information obtained from interviews.

The time taken for data collection in each SU is one week (5-6 days) on average.

The process for data collection is summarized in Figure 8, which also outlines the structure of the following sections.

Figure 8. Data collection procedures



4.2 Preparation for the fieldwork

4.2.1 Bibliographic research

Secondary information is necessary to prepare the field survey and carry out the interviews. Existing reports on natural resource and forest inventory, farming systems, national policy and community management issues, local people, customs and livelihoods and socioeconomic context, etc. have to be studied to enable the team members to understand and to build better knowledge on the local realities.

The field team leader is responsible for obtaining this data, but should obtain support of district/provincial authorities to compile and make available information required for NFMA, such as:

- Demographics/population census;
- Crop, livestock, forest, range, soil and water resources and production data;
- Socioeconomic data (markets; infrastructure, health, etc.); and
- Policy and legislation application, especially local byelaws, etc.

4.2.2 Contacts with communities and relevant local government departments

Each field team should, through its leader, start its work by contacting district staff who is involved in local/community based development in the area where the sampling units (SU) are located. These local staff should help contacting the authorities, community leaders and land owners in order to introduce the field team and its programme of work in the area. The local staff may also provide information about access conditions to the site and about the people who can be locally recruited as guides or workers with required local knowledge on relevant subjects (land use practices, forest use, etc.). They should also inform the local people about the project and fieldwork and generate interest in the survey findings by local stakeholders.

A recommendation / identification letter written by the relevant government departments, asking for support and assistance to the field team members should be issued to facilitate the work.

The data related to the land owners and informants must be reported in **form F1b**.

4.2.3 Preparation of the field forms

The Project Technical Unit prepare and print for each team the necessary field forms to cover the SUs assigned to it. For each SU, 6 (or 7 ILUA) field forms of one or more pages are needed. The forms are further described in the following section (section 5).

Some information will be filled in before going out in the field: sections for identification of the SU and plots (**header of each page**), general information related to SU location (**form F1**, **section A**), coordinates of the starting point of the plot (**form F2, section A**), names of field team members (**form F1b**).

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

The team leader must ensure that enough forms are available to carry out the planned field data collection.

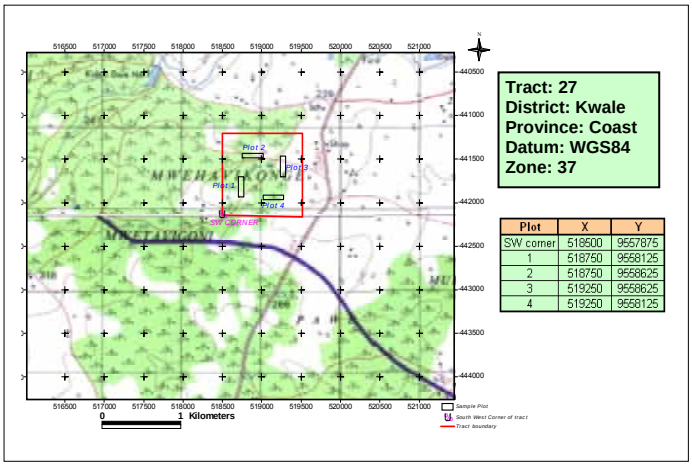
4.2.4 Preparation of the field maps and GPS set up

Maps covering the study area should be prepared to help the orientation in the field. These may be enlarged and reproduced at the appropriate scale, if necessary. These should include topographic (1:50,000 scale, if possible), administrative (1:250,000) and land cover maps (1:250,000).

Prior to the field visit, each team must plan the easiest and least time consuming itinerary to access the SU. Advice of local informants (local forestry and extension staff, for example) are usually valuable and help saving time in searching the best option to access the SU.

The SU and plot limits will be delineated on topographic maps and if available on aerial photographs or high resolution satellite images. The starting points of the four plots in the SU are to be indicated together with their respective coordinates in a projection system commonly used in the country (such as UTM), in meters (X, Y). The UTM system is more precise and easier to apply when using the maps, and will be used in GPS (datum WGS84). The GPS will be set up accordingly by specifying the projection system (e.g. "UTM") and datum used (e.g. "WGS84")

Figure 9. Example of field map with plot location



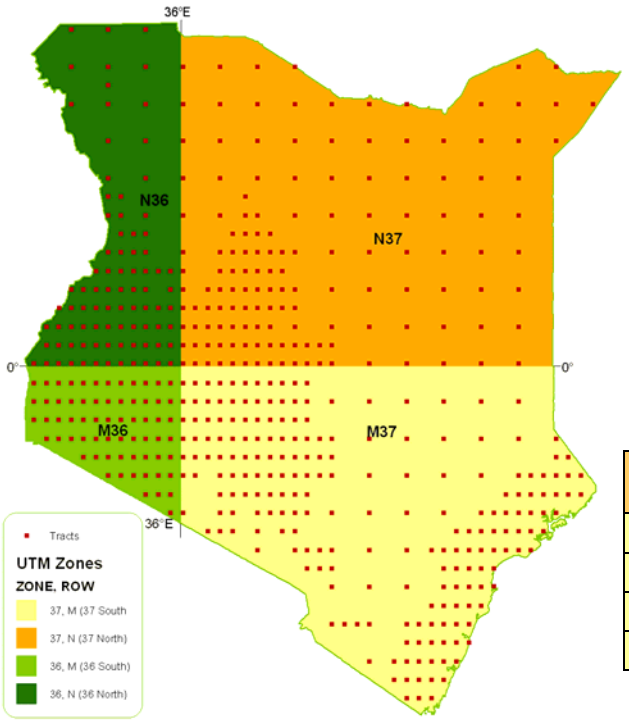
An enlarged section of the map corresponding to the area surrounding the SU will be prepared (photocopy or printed copy) and used to draw the access route to the first plot (see Figure 9).

The plot order (1 to 4) for data collection will vary according to conditions of accessibility. It is determined during the preparation phase, before going to the field.

Reference objects (roads, rivers, houses) that contribute to better orientation of the team in the field are identified.

The starting point coordinates of the plots are entered into the GPS receiver as waypoints. The point name will be given in the following way: (three digits SU number) + "P" (=Plot) + (Plot number) + "S" (= Starting), e.g. for SU 13, plot 3: 013P3S. One might consider if needed the projection zone (e.g. UTM zone) where the SU is located. An example in given in Figure 10 (Kenya UTM zones). All SUs West of 36 degrees in longitude East are in zone UTM 36 and while the SUs East of 36 degree longitude East are in zone UTM 37.

Figure 10. UTM Zones in Kenya



UTM Zone	Latitude (Y)	Longitude (X)
36 North = N36	≥ 0° N	< 36° E
36 South = M36	<0° N	< 36° E
37 North = N37	≥ 0° N	≥ 36° E
37 South = M37	<0° N	≥ 36° E

4.2.5 Field equipment per team

In order to conduct the data collection in the field, each field team must carry the equipment that is listed in Table 5.

Table 5. Equipment required for each field team

Equipment needed	Number required	Additional Comments
Precision compass (360°)	1	- High precision - In degrees - Waterproof and resistant
GPS receiver (Geographic Positioning System) and extra batteries	1	- Possibility to calculated average point - Optional antenna
Tree height and land slope measuring equipment	1	Clinometer with 15m, 20m and % scales to measure both tree height, in meters, and slopes, in percent
320cm / 10m measuring tapes	2	- Graduated in meters - Diameter measurement on one side, distance measurement on the other side - Auto rewind
30-50m (Self-rolling) measuring tape or rope/ chain, marked at every 1-5 meters	1	Metric

Range finders with amplification	1	Optional
Digital camera+ Spare memory card + Extra batteries + charger	1	
30-50cm galvanized steel bars for plot marking	40	For plot marking
Coloured flagging tape	Several rolls	Used for marking and retracing the access route
Machete	2	
File	1	
Waterproof bags	2	To protect measurement instruments and forms
Spade	1	
Hoe	1	
Callipers ILUA	1	Metric For shrub stems diameter measurements
Hydron pH paper ILUA	2 packs	To measure pH
1 Plastic Basin + 1 hard board insert + 4 Plastic sheets ILUA	1	Used for soil measurements parameters on structure, texture, porosity, type, colour
Water test kits (Dissolved Oxygen test) ILUA	1	Measuring dissolved oxygen
Turbidity test kit + refill test ILUA	1	For measuring turbidity
Infiltration rings and water ILUA		- For measuring soil infiltration - 12 inch (30 cm) diameter
Boots and waterproof outfits	One for each permanent team member	Size to fit team members
Leather gloves	1 pairs	
Clipboard	3	To take notes
Topographic maps and field maps	As necessary	
Field forms	As necessary	
Field manual	As necessary	
Notebooks	3	
Pens and markers	As necessary	
Hand calculator	1	
Flora and fauna species list / identification key	As necessary	On forestry, pasture, range, weeds, pests and others are relevant topics
Press and newspapers	As necessary	For collection of samples (plant/ leaves)
Flashlights and batteries	As necessary	
Knives	1	
Camping equipment and cooking utensils	1	Food if required

4.3 Introduction of the project to the local people

If the SU area is inhabited, the team must establish contacts with local people on arrival to the site and meet with contacted persons, village representative, closest government institution in place and owners. Except in very remote areas, the local population should be contacted before visiting the SU, in order to inform them about the visit and request permission to access the property. An introductory meeting should be organized to briefly and clearly introduce and explain the aim of the visit and study to generate interest and avoid misunderstandings or raising false expectations. A map or an aerial photograph, showing the limits of the SU, may be very useful to facilitate the understanding. It is important to ensure that both local people and the field team understand which area will be studied. 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 only in data collection for use by decision makers at national/provincial levels and is not a local development project. Care must be taken to ensure that no commitments are made during discussions and interviews.

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

Besides the presentation of NFMA, this initial meeting aims at resolving logistical matters. After the general introduction, access to the land, especially to forest and protected areas, fieldwork and interview schedule, as well as food and accommodation issues should be discussed.

This meeting should also give the opportunities to start collection of secondary data and to identify key informants and user groups for focus group interviews.

Box 1. Key points to be stressed when presenting the assessment to the local people

- This assessment is part of a larger programme for land use data collection at global and country level.
- There is limited information on the local use of land and natural resources and the problems that might exist at the local level. The collected land use information will be used by the country and the international community.
- The objective is to generate reliable information for improved land use and resources management policies that take into account peoples' reality and needs. Such information could help the government to plan and improve on food security and poverty reduction.
- The sampling units (SU) where the survey will be carried out are distributed systematically throughout the country. 501 SUs were selected in the country.
- The results from the study will be shared with the local authorities and communities after the data analysis. A meeting will be held to present the results to local authority. Posters and a copy of the final documents and reports will be sent to regional governmental offices.
- The study will use a participatory approach therefore involve local users of resources in data collection and understand how they manage their resources.
- The data are collected from two main sources:

(1) Measurements of land use and management practices in forest, agriculture lands (ILUA), rangeland, pasture including livestock ((ILUA)), wildlife and trees outside of forests; and

(2) Interviews with key persons, individuals, focus groups and randomly selected households ((ILUA)).

- Measurement to be undertaken includes: tree diameter and height; species composition (forest, crops and plants); soil and water quality; and land degradation indicators.
- The field team should be especially interested in the perception of local land users on land use changes and will therefore interview them about the main products extracted from land; land use related problems; and local solutions/innovations.
- Some or all of the SUs surveyed in the country will be monitored in the future, and on a periodic basis (e.g. every 5 years) with the aim of assessing land use changes and their impacts and implications.

4.4 Field data collection

4.4.1 Interviews

The following sections present the procedure on the identification and selection of persons to be interviewed, the interview's preparation, organization and conduction.

The interviews will be carried out with the following target groups: key informants; focus groups or individuals and randomly selected households ((ILUA)).

A summary of the interview procedure is provided in the Table 6.

Table 6. Interviews

Target group to be interviewed	Who are they?	How to identify them?	Where?	When? (see Figure 12)	Information
Key informants	• **External key informants**, includes officers from local government departments, NGOs, extension workers and local administration representatives. • **Internal key informants,** includes the community members who possess an overall and in-depth knowledge of the local use and users of natural resources, such as community leaders, community representatives, school teachers, customary leaders, community based organizations and owners.	• Based on their official function and personnel involvement in the areas development. • Suggestion from local government departments, NGOs and community members.	• At the office • At the house • At the site/village	• During the planning phase of the fieldwork • Before reaching the site • When arriving to the site • During the fieldwork activities	• Logistics • Background information on the SU • Information on the people living in the SU or in the surroundings, including household locations • General information on the distance and access to the SU/plots • General information on the Land Use/Cover Section (ownership, protection status, management, ecological problems) • General information on local uses and importance of forest products and services • Information that will help identifying user groups. This information will help select individuals and focus groups to interview • Queering where questions were left blank after data collection • For verification and cross examination of data collected from households

Target group to be interviewed	Who are they?	How to identify them?	Where?	When? (see Figure 12)	Information
Focus groups or individuals	Representative groups or individuals living and/or using land resources in the area. Examples of user/focus groups: • Forest and tree users • Farmers and pastoralists managing various combinations of crop, livestock, rangeland and agroforestry systems • Fishermen – using water resources for fishing and aquaculture • Women • Men • Youth • Owners • Tenants • Occupants • Nomads / transhumant, etc. • Long-term residents (for historical changes) • Hunters and gatherers	• Recommended by key informants • Identified by applying rapid rural appraisal to identify stakeholders (see section 6.7.2) • Gender balance in resource uses should be considered when selecting focus groups • Locally recruited team members can be used as focus individuals	• At their house or in the village • In the field (transect walk, persons working in the field) • Close to or within the SU	• During the introduction to the local people • Arranged meetings (group or individual meeting) parallel to and after the data collection in the plot	• Information on local population (history, etc.) • General information on the land use/cover section (ownership, protection status, management, ecological problems, etc.) • Products and services • Management and uses, of products and services derived from the different land uses/ resources • Historical information related to the changes in the area • Temporal changes in land resources, biodiversity and livelihoods, invasive and threatened species • Change in ecosystem services and functions

Target group to be interviewed	Who are they?	How to identify them?	Where?	When? (see Figure 12)	Information
Selected households (for the household survey) ILUA	15 households living within or close to the SU centre	• Random selection within the HSA (2km from the SU centre (see section 4.4.1A) • If within the sampling site there are less than 15 households all will be interviewed	• At the household • In their fields	• Parallel to the biophysical data collection in the plot	• Household questionnaires (Form F7) • Household composition and activities • Natural resources products (Fish, wildlife, trees, forest, crop) • Crop and livestock production systems • Accessibility to services and water resources, etc. • Conflicts (in resource use and accessibility) • Other: Changing in status of threatened species and invasive species

A. Identification and selection of informants and interviewees

As previously mentioned three major informant categories will be interviewed:

- Key informants;
- Focus groups and individuals; and
- Randomly selected households.

In sparsely populated areas and in the absence of local inhabitants or sedentary populations, many of the social economic variables will essentially be collected from observations or from key informants.

All the persons interviewed (key informants, individuals and households) and providing information on the SU must be mentioned in the list of persons involved in the assessment (**form F1b**).

A1. Key informants

These are external (living outside the area) or internal (living in the area) individuals with particular knowledge about the area, the land/ natural resource use and the local community. They do not have to be local land resource users themselves.

In the process of planning of the fieldwork, local government officials, leaders of local development organizations and local administration will be contacted for logistics and planning purposes. They may provide very useful background information and may be selected as **external key informants**. Often they have knowledge about conditions and accessibility to the site. They may also provide literature and other existing data.

Some individuals within the community may possess an overall and in-depth knowledge of the local settings, costumes and use of natural resources and may serve as **internal key informants**.

A2. Focus groups and individuals

These are representative persons of key stakeholders or land/resources user groups that are of particular important and/or significant in the area. User groups are defined as people who relate to and use the land and resources on a frequent basis. These people live in or close to the SU. They may be interviewed in groups (focus groups), or individually.

Upon arrival to the site, the main resource user groups, or stakeholders, must be identified. This task may be carried out through discussions with village representatives, community members, and key informants, or through visual exercises. Stakeholders identification, and the understanding relationships between users and resources will be undertaken through the Rapid Rural Appraisal (RRA) exercise, as explained in Annex section 6.7.2 page 169 (Venn diagram). It is recommended to carry out such an exercise during the introduction meeting, so that an overview of the key user groups is established early in the stay.

Representativeness is a complex issue to be aware of when identifying land/resource users or stakeholders to interviews. Many users share common characteristics and are classified within a common group, for analytic purpose. Nevertheless, wide variations in cultural and social

factors (gender, age, wealth, status, religion, etc.) often exist and should be taken into account. Therefore it is recommended to identify stakeholders together with several local participants in order to appropriately define the user groups. Many different groups might be identified but the assessment must put emphasis on the individuals and groups that use natural resources, products and services. The gender aspect should be emphasised as crucial when selecting focus groups and conducting interviews as males in some cases dominate discussions, which in turn might result in biased results.

ILUA

A3. Selection of households for the household survey

A household is defined as an unit that consists of all members of one family who are related by blood, marriage, or adoption, including other persons, such as house-help or farm labourers, if any, who normally live together in one house or closely related premises and take their meals from the same kitchen. It may also consist of one member.

In general, sixteen (16) households will be interviewed for each SU. These households will be **randomly** selected, in order to avoid any bias or non representative sampling procedures.

The selection is made in the household survey area (HSA), within a circle of 2 km radius from the SU centre (see Figure 5, p. 16).

Household selection will be carried out through the following process:

- If there are no inhabitants within the sampling area then no household survey interview will be carried out (but some information will be collected by observations and key informants).
- Households within the SU will be equally treated as households within the HSA.
- Nomadic population should also be included in the selection if they are in the site during the survey.
- If there are less than 16 households within the HSA then all households will be interviewed.
- If there are more than 16 households within the HSA then a random selection procedure will be applied, as follows:

  Case A: there are less than 80 households in the HSA, **Form F1c – Part F (front page)** is used:

  1. All the households in the HSA are listed with the help of the key informants in the table Form F1c.
  2. The Sampling Interval (SI) will be determined by applying the formula: THSD/16 (where THSD represents the total household number in the HSA). The SI is given by rounding to the closest whole number (example: 3.1 will be rounded to 3; 3.6 will be rounded to 4; 3.5 will be rounded to 4).
  3. Use a table of random numbers or a scientific pocket calculator to get a random number between '1' and the SI, inclusive. The given/Starting Number (SN) will be the first selected household on the household list. If the number is given by a calculator, obtain a number between 0 and 1, multiply it by SI, add 1, and drop the decimals. For instructions on how to use the random number table, see the Annex 6.5, p. 162.

4. Add the SI to the Starting Number (SN); the sum will give the second household on the list to be in the sample. Continue with the procedure, adding SI to each successive sum until you have selected all the 16 households.

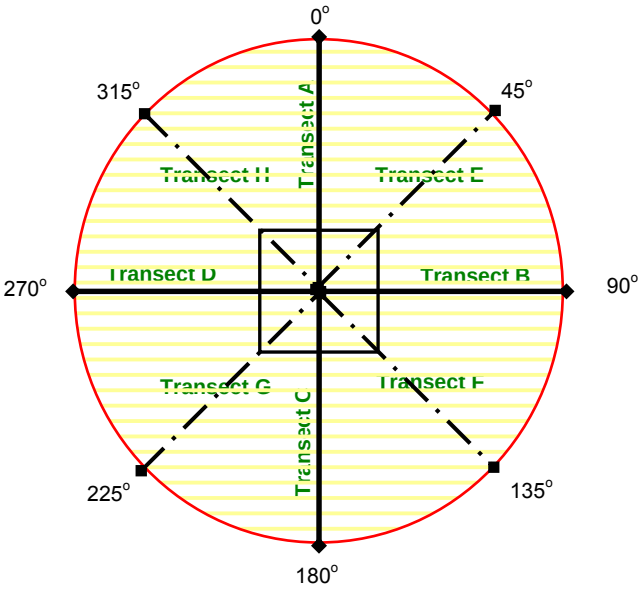
5. For each selected household mark the checkbox in the table in form F1c, column 201c.

Case B: there are more than 80 households within the HSA. It would be too time consuming to list all households, so transect selection method is applied, using **Form F1c/R – Part F (reverse page)**:

1. The interviewees make walk transects that go from the centre of the SU to North, East, South and West as shown in the picture below (Figure 11, respectively transects A, B, C and D) and count the number of households on or close to each transect (left or right). Households should not be doubled counted, especially if they are close to the SU centre (they will counted for the closest transect);

2. If there are less than 16 households, then the four other transects, from centre of the SU to North/West, South/West, South/East, North/East (respectively transect E, F, G and H, as shown in Figure 11) have also to be surveyed.

Figure 11. Transects for random selection of households (households in the HSA >80)



3. After that procedure, it is necessary to calculate for each transect the selected number (SN) of households to be surveyed in that transect by using the formula SN=(HS/Tot HS)*16 (round the number to the closest whole number) and determine the sampling interval (SI) by using the formula HS/SN. The SI is given by rounding to the closest whole number (example: 3.1 will be rounded to 3; 3.6 will be rounded to 4; 3.5 will be rounded to 4).

   In this way the number of households to be selected on one transect is weighted according to the number of household in that transect.

4. For each transect, use a table of random numbers or a scientific pocket calculator, to get a random number between '1' and the SI, inclusive. The given/Starting Number (SN) will be the first selected household on the transect (from the SU center). If the number is given by a calculator, obtain a number between 0 and 1, multiply it by SI, add 1, and drop the decimals. For instructions on how to use the random number table, see the Annex 6.5, p. 162.

5. Add the SI to the Starting Number (SN); the sum will give the second household on the transect to be in the sample. Continue with the procedure, adding SI to each successive sum until you have selected all the households to be surveyed in that transect (SN).

6. For each selected household fill in the table in **form F1c (front page)**.

Cases of non-response

Some households selected for the sample will not be interviewed due to absence, refusal, or because it does not live anymore in the area. In these cases, this will be specified in the table in form F1c (**front page**), column 199.

In case of temporary absence, the interviewers have to try to reschedule or better schedule the appointment.

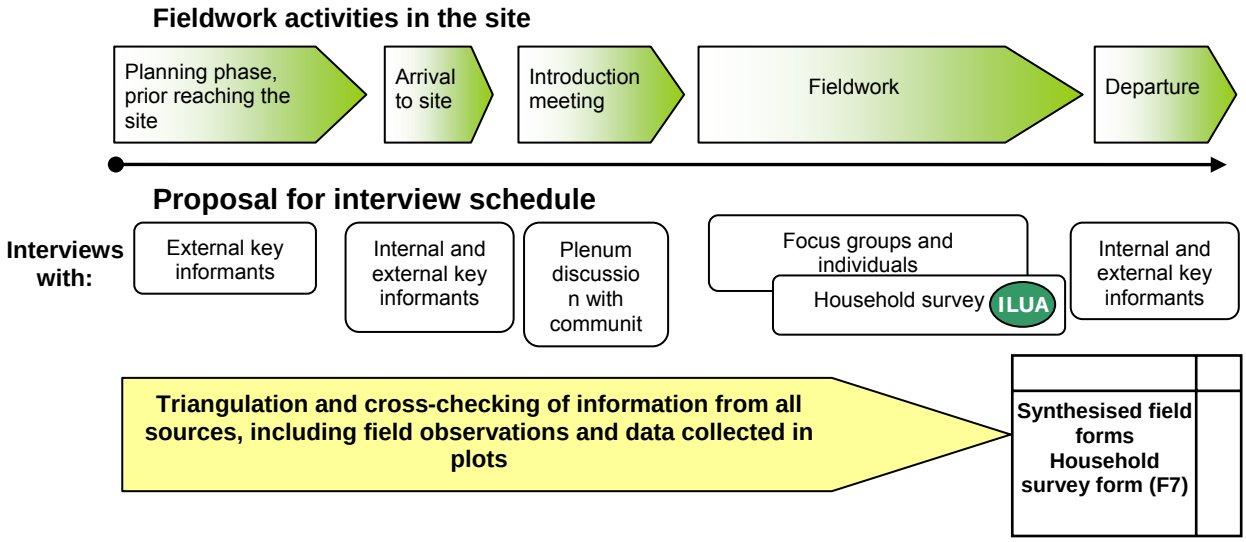
In case of refusal, all attempts should be given to reformulate the request and better explain the objectives of the survey. Refusals often depend on the interviewers' attitudes and experiences.

If, after all efforts provided, there is still non-responding households, they will be replaced by another randomly selected household The newly selected household will be considered as a "replacement household" and this will be specified in F1c table, column 201a.

B. Interview organisation and preparation

The Figure 12 gives an overview on how interviews with key informants, focus groups and individuals, and the household survey should be scheduled.

Figure 12. Suggestion on how to organise interviews during the field work activities



Some general information required in the field forms may be completed through interviews with **external key informants before going to the field** (during planning / preparation phase), especially SU information (**form F1**).

Subsequently, further data should be collected through interviews **in the field** with internal key informants, focus groups/individuals and households:

- **Internal key informants** may be contacted and interviewed when arriving to the site to establish some basic knowledge about area, the local population (e.g. user groups) and land uses. Key informants might also be valuable sources for information throughout the stay in the site and for cross-checking information that is received from other sources (both from interviews and field observations/measurements).

- **Identified focus groups or individuals** (see previous section on how to identify them) will be interviewed throughout the stay in the site. Nevertheless, as the information received from a group interview might serve to better understand and approach households in interviews, focus group interviews could with advantage be carried out early in the interview schedule. The introduction meeting might serve as first opportunity for a group discussion and platform for a general discussion with the present population on historical changes, existing land use patterns, etc. Other group interviews, targeting focus groups will be carried out subsequently to gather data on those specific users.

- The **household survey**, (form F7 ILUA) should commence as soon as **households** have been selected.

ILUA

Two members of the field team will be dedicated to the household survey and will carry out the interviews parallel to the data collection in the plots. In this manner working effort is appropriately distributed between the two tasks and assigned the necessary time and attention. Preferable, the two members assigned to the household survey tasks should contain both a man and a woman in order to allow gender separated interview.

The interviews with key informants, focus groups and individuals will be carried out by some of the field team member working in the field measurements/ observations so they can refer to what they have seen in the field. Some of these interviews can also be carried out directly in the plots, with people met in the field during the measurements, or with the local guide/ temporary assistants.

In general, it is recommended the interviews be scheduled to fit with the daily work-schedule of the local people. Also, the information generated from household surveys should be cross-checked with and complemented by other sources (key informants, focus groups/individuals and field observations) and vice versa.

At the end of the field work in the SU all data collected about the SU, plot, Land Use/Cover Section (LUCS) and land use SU from the various interviews should be interpreted and synthesized onto the field forms (**F1**, **F5** and F6**).**

C. Data collection through interviews - Interview techniques and tools

Data will be collected or validated/ cross-checked trough interview. The source of this data will vary according to the type of data. The table below summarizes what data may be collected from what sources. This table is indicative; one type of information might derive from one source in one SU and from another in the next.

Table 7. Data to be collected through interviews

Interviewee category	F1a			F1c ILUA		F1d	F3		F4a		F5			F6 s/p **			F7 ILUA
	Table A (SU location)	**Table C** (population)	**Table D** (proximity to infrastructure)	**Table G** (catchments condition)	**Table H** (water use point)	**Table K** (list of households)	**Variable 56a** (common/local name)	**Variable 60** (years since cut)	**Variable 77a** (common/local name)	**Variable 56a** (common/local name)	**Table A** (general)	**Table B** (forest and OWL management)	**Table C** (crop management) ILUA	**Table A** (products harvested in LUCC)	**Table B** (services provided by LUCC)	**Table C** (biodiversity indicators)	**All tables/ variables**
External key informant	M	C	C	M		C											
Internal key informant	C	M	M	M	M	M	C	C	C		C	M	C	C			
Focus individual*		C			C		M	M	M	M	M	C	M	C	C	C	
Focus group*		C			C						C	C	C	M	M	M	
ILUA **Household**														C	C	C	M
Observations			C	C	C		C		C	C	C	C	C	C	C	C	C

Notes: ***M*** *= Main information source* ***C*** *= Complementary information and for cross-checking purposes*
** Interviews with individual informants should complement focus group interviews or substitute these when not available. Individual informants are also the local guides/ workers recruited to help in the work in the plots.*
*** F6s/p: For each information source (focus group or individual) a separate form F6p should be used. Focus groups should have priority. A summary will be made in form F6s.*

General explanations on the data collection techniques and group discussions, interview recommendations and example of questions are provided in Annex (section 6.7, page 166).

In general, the questions should be clear and simple in order to be easily understood by the interviewee. They should be asked in the order that is the most natural following on from informants' responses and should not be repeated. When formulating the questions, interviewee's culture and language must be taken into account. Historical information related to the changes in the area may be a good starting point for the discussions.

Tools and techniques that may be adopted include:

- **Stakeholder identification analysis exercise (Annex, section 6.7.2, page 169):** This should be carried out as an initial exercise (e.g. during the introduction meeting) and will help identifying user groups for focus group interviews. It might be merged with the *Participatory analysis* (see below) and serve as a source for generic information about the use of natural resources, forest products and services, agriculture production, environmental problems, etc.
- **Participatory analysis of aerial photographs or maps (Annex, section 6.7.3, page 170):** This exercise may stimulate discussions with the focus groups on a number of variables and could be carried out during the introductory meeting or later with identified focus groups. It will provide important information on both the use and management of resources (What uses? Who uses what? Where? How? etc.) and the logistics on how the field team can access the SU.

- **Interviews within the sampling unit itself (Annex, section 6.7.6, page 171):** This exercise could be done by organizing a transect walk or by collecting information from locally recruited workers who participate in the plot measurement work. This will allow one to link collected data with the location of the SU/plot/LUCS/LUCC in the field. This exercise can also be applied during the household survey for better understanding household practices and uses of natural resources.
- **A products and services identification exercise (Annex, section 6.7.7 page 172):** This exercise may be organized to collect data from the focus groups, for example, on forest, fish, crop, wildlife products, services and users.
- **Cross-checking (Annex, section 6.7.4, page 170):** Cross-checking and triangulation should be applied as much as possible to verify/validate information from all different sources e.g. between different types of interviews and between qualitative information from interviews and quantitative data collected in plots or direct observations (Annex, 6.7.5 page 171). Mechanisms have been incorporated in the F7 field forms so that enumerators easily and continuously can cross-check the received information.

4.4.2 Field plot measurements and observations

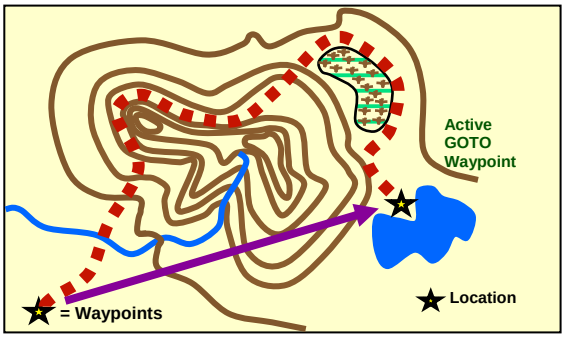
A. Access to plot

For each sampling unit, the plots will be located with the help of the UTM coordinates and topographic maps (and aerial photographs/satellite images, if available), on which the plots have been delineated (field maps, see section 4.2.4, p. 11 and Figure 9). Some reference points that facilitate the orientation in the field (e.g. roads, rivers...) will also be identified on the field maps. It is also important to hire a local guide who can provide useful information on how to access the plots more easily.

The order in which the plots are inventoried (usually already decided during the planning phase) depends on the accessibility but the plot code (1 to 4) and orientation must be respected (the data collection process must start at the plot starting point).

Navigation in the field to arrive to the first plot starting point will be assured with the help of a GPS where the starting points of each plot have been pre-registered as waypoints, using the "GOTO" function (see GPS guide in Annex 6.3, p. 160). The GPS normally indicates the straight distance and bearing to the active GOTO waypoint. But in some cases the path to the waypoint requires meandering around topographic obstacles (see Figure 13) or following as far as possible roads or existing paths.

Figure 13. Path to a waypoint using a GPS GOTO function



While accessing the first plot, **form F1, section D** must be filled in. The coordinates of the departure location on foot towards the first plot (usually from the vehicle) must be read on GPS (or on the map, if the GPS does not capture a signal).

Figure 14. Access to SU - Starting position coordinates and access time (form F1 Part D)

Starting position coordinates:

32a.UTM E 0 1 7 4 1 4 8 m 32b. UTM N 1 6 5 7 3 5 9 m

Access time:

33a. Start time: 0 7:2 0 h 33c. Start date: 12 / 10 / 2008

34a. End time: 0 8:1 5 h 34c. End date: 12 / 10 / 2008

34b. Arriving at plot No 1 34d. Total access time: 0 0: 5 5 h

During the access to the plot, photographs will also be taken for relevant sites (such as road/path junctions, settlements) that can orientate to arrive in the future to the sampling unit. For these reference points to access path, the coordinates, bearing and a brief description must be recorded in the table at the bottom of **form F1** (see Figure 8). 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 relocation of the plot (see example given in Figure 15. The coordinates of each reference point are read on the GPS and recorded on the form and reference photos may also be taken and their codes are specified on the form. If required, the flagging coloured tape will be placed along the access path, on trees, visible enough to facilitate the return out of the SU.

Figure 15. Access to Sampling unit sketch (Field form F1a/R)

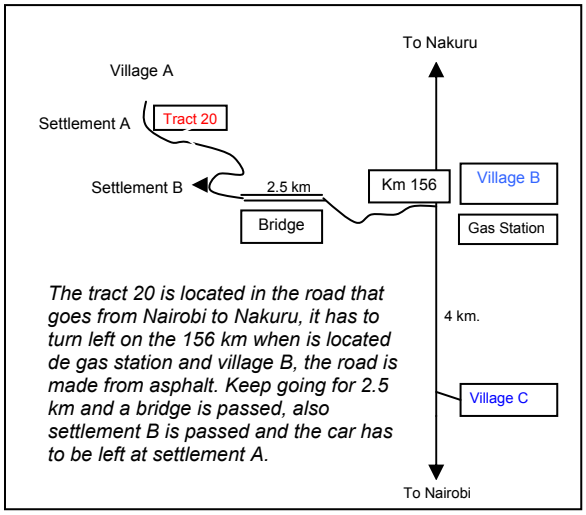


Table 8. Example of reference point of access path table (Form F1, Part D) (SU No13)

Reference points of access path (Route sketch to be attached)

35. ID	36. Description	37a. UTM E (m)	37b. UTM N (m)	36b. Photo #	36d. Bearing
1	River bridge	0174162	1657372	013-0.1	28°
2	Road crossing	0174024	1657451	013-0.2	54°
3	Settlement	0174038	1657523	013-0.3	160°

If the GPS signal is lost at the moment of locating the starting point of the plot, the team can stop and wait the signal to be established again or move to a location with a clear view of the sky (dense foliage, buildings can block the signal) to get the coordinates, and from there navigate using a compass and measuring tapes, calculating distances to the plot starting point for the East-West and the North-South axes (see below).

When the team is close to the starting point the GPS (about 10 metres distance), reading will not stabilised. At this moment, to establish a well defined starting point without subjectivity, the team:

1. Stops and get the position coordinates using the "average position" function of the GPS;
2. Calculate the difference between the actual position coordinates and the plot starting point coordinates (northing and easting);
3. Move to the East or West for a distance corresponding to the difference between the easting (= X coordinates), using the measuring tape and compass (bearing 270^o or 90^o):
   - if the easting of the actual position is lower than the easting of the plot starting point position, then the team will move to the East (bearing 90^o);
   - on the contrary, if it is higher, then the team will move to the West (bearing 270^o);
4. Move to the North or South for a distance corresponding to the difference between the northing (= Y coordinates) using the measuring tape and compass (bearing 0^o or 180^o):
   - if the northing of the actual position is lower than the northing of the plot starting point position, then the team will move to the North (0^o);
   - on the contrary, if it is higher, then the team will move to the South (180^o).

Once arrived at the plot starting point location, the starting date and time of work in the plot will be recorded in **form F2, section B.**

B. Establishment of permanent plot

The position of the starting points of all 4 plots in the SU need to be precisely located, marked with a permanent marker and properly referenced to enable their easy relocation in the future.

When arriving at the starting point of the plot a permanent marker (galvanized metal tube) is inserted fully into the ground so it is no longer visible. The marker must be placed exactly on the position of the starting point of the plot. In cases where obstacles obstruct or prevent such exact location (tree, rock, river, house, etc.), the permanent marker should be placed as close as possible to the starting point of the plot (see below).

The permanent marker will not be possible in cropland; there attention should be paid on providing good reference points/objects.

Marker location data must be recorded on the field form (**F2**, **part C**) together with a starting point description of the plot in order to enable relocation in the future.

The coordinates of marker position are determined using the GPS (average position). An identification code will be assigned to name each one of the points identified by the GPS according to following: (SU number) + "P" (= Plot) + (Plot number) + "M" ("Marker"), e.g. for SU 13, plot 3: 013P3M. A photo of the Marker position may be taken, it should have the same code.

If for any reason (presence of rock, river, house …) the marker could not be placed at the starting point, the distance and compass bearing (in degrees) of the plot starting point should be measured from the marker location.

In addition, 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 should be measured. A photo from the marker should be taken for each reference and coded as follow: "Three-digit SU number" + "-" + "plot number" + "." + "running photo number within plot" (e.g. photo of the 3rd reference taken in the 2nd plot SU number 028 = 028-2.3).

These indications are reported on a sketch (plot starting point plan, 43) 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 fieldwork) (see Table 9 and Figure 16).

Figure 16. Marker description (sketch and table) (Field form F2 part C)

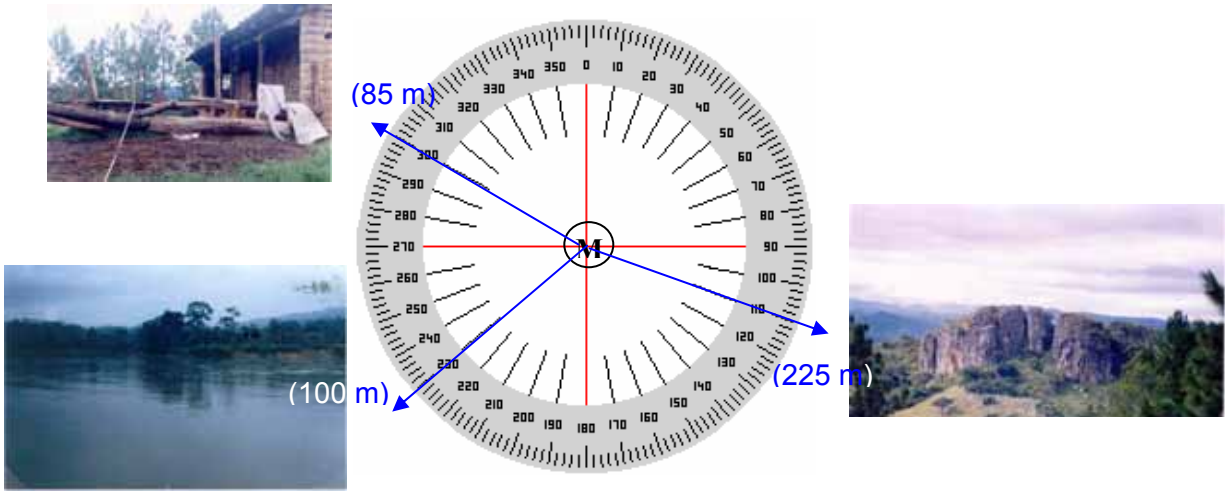


Table 9. Example of reference point of access path table (Form F1, Part D) (SU No13)

Reference points surrounding Marker position

44. ID	45. Description	46. Bearing* (°)	47. Distance * (m)	36c ID Photo
1	South West corner of the House of the Otieno family.	300	85	015-2.1
2	Summit of big hill "Got Agulu".	110	225	015-2.2
3	Inner curve of Nyando river.	230	100	015-2.3

C. Summary of data collection procedure in the plot

The data collection starts at the plot starting point and continues in the predefined plot direction (see Table 2 and Figure 2). The progress along the central line will be made with the help of the compass and 50 m meter tape or rope (or metal string), to get a well define central line. In order to facilitate the bearing, flagging coloured tape may be attached to cut branches trees stretched along the central line, as the field team advances. It is necessary that slope corrections be made using the Table 13 (given in Annex 6.4) in order to obtain a more accurate measurement of horizontal distances.

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

All the data collection process has to be well documented with photographs. A photograph has to be taken for each land use/ cover class found in the plot. Pictures for any problem encountered, unique features or environmental problems should be taken during field work.

Different variables are collected depending on data collection levels:

- **Plot**: identification of different land use/cover sections (LUCS) and measurements of large trees and stumps (Dbh ≥ 20 cm, or ≥ 10 cm for the trees outside forest). Data on trees measured in the plot are to be recorded in **form F3a or b** (one for each plot). A plan of the plot indicating in particular land use/cover sections limits must also be completed in **form F2** (**section D**).

- **Land Use/Cover Section (LUCS)**: corresponds to the land use/cover sections identified along the plot. Information collected at this level will be recorded in the field **forms F5** (one for each LUCS). It includes:

    - general information related to the area (designation, land tenure, environmental problems, vegetation cover, etc.), (**F5 section A**)

    - forest and other wooded land management practices (harvesting, silviculture, etc.) and structure (**F5 section B**), and

    - crop management practices (**F5 sections C)**.

- **Land Use/Cover Classes (LUCC):** corresponds to each land use class found in the SUs (in all 4 plots). Information on forest, trees, wildlife, crop, fish products, on environmental services, invasive and threaten species, wildlife abundance, and land use change is collected at this level and reported in **form F6** (one for each LUCC).

- **Rectangular Subplot (RSP):** shrubs (in all LUCC), small diameter trees (only in forest LUCC) and indicator plant species (in all LUCC except in water and cropland) are inventoried at this level:

    - Data related to small diameter trees and stumps (Dhp>=10) are reported in **form F3 (a/b)** (only in forest as all trees with Dhp>=10).

    - Data related to shrubs are reported in **form F4c section E**.

- Indicator plant species are recorded in **form F4 a/b section C**.

- **Circular Subplot (CSP)**: tree regeneration data (in all LUCC except in water) are collected at this level and recorded in **form F4 section D**.

- **Measurement point (MP):** topographic and soil data is collected at the three measurement points and registered in **form F4 section A.**

D. Details on plot measurements

D1. Plot plan

All details related to the plot must be indicated in the plot sketch in **form F2, section D**. In particular, the following characteristics will be drawn:

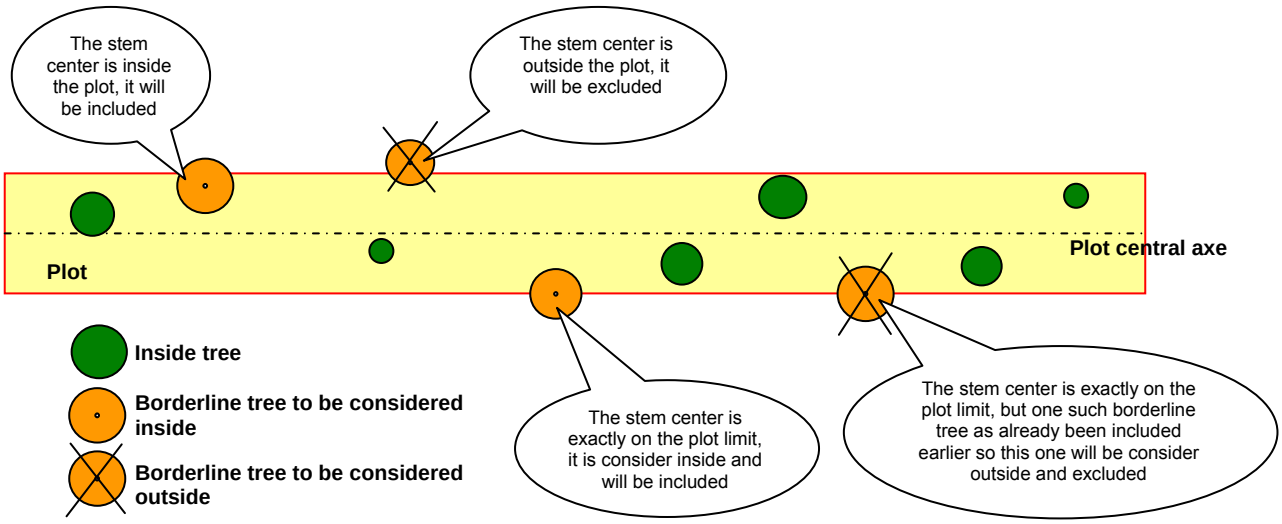
- limits between land use/cover sections, including the code of the land use/cover class code (inside the corresponding sections).
- crossing of water courses and infrastructures (roads, paths, fences), including the code and width of the road/water course.

In addition, the sketch must also include all the information and observations that help interpreting the plot.

D2. Tree measurements

All trees over 20 cm of diameter at breast height (Dbh) found within the plot are measured (Table 10) and the data is 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. If the stem centre is exactly on the plot limit then it will be considered once inside, once outside.

Figure 17. Borderline trees cases



For smaller diameters, measurements are carried out within the subplots, located at every 120 meters (see Figure 2). The size of trees measured varies according to the subplot level (RSP or CSP) where the measurements are made (see Table 10).

In the LUCS classified as "outside the forest", all trees with a Dbh ≥ 10 cm are measured, and these data are recorded on form **F3a** or **b**.

Stumps are measured as for trees, following the same diameter criteria. Stump diameter is then measured at breast height or at the top of the stump if less than 1.30 m above ground level. In this case, the height of the stump (where the diameter is measured) is recorded in F3a or F3b (number 59).

Table 10. Trees and stumps measured per level and corresponding forms

Level	Measured trees/stumps		Measurements	Field form
	Forest	Other LUCC		
Plot	Dbh ≥ 20 cm	Dbh ≥ 10 cm	Species, location, diameters, total height, health, quality	F3a or F3b
Rectangular Subplot (RSP)	DBH ≥ 10 cm	None	Species, location, diameters, total height, health, quality	F3a or F3b
Circular Subplot (CSP)	Tree height ≥ 1.30 m and Dbh < 10 cm	Tree height ≥ 1.30 m and Dbh < 10 cm	Number of trees by species	F4 (section C)

Tree regeneration (tree height ≥ 1.3 m and Dbh < 10 cm) are only counted by species within CSP. Only tree species (species reaching 5 m height *in situ*) are recorded.

For bigger diameter trees, within RSP or within the plot, collected data are more complete and include, besides the species identification, height, diameter, health and tree quality.

Indications on tree diameter and height measurement methods are provided in appendix (see section 6.2) page 152.

D3. Soil measurements

Two methods are proposed to collect data on soil, depending on information requirement and available funds: Soil Visual Assessment, based on observations carried out in the field, and soil sample collection, which implies subsequent laboratories analysis. Both methods might also be applied jointly as they provide different information.

ILUA Soil infiltration measurement procedure is also described but is optional as it requires a lot of water and can be time-consuming.

- **Soil Visual Assessment (VS-Fast)**

Soil measurement methodology is adapted from the visual soil field assessment methodology of FAO. The methodology was first designated for farmers (and their advisors) use with the prime aim of providing a cheap, repeatable and usable by farmers, immediate mains of land degradation assessment (McGarry and Sharp, 2001, Su et.al 2004).

The biophysical and hydrological properties of the soil are assessed at the **measurement points** (centre of Rectangular Subplots, i.e. 3 per plot, see Figure 2).

The rapid Soil Visual Assessment technique (VS-Fast) is used to observe the soil surface, the top layer of soil and the tilled layer (ILUA) to about 30 cm in depth and assign a score for each of the properties. These various tests are described with more details in the description of field forms section of this manual. Data are recoded in the **field form F4, section A**.

More details on soil visual assessment techniques are provided in Annex 6.5, p. 162.

- **Soil sample collection and analysis (optional)**

Soil information is gathered systematically in five defined **soil sampling points** along the plot level (see Figure 18). LUCS number should be recorded for each soil sampling point. Site variables like slope, slope orientation, relief and flooding characteristics are to be recorded as well as soil variables including soil surface, top soil depth, sub soil depth, soil depth restriction and soil infiltration.

19 samples are collected for each plot as follows:

1. At each sampling point, two composite samples are generated by mixing up four samples taken from different points (about 5 meters apart, as shown in Figure 18) at the same depth: 0-20 then 20-50 cm.
2. Then at the 3 Measurements points (center of RSP) auguring continue to a depth of 110 cm, where the soil profile allows, and 3 more samples are collected at 50 – 70; 70 – 90; 90 – 110 cm respectively. If the soil becomes impenetrable with the soil auger the depth will be recorded and the reason of depth restriction will be indicated as either compaction or rocky/stone/gravel.

Table 11 shows the number of soil samples to be collected on each plot.

All the samples collected should be taken to laboratories for sample preparation for analysis then all the samples are analyzed using spectroscopy method. The parameters to be measured includes: carbon, calcium, magnesium, particle size, CEC, pH, extractable nutrients: NPK, erosion risk factors will be analyzed. 20% of the soil samples collected will undergo a full wet laboratory analysis for calibration and validation of the results obtained from spectroscopy method.

Figure 18. Soil sampling

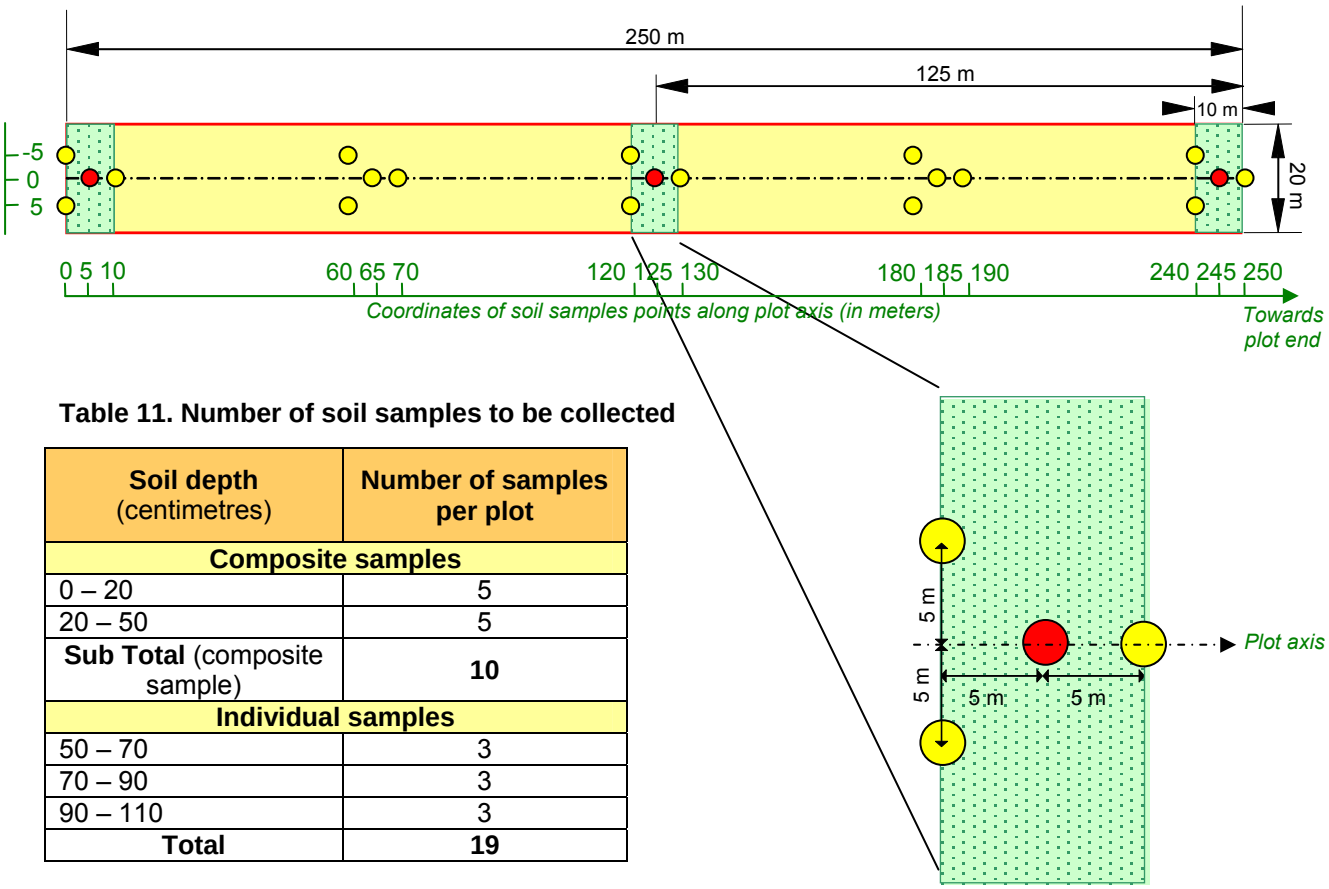


Table 11. Number of soil samples to be collected

Soil depth (centimetres)	**Number of samples per plot**
Composite samples	
0 – 20	5
20 – 50	5
Sub Total (composite sample)	**10**
Individual samples	
50 – 70	3
70 – 90	3
90 – 110	3
Total	**19**

D4. Data collection on products and services

Data on forest, trees outside of forests, crops and fish products is collected for each land use/cover class (LUCC) present in the sampling unit (SU). The information will be reported in **form F6.** If there are several LUCS with the same LUCC in the SU, the data is grouped and recorded on the same sheet.

This information will essentially originate from interviews with local people or from people accompanying the field team in the field, but should also be verified/ complemented through direct field observations. Interview and group discussion techniques and instructions are included in section 4.4.1, p.37.

D5. Shrubs measurements

Shrubs within the Rectangular Subplot (RSP) are inventoried and these data are recorded on field **form F4 section D**. Collected data include species, average diameter at 0.5 meters, height and number of stems.

D6. Plant indicator species inventory

Plant indicator species are identified in the Rectangular Subplot (RSP) and data are recorded on form **F4 section B**.

These species might indicate poor, medium or good forest, cropping, rangeland (or other) conditions.

E. 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 team need to access the second plot. It may be possible to directly access the plot with the help of the GPS. Otherwise, for example in dense forest, it may be assured by using the compass bearing and 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.

5. Description of field forms

There are 6 (or 7 ILUA) different forms, as indicated in the below table.

Table 12. Field forms description and corresponding information level

Form No.	**Information** (see figures in Annex 6.9, p.177)
F1a/b/c/ (d/e/...)	**Sampling unit (SU)**: F1a -General information and access F1b - List of persons involved in the inventory F1c - Household lists ILUA (F1d) - Water and catchment conditions ILUA (F1e) - Other relevant forms for information to be collected at SU level (wildlife observation
F2	**Plot**: Marker position, plot access and plan
F3a/b	**Plot and RSP**: Tree and stumps measurements (Dbh ≥10 cm)
F4a/b	**Subplots and measurement points**: F4a - Soil and topographic; indicator plant species within CSP F4b - Tree measurements within CSP (Dbh < 10 cm); shrubs measurements within the RSP
F5	**Land Use/Cover Section (LUCS)**: General information (land tenure, vegetation cover, environmental, problems) - Forest and other woodland structure and management - Crop management practices (ILUA)
F6	**Land Use/Cover class** (**LUCC**): Products and services and users (forest and trees, wildlife and crop and fish) – Threaten and extinct species – Invasive species - Land use changes
F7a/b/c/d ILUA	**Household**: Household survey form

The data to be recorded in the field forms as follows:

- ..... or ☐
- ☐ C ➲ **Numeric codes** to be recorded in the box; the option codes are given below in the field forms description;
- ☐ Y/N ➲ **Y or N** respectively for "Yes" or "No" to be recorded in the box;
- ■ ➲ **Checkbox**, to be marked, when the box or table cell is dark grey;
- _ _, _ km or ☐ m ➲ **Number** in the specified units (km, meters, m...).
- The **code "90**" is usually used for "unknown".
- The **code "99**" stands for other. When used, then it should be specified in the notes what "other" means together with the variable code (e.g. "variable 509b- 99= new legislation).
- **All tables and field must be compiled**. If some of them are not applicable then this as to be specified (either by indicating the "not applicable" code or by writing "**N.A.**"
- **Pertinent notes** should be provided as much as possible, to help in understanding the data, indicate particularities, problems encountered by the field team, etc. If the space is insufficient then notes can be written on the backside of the form or on a blank page where the SU number will be also mentioned.

5.1 Form F1: Sampling unit (SU)

This form will be filled for each sampling unit (1 km x 1 km). It is divided into two or more parts: **F1a, F1b, F1c, F1d...** It contains:

- **F1a**: general information related to the sampling unit (SU) location, access and identification, information on the people living within and in the surrounding area of the SU and on the distance to the main infrastructures. (see Annex 6.9, Figure 36 and Figure 37)
- ILUA **F1c**: list of households within the SU (see Annex 6.9, Figure 39 and Figure 40).
- ILUA **(F1d)**: information about use, pressure and contamination of the different types of water points (F1b) and catchment conditions (see Annex 6.9, Figure 41).
- (**F1e**): Other relevant forms for information to be collected at SU level (wildlife observation.

Headline: identification of the SU

- **Country name (1)**
- **SU Nº (2**): identification number of the sampling unit (from 1 to total SU number). See map with sampling units (see Figure 1).

A. SU location (Form F1a): general information on SU location.

- **(ADM1) (7):** name of the first administrative division level (e.g. state) where the SU is located.
- **(ADM2) (8):** name of the second administrative division level (e.g. province) where the SU is located.
- **(ADM3) (9**): name of the third administrative division level (e.g. district) where the SU is located.
- **(ADM4) (10):** name of the fourth administrative division level (e.g. locality, municipality, etc.) where the SU is located.
- **(ADM5) (10b):** other administrative division level (e.g. locality, municipality, etc.).

- **Global Ecological Zone (GEZ) (11a):** name of the global ecological zone where the SU is located, based on the FRA Global Ecological Zones map. The various classes are as follows:

Options	Description/definition	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**

- **National/Regional ecological zone (11b):** name of the national or regional ecological zones where the SU is located. To be indicated according to option list:

Options	Description/definition	Code
NEZ/ REZ 1		1
NEZ/ REZ 2		2
NEZ/ REZ 3		3
NEZ/ REZ 4		4
NEZ/ REZ 5		5
NEZ / REZ 6		6

- **Altitude (12):** altitude in meters above the sea level of the central point of the SU. May be determined from a topographic map or from GPS as the average of the altitude at each plot starting point.
- **Maps and aerial photos (13):** name of maps (reference code, date) and aerial photographs or satellite images (acquisition date, coordinates) used for the location of the SU.
- **Coordinates SU SW corner (14):** calculated coordinates latitude (**14a**) and longitude (**14b**) in decimal degrees, and in easting (**14d**) and northing (**14e**) in meters in the projection system of the south-western corner of the SU.
- **Coordinate system (14c):** projected coordinated system used for the inventory (for GPS reading). To be selected by marking the appropriate checkbox (if there are several projection zones e.g. UTM 36N, 36S, 37N or 37S).

B. Human population (Form F1a)

Sedentary population distribution:

- **Number of households (21c):** estimate of the total number of sedentary households in the SU (or HSA- 2 km radius circle of SU center, in ILUA). Total number and percentage of female headed households (= "F") and male headed households (= "M").
- **Average household size (21f):** average size (number of persons) of households in the SU (or HSA in ILUA), calculated for total households, female headed (= "F") and male headed (= "M") households. If the information is not known then write "nk" (=unknown).
- **Population on the SU (21):** estimate of the number of people living in the SU (or in HSA in ILUA). Total number and distribution by gender in percent ("F"= female; "M"= male). If the information is not known then write "nk" (=unknown).
- **Adult literacy rate (21d):** refers to percentage of adult population, 15 years old and over, who are able to read and write, in total, female (F) and male (M) population. If the information is not known then write "nk" (=unknown).

- **Ethnic group (21e):** name of the main ethnic group found in the area of the SU. To be indicated according to an option list

Options	Description/definition	Code
Ethnic group 1		**0**
Ethnic group 2		**1**
Ethnic group 3		**2**
Ethnic group 4		**3**
Ethnic group 5		**4**
Ethnic group 6		**5**

- **Years since settlement (22):** approximate number of years since when the settlement was established in or close to the SU. This data could be collected from external or internal key informants and verified in the field though interviews and observations. To be indicated according to an option list:

Options	Description/definition	Code
Not applicable	There is no inhabitant in the SU or surroundings	**0**
< 5 years	The establishment was less than 5 years ago	**1**
5 – 10 years	The establishment was between 5 to 10 years ago	**2**
10 – 20 years	The establishment was between 10 to 20 years ago	**3**
20 - 50 years	The establishment was between 20 and 50 years ago	**4**
>50 years	The establishment was more than 50 years ago	**5**
Not known	There is not enough information to estimate the year of settlement	**90**

- **Population dynamics (23)**: trend of the population living in or close to the SU (HSA in ILUA), in the past 5 years. To be indicated according to an option list:

Options	Description/definition	Code
Not applicable	No inhabitants in the site or surroundings	**0**
Decreasing	The population living in the site decreased during the last 5 years	**1**
Stable	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**

- **Population main/secondary activity (24):** main (**24a**) and secondary (**24b**) income generation and employment source of most of the population living within the SU or in the surroundings. 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. To be indicated according to an option list:

Options	Description/definition	Code
Not applicable	No inhabitants in the SU or surroundings	**0**
Crop production	Livelihood and income generation provided by cropping activities	**1**
Livestock/ Herding	Livelihood and income generation provided by livestock, pasture, herding	**2**
Forestry	Livelihood and income generation provided by the forest and related activities, including processing and marketing of forest products	**3**
Aquaculture	Livelihood and income generation provided by aquaculture activities (fish farming, mariculture, algaculture)	**4**
Fishing	Livelihood and income generation provided by fishing	**5**
Industry	Work in the industrial sector	**6**
Handicraft	Livelihood and income generation provided by handicraft	**7**
Trade	Livelihood and income generation provided by trade in goods or services	**8**
Services	Income generated from services (doctor, lawyer, teacher...)	**9**
Tourism	Income generated from tourism or activities related to recreation	**10**
Mining / Extraction	Livelihood and income generation provided by mining and extraction activity	**11**
Hunting	Livelihood and income generation provided by hunting	**12**
Gathering	Livelihood and income generation provided by collecting fruits, plants, nuts, fibre from a wide area	**13**
Others	To be specified. Includes subsidies, etc.	

Nomadic and transhumant population: population that only stays within the SU (HSA, in ILUA) or in the surrounding for a short period of time according to the seasons.

- **Number of households (21g):** estimate of the number of nomadic/transhumant households coming in the SU (or HSA in ILUA).
- **Average household size (21h):** average size (number of persons) of nomadic/transhumant households in the SU (or HSA in ILUA).

- **Ethnic group (21i):** name of the main nomadic / transhumant population ethnic group found in the area of the SU**.** To be indicated according to an option list:

Options	Description/definition	Code
Ethnic group 1		**0**
Ethnic group 2		**1**
Ethnic group 3		**2**
Ethnic group 4		**3**
Ethnic group 5		**4**
Ethnic group 6		**5**

- **Period in the SU (21j):** period of time where the nomadic / transhumant population stays in the area of the SU expressed in starting month –end month (e.g. May to July = "05-07").

- **Settlement history (25)**: major historical events that have affected the local people and land use in the area and date or periods of these events **(25a**). To be indicated by marking the appropriate checkbox(es) (multiple choice possible):

Options	Description/definition	Code
Not applicable	No inhabitants in the SU or surroundings	**0**
Wars	Armed conflicts that obligate people to look for safer places to live	**1**
Insecurity, ethnic conflict	When people move from their original places looking for safety, major problems between ethic groups that force people to look for other places to live	**2**
Change of ownership/ land tenure	When a new owner forces the people to move from his property	**3**
Expansion of agriculture	Land converted to agriculture fields or pastures from other land use	**4**
Urban development	Land changed from agricultural production, open rangeland, forest, or recreational uses to residential, commercial, or industrial uses	**5**
Infrastructure, electric power	Infrastructure, e.g., roads, water or water channel, electric line, recently installed in the SU	**6**
Economic crisis	Drastic reduction in income generation, enterprises, changes in consumption patterns	**7**
Natural disaster	Severe drought, flood, landslide, etc.	**8**
Human diseases	Causing drastic change in labour force and dependency ratio	**9**
Rural-to-urban migration	Migration of people from rural areas to urban areas	**10**
Urban-to-rural migration	Migration of people from urban areas to rural areas	**11**
Rural-to-rural migration	Migration of people from a rural area to another	**12**
Urban-to-urban migration	Migration of people from a urban area to another	**13**
Immigration	There has been an influx of people from other countries moving to the area	**14**

Emigration	There has been an exodus of people from the area to other countries	**15**
Squatters	Land that is illegally owned by the owners but have been living there for many years	**16**
Others	To be specified	

C. Proximity to infrastructure (Form F1a)

- **All-weather road (26):** distance, in km, to reach the closest all-weather road (accessible by motor vehicle all the year), departing from the SU centre (equal to 0 if the road is located within the SU).
- **Seasonal road (27):** distance, in km, from the centre of the SU to the closest seasonal road (road accessible by motor vehicle during some seasons only, equal to 0 if it is located within the SU).
- **Settlement (28):** distance, in km, from the SU centre to the closest settlement (village...) equal to 0 if it is located within the SU).
- **Health centre (29):** distance, in km, to reach the closest health centre (hospital, dispensary...), departing from the SU centre (equal to 0 if the hospital is located within the SU).
- **Veterinary services (29b):** distance, in km, to reach the closest veterinary services, departing from the SU centre (equal to 0 if the hospital is located within the SU).
- **School (30)**: distance, in km, to reach the closest school, departing from the SU centre (equal 0 if the school is located within the SU).
- **Food market place (31a):** distance, in km, to reach the closest food market (to satisfy domestic needs), departing from the SU centre (equal to 0 if the market is located within the SU).
- **Input market place (31b):** distance, in km, to reach the closest market where inputs can be bought (seeds, fertilizers, forestry tools…) (equal to 0 if the market is located within the SU).

D. Access to SU (Form F1a)

- **Starting position (32a and 32b/ 32c and 32d):** latitude (32a) and longitude (32b) in decimal degrees, or easting (UTM E) (**32d**) and northing (UTM N) (**32c**) coordinates, in meters (in the coordinate system adopted), of starting position where the field team starts accessing the SU by foot (i.e. at the closest road accessible by motor vehicle) as read on the GPS.
- **Access Time – Start date (33c) and time (33a):** date (dd/mm/yy) and time (hh:mm) when leaving vehicle to access the SU by foot.
- **Access Time – End date (34c) and time (34a)**: date (dd/mm/yy) and time (hh:mm) when arriving at the first plot.
- **Total access time (34d)**: total time spent for accessing the first surveyed plot, by foot (hh:mm).
- **Arriving at plot No (34b):** number of the first surveyed plot (from 1 to 4).

Reference points of access path: these points will be used to retrieve the SU in the future. An itinerary sketch representing the access path from the road where the car is left to the SU will be drawn on reverse page (F1a/R) while accessing the SU and attached. It could be also drawn on the map attached to the SU report. The following data must be filled in for each SU (see example on Table 8, p. 45):

- **ID (35):** reference point ID (number from 1 to a series of reference points); this number is reported on the attached itinerary scheme.
- **Description (36):** brief description of reference point (i.e. road, river, house, rock).
- **UTM E (37a)** and **UTM N (37b):** easting and northing coordinates, in meters in the UTM projection system, given by GPS for the reference point.
- **Photo ID (36b):** "three-digit SU number" + "-0." + "running photo on the access path to SU" (e.g. the 3rd photo taken on the access path to SU number 028 = 028-0.3).
- **Bearing (36d):** compass bearing in which the photo is taken (from 0 to 360 degrees).
- **Notes (38):** relevant notes concerning the SU including landscape composition and dynamics, vegetation, population in the area, historical events, particularities, and the logistics during the inventory in the SU (difficulties met, access to the SU).

E. Team/Owner/Informant list (Form F1b)

This table will include name (15), address (16), title or function (16b) and telephone number (17) (if possible) of:

- **Team leader (18a):** the leader of the team in current SU. In this case, "team leader" will be ticked.
- **Team members (18b):** other team members working in the SU. In this case, "team member" will be ticked.
- **Owner (19):** owner(s) of all, or part of the land where the SU is located. In this case, "owner" will be ticked.
- **Informant (20):** the persons interviewed in the SU (household survey excluded, ILUA) referred by a code indicating existing relationship between the informant and the SU. To be indicated according to option list (multiple choice possible):

Options	Description/definition	Code
Owner	Owner of a plot or part of a plot within the SU	**O**
Employee	Person working in the SU	**E**
Manager of site	Person responsible for natural resources management in the SU	**M**
Settler	Person living in the SU or user from surroundings	**S**
Internal key informant	Individual living inside the area, with in-depth knowledge of the local settings, use of land and natural resources	**I**
External key informant	Individual living outside the area, but with particular knowledge about the site, the land/ natural resource use and the local community (e.g. local government officials, leaders of local organizations...)	**X**

- **Notes (38b):** relevant notes concerning to the persons involved in the assessment within the SU**.**

ILUA

F. Household selection for the household survey in HSA (Form F1c)

This form is used to randomly select households within the Household Survey Area (HSA, 2 kilometres radius circle of SU centre), including female headed and nomadic/transhumant households (see section 4.4.1A p. 38 for further explanation). Two different procedures are adopted if the total number of households (THSD) is less (**case A**) or more (**case B**) than 80.

- **Total household number** (201b): total number of households (THSD) within the HSA (2 km radius circle of SU center) during the survey. It is the total of sedentary households (F1 21c) and nomadic/transhumant households if there are present during the survey (F1 21g).
- **Sampling Interval (201c):** sampling interval (SI) to be applied for selecting households to be surveyed. To be entered only if THSD ≤ 80 (**case A**). Equal to total number of households THSD (F1a **21c**) divided by the number of households to be selected (16) and rounded to the closest whole number (see 4.4.1A, p. 37).

Table: the table will contain the list of:

- **Case A (THSD ≤ 80):** all households in the HSA. The list can be established with help from key informants. One line corresponds to one household.
- **Case B (THSD > 80):** households selected for the household survey (included thoses that need to be replaced).

Information to be registed in the table:

- **Number No. (195):** household identification number. Households are numbered consecutively in the order they are listed (from 1 to total number of household in the HSA).
- **Name of household head (196):** the name of the household head (female or male).
- **UTM E (197a) and UTM N (197b):** UTM easting and northing (coordinates) given by GPS for the location of each household.
- **Selected household (201a):** indicate if the household is selected for the household survey by marking the checkbox with "S" (household selected during the initial selection procedure) or with "R" (household selected to replace a non-responding household).

- **Interview status (199):** indicate whether the selected household was interviewed or not and, if not, reasons why it was not possible to interview it. To be indicated according to an option list:

Options	Description/definition	Code
Interviewed	The household was successfully interviewed	**1**
Not interviewed because of refusal	The household was not interviewed because of refusal	**2**
Not interviewed because of absence	The household was not interviewed because of absence during the full survey period	**3**
Does not live there anymore	The household was not interviewed because moved to another place or other	**4**
Cannot be located	The household cannot be located because of wrong of insufficient information on the address or coordinates	**5**
Other	To be specified	

Form F1c/R (reverse side of F1c):

The backside of form F1c is used for the selection of households in the case B (Total household number in HSA > 80). In this case *Transect selection* is applied as described in section 4.4.1A, p. 37. For each transect the following variables are collected or calculated:

- **Household count (201d):** allows to count individual households present on or close to the transect.
- **Number households (HS) (201e):** total number of households on or close to the transect.
- **Selected number (SN) (201f):** number of households to be interviewed on the transect. Equals to the number of household in the transect HS (**201e**) divided total household number counted for all transects Tot HS (**201h**), multiply by 16 and rounded to the closest whole number: SN=round (HS/Tot HS*16).
- **Sampling Interval (SI) (201g):** sampling interval to be applied for selecting households to be surveyed. Equal to total number of households in the transect HS (**201b**) divided by the number of household to be selected in the transect SN (**201f**) and rounded to the closest whole number.
- **Total Household number on transects (Tot HS)** (**201h**): total number of households counted on all transects (sum of SN (**201d**) for all transects).
- **Notes (38c):** relevant notes concerning to the selection of households for the household survey within the HSA, difficulties met in selecting the households.

G. Water and catchment conditions (Form F1d)

G1. Catchment conditions

- **Season (500a):** the current season, wet season ("W") or dry season ("D").
- **Date of last rain (500b)**: estimation of the date when it last rained, day (optional), month and year.
- **Land degradation/erosion (501):** a general indication of the status of resources degradation in the surrounding area or catchment. To be indicated according to an option list:

Options	Description/definition	Code
Not visibly degraded or eroded	The catchment or surrounding area does not show specific symptoms of natural resources degradation: little or no soil erosion by wind or water, healthy vegetation/ crops, no significant ponding	**0**
Slightly degraded	The catchment shows some signs of degradation: slight sheet or rill erosion, some sedimentation downslope or along water courses, some bare soil on pasture/range, slightly degraded vegetation	**1**
Moderately degraded	The catchment shows moderate signs of degradation: significant sheet or rill erosion and possibly a few small gullies where water is channelled (e.g. along roads), significant downslope sedimentation and sediment inputs in streams/rivers, degraded vegetation (stunted trees/shrubs, low palatability grass species, poor crops and patches of bare soil in pasture/range (e.g around watering points, paths)	**2**
Severely degraded	The catchment shows signs of severe degradation: extensive and severe sheet, rill and in cases gully erosion, or severe wind erosion (dust storms and dunes). Significant erosion on hill crests and sedimentation downslope and high sediment input in streams/rivers (brown muddy water), severely degraded vegetation (cleared forest, sparse trees, low palatability grass species, poor crops and large areas of bare soil)	**3**

- **SU flooded (502):** indicate whether the SU is regularly flooded or not. To be indicated according to an option list:

Options	Description/definition	Code
Yes	The SU is regularly flooded	**Y**
No	The SU is not regularly flooded	**N**
Not known		**90**

- **Notes (525a):** relevant notes concerning to the catchment conditions**.**

G2. Water points

Number of water points by type:

- **Water point type (503):** type of water points located in the SU, according to the following list:

Options	Description/definition	Code
Natural water course (springs, rivers, streams)	Natural water courses such as springs, rivers, streams	**1**
Lake	Freshwater or slightly saline	**2**
Pond	Small body of still water formed naturally or by hollowing or embankment	**3**
Dam / Reservoir	Barrier constructed to hold back the water and raise its level to form a reservoir. Natural or artificial lake used as source of water or store of water for a settlement	**4**
Rock Catchment	Rock catchments providing water	**5**
Borehole	A ground water source made by drilling thru rocks using a drilling rig	**6**
Well	Spring or fountain sunken in ground lined with stone or other protection for obtaining subterranean water	**7**
Piped water	Piped, gravity fed or pumped water	**8**
Other	To be specified	

- **Total number (504):** sum of all the water points of that type in the SU (all year round + wet season only + abandoned).
- **In-use during dry season (505a)**: number of water points that continue to provide water in the dry season.
- **In-use during wet season (505b):** number of water points that provide water in the wet season.
- **Abandoned (506):** number of water points that have been abandoned since more than one year; no longer used by the population.

Pressure on water points:

- **Water use (507):** type of water use, according to the following list:

Options	Description/definition	Code
Human consumption	Water use for human consumption (drinking)	**1**
Livestock	Livestock watering	**2**
Wildlife	Water used by wildlife	**3**
Water abstraction (irrigation)	Water used for abstraction of water for irrigation	**4**
Industrial	Water used to meet industrial demand (agro-industry, water cooling, waste disposal, etc.)	**5**
Other	To be specified	

- **Pressure on water (508):** level of pressure on water resources in the SU exercised by the different uses in the wet season (**508a**) and in the dry season (**508b**). To be indicated according to an option list:

Options	Description/definition	Code
None	Water not used for this purpose	**0**
Low	Low pressure on water resources	**1**
Medium	Medium pressure on water resources	**2**
High	High pressure on water resources	**3**

- **Trend (509a):** Trend in pressure on water points over the last 5 years. To be captured through interview and indicated according to option list:

Options	Description/definition	Code
Decreasing	Decreasing pressure on water points for the range of uses and users over the last 5 years	**1**
Stable	No discernible change in pressure on water points in last 5 years	**2**
Increasing	Increasing pressure on water points for the range of uses and users over the last 5 years	**3**
Not known	There is not enough information to estimate this trend	**90**

- **Change reason (509b)**: main reason of change in pressure on water points during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable	No significant pressure on water points	**0**
Change in human population	Change in human population using water points	**1**
Change in Livestock population	Change in livestock numbers using water points	**2**
Change in wildlife population	Change in wildlife numbers using water points	**3**
Change in irrigation	Change in irrigation	**4**
Change in industry	Change in agro-industry, extraction industry	**5**
Drought / Degradation	Land degradation and drought (lowering water table, drying out of water points, sedimentation)	**6**
Increased rains & water quantity	Increase water quantity (more rains, etc.)	**7**
Change in water quality	Change in water quality, degree of contamination	**8**
Not known	There is not enough information to estimate the change reason	**90**
Other	To be specified in the notes	**99**

Water Legislation:

- **Awareness (530a):** level of awareness of water related legislation. When most of the people living in or close to the SU is aware of the legal restrictions this should be indicated by marking the checkbox. To be obtained through key informants.
- **Compliance (530b):** degree of compliance of water related legislation. If the majority of the people living in or close to the SU acts in compliance with the legislation this should be indicated by marking the checkbox. To be obtained through key informants.

G3. State of the water resource (quantity and quality)

The following measurements of water sources are taken for up to two surface water supplies in the SU and for up to two manmade water sources (boreholes and wells).

Surface water source measurements:

Surface water sources include rivers, streams, springs, lakes, ponds, dams and rock catchments. Measurements will be carried out in the SU, in the two different types of surface water sources most representative of the area. It there is only one type, or if there is only one river / stream then the two measurement points should be as distant as possible.

- **Water point type (510):** type of water points where are effectuated the measurements in the SU. To be indicated according to an option list:

Options	Description/definition	Code
River / Stream	Large natural stream of water flowing in a channel	**1**
Spring	A place where the water comes naturally to the surface from under the ground	**2**
Lake	Freshwater or slightly saline	**3**
Pond	Small body of still water formed naturally or by hollowing or embankment	**4**
Dam / Reservoir	Barrier constructed to hold back the water and raise its level to form a reservoir. Natural or artificial lake used as source of water or store of water for a settlement	**5**
Rock Catchment	Rock catchments providing water	**6**

- **UTM E (511a)** and **UTM N (511b):** easting and northing coordinates given by GPS for the measurement point, in meters, in UTM coordinate system.
- **Water point width (512a):** estimated water point width, in meters. Can be measured with a rangefinder or a measuring tape. In case of a lakes, ponds, dams and reservoirs then it is the average between the wider and narrower parts.
- **Water point depth (512b**): estimated water point depth, in meters. Can be measured using a measuring stick or pole or a chain with a weight attached to the end at three different points and calculating the average. Manual measurement of depth is limited to 5-6 meters, so if the water point is deeper than 5-6m then indicate >= 6 meters.
- **Turbidity (513a):** estimation of the degree of transparency or opaqueness of the water due to suspended particles and sediments. To be measured using turbidity test kit, in meters, JTU or NTU.
- **pH (513b):** pH value of water. To be measured using pH paper.

- **DO (513c):** measure of the **D**issolved **O**xygen (an indication of oxygen availability and hence degree of contamination). Will be measured using Dissolved Oxygen test kit, following provided instructions.
- **Sources of contamination (514):** the main sources of contamination of the water point. To be indicated according to option list (multiple choice possible):

Options	Description/definition	Code
None		**0**
Urban storm water	Waste water generated from urban streets and urban water ways	**1**
Sewage	Waste matter liquid or semi liquid from human bodies, factories, towns	**2**
Industrial cooling water	Waste water from industries used for cooling industrial plants	**3**
Mining / Processing	Waste generated from the mining process	**4**
Irrigation tail water	Water generated from irrigation systems	**5**
Intensive animal production	Waste/ leachate from a livestock production unit	**6**
Intensive agriculture / horticulture	Waste/ leachate from a agriculture/horticulture production unit	**7**
Land fill sites	Area of land where waste material/litter is buried and a layers of earth	**8**
Rubbish dumping / Littering	An area where waste material/litter is dumped	**9**
Agro industry	Waste/waste water from agro industrial activities, sugar processing, coffee, tea	**10**
Other industrial	Waste from other industries	**11**
Other	To be specified in the notes	**99**

- **Water flow (515):** to be estimated for rivers, streams and springs only (not ponds, dams or lakes), in litres/ minute (l/min). This is estimated by recording the time taken (T) for a twig /stick to move a certain distance (L) (e.g.20 m) along the water surface. For a U shape channel water flow = (average Width x average Depth x L)/T. For a V shaped channel water flow = (average Width/2 x Depth x L)/2.

Borehole/ well measurements:

Water measurements will be carried out for two boreholes / or wells in the SU, representing different situation and as distant as possible. Measurements are the same as for surface water with the following differences and additional variables:

- **Water point type (520):** type of water points where are effectuated the measurements in the SU. Either Borehole or Well, to be indicated by marking the appropriate checkbox.
- **Groundwater depth (521):** to be estimated in meters by measurements (wells) or by asking key informants (borehole).
- **Number of people (522):** estimation of number of people using the water point where measurements are done, at peak watering time.

- **Number of animals (523):** estimation of number of animals (heads) using the water point where measurements are done, at peak watering time.
- **Depth, width and flow** are not applicable.
- **Notes (525b):** relevant notes concerning to the water use, qualitative and quantitative assessment and measurements.

5.2 Form F2: Plot

This form will be filled in for each plot contained in the sampling unit (thus, a total of 4 per SU). The forms (see Annex 6.9, Figure 42, p. 183) will include the general data on the plot and the information on its location and access.

Plot identification

- **Country name (1)**
- **SU Nº (2):** identification number of the sampling unit (from 1 to total SU number). See map with SUs (see Figure 1).
- **Plot Nº (3):** identification number of the plot (1 to 4).

A. Plot access

This section is not completed for the first visited plot in the SU as the information was already registered in section D of Field form **F1a**.

- **Starting position (34):** Easting (UTM E) (**34g**) and Northing (UTM N) (**34h**) coordinates, in meters, in the UTM projection system, where the field team starts accessing the plot by foot (at the closest road accessible by motor vehicle or from the previous surveyed plot) (GPS reading).
- **Access time - Start time (34i):** time when the field team starts accessing the plot by foot (hh: mm).
- **Access time - End time (34j)**: time when arriving at the plot (hh: mm).

B. Time record of work within Plot

- **Date 1 (48):** first date of measurement in the plot (dd/mm/yy).
- **Date 2 (50):** second date of measurement if the work in the plot cannot be completed within one day (day / month / year).
- **Start time (49):** start time of measurement in the plot (hh:mm) at the first **(49a)** or second **(49b)** measurement day. The measurements start when the permanent marker has been driven in the ground.
- **End time (51):** end time of measurement in the plot (hh:mm) at the first **(50a)** or second **(51b)** measurement day.

C. Plot starting point description

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

Plot starting point (given):

- **UTM E (39a)** and **UTM N (39b):** easting and northing coordinates, in meters, in UTM projection system, of the plot starting point. These coordinates are given to the teams (theoretical).

Marker position (GPS reading):

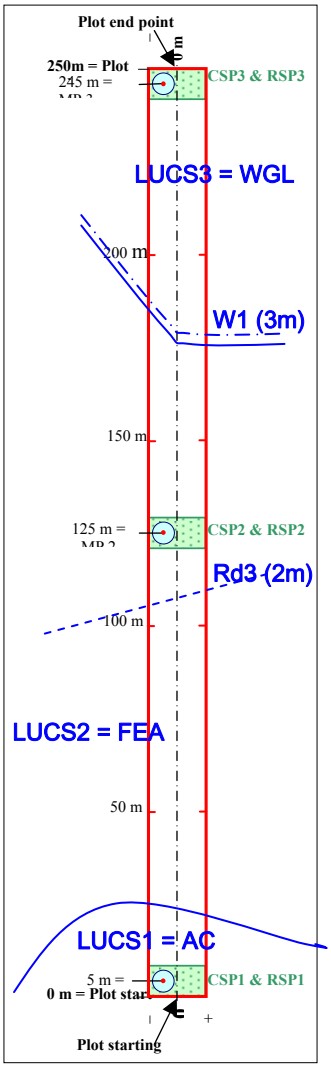
- **UTM E (40a)** and **UTM N (40b):** easting and northing coordinates, in meters, in UTM projection system of the marker, as read on the GPS. The "average" function of the GPS will be used for more accuracy.
- **Distance from Marker to Plot starting point (41):** distance in meters from the plot starting point to the marker (equal to "0" if the marker and the starting point coincide).
- **Bearing from Marker to Plot starting point (42):** compass bearing (from 0 to 360 degrees) from marker to the plot starting point (equal to "n.a." if the marker and the plot starting point coincide).
- **Plot starting point plan (43):** three accurate and if possible permanent reference points such as rock, house, bridge, dominant/outstanding trees must be selected in order to be able to find the marker in the future. 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. These reference points as well as the plot start position will be represented in the plan (see section 4.4.2B Establishment of permanent plot). Information and measurements concerning the reference points will also be reported into a table as following:
- **ID (44):** identification of the reference points (e.g. R1).
- **Description (45):** description of the reference points (e.g. north side of rock, Pinus with Dbh= 95 cm).
- **Bearing (46):** orientation of the reference points from the marker, in degrees.
- **Distance (47):** distance of the reference points to the marker, in meters.

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

- **ID Photo (36c):** "three-digit SU number" + "-" + "plot number" + "." + "running photo number within plot" (e.g. photo of the 3rd reference taken in the 2nd plot SU number 028 = 028-2.3).

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

Figure 19. Plot plan example



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

The following objects should be drawn (see example in Figure 19):

- **Borderlines of the LUCS**, including the code of the land use/cover classes inside the corresponding sections, see Figure 3.
- **Intersections with infrastructure** (roads, paths…) **and water courses**, as line object, including the code and width of the road/water course. The line drawing corresponds to the centre of the road/stream.

Codes must be attached to the lines according to the legend included in the form (water course, road type). The total **number of water courses and roads crossing the plot** should be indicated in the field **52b,** once the plot survey is completed.

In addition, the sketch must also include all the information and observations that help interpreting the plot. When entering the fieldwork data in the database these notes must be entered in the field **52a** plot plan notes in the database.

- **Plot middle point (39c and 39d):** easting (UTM E) (**39c**) and northing (UTM N) (**39d**) coordinates, in meters, in UTM projection system of the plot middle point (at 125 m from plot starting point) (GPS reading).
- **Plot end point (39e and 39f):** easting (UTM E) (**39e**) and northing (UTM N) (**39f**) coordinates, in meters, in UTM projection system, of the plot end point (at 250 m from plot starting point) (GPS reading).
- **Notes (53):** relevant notes concerning the whole plot, on access, vegetation, marker (if the markers could not be put it should be explain why), problems and difficulties encountered during the survey in the plot.

5.3 Form F3: Plot - Tree and stump measurements

This form (see Annex 6.9, Figure 43, p. 184 and Figure 44, p. 185) consists of a table where information related to all the trees and stumps measured in the plots will be recorded, apart from tree regeneration (height over 1.3m), whose data, collected in the Circular Subplot, will be reported in the form F4 (see Table 10).

The form **F3a** will be used for most of the trees. If branches represent most of the volume in a tree then the form **F3b** will be used for that tree.

Plot identification

- **Country name (1)**
- **SU Nº (2):** identification number of the SU (from 1 to total SU number). See map with SUs.
- **Plot Nº (3):** identification number of the plot (1 to 4):

Table: this table will contain data related to:

  - All trees and stumps with Dbh ≥ 20 cm present in the plot (in forest Land Use/Cover Sections) and Dbh ≥ 10 cm in all non forest sections;
  - Trees and stumps with a Dbh ≥ 10 cm measured in rectangular subplots (in forest Land Use/Cover Sections);

- **LUCS No (4a):** identification number (from 1 to number of land use/cover sections within the plot) of the LUCS where the tree/stump is found.
- **Tree No (55):** tree/stump identification number. Trees are numbered consecutively in the order they are measured.
- **Stump (55b):** indicate if the measurement is for a stump (checkbox).
- **Species (56):** either common/local **(56a)** or scientific **(56b)** species name of the tree. In the case of local name, the language used should be specified into brackets.
- **Tree/Stump location:** tree or 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).
- **Dbh (58):** tree or stump diameter, in centimetres:
  - In the case of a tree, diameter in centimetres at breast height (1.3 m, Dbh) (see appendix section 6.2.1 for diameter measurements and particular cases).
  - In the case of a stump, the stump diameter, in centimetres, at breast height (Dbh) or measured at the top of the stump (stump height) if the stump is lower than 1.3 m (Dsh).
- **Diameter height (59):** height of diameter measurement in meters, if different from breast height (1.3 m, Dbh).

- **Year(s) since cut (60):** only for stumps**.** Estimated time since the tree was cut according to option list:

Options	Description/definition	Code
< 1 year	Recent exploitation	**1**
1 – 5 years	The harvest took place between 1-5 years	**2**
6 – 10 years	The harvest took place between 6-10 years	**3**
> 10 years	The harvest took place more than 10 years ago	**4**
Not known	There is not enough information to know about the year since cut	**90**

- **Total height (61):** total tree or stump height in meters (see appendix section 6.2)
- **Bole height (62):** tree height at the first big branch in meters (only for trees).
- **Stem quality (63):** estimated stem quality (only for trees). To be indicated according to option list:

Options	Description/definition	Code
Low	Tree with several defects or damage due to fire, pests, diseases, animals…	**1**
Medium	Tree with little defects or damage due to fire, pests, diseases, animals, etc.	**2**
High	Straight tree without visible damage due to fire, pests, diseases, animals, etc	**3**

Health (does not apply to stumps):

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

Options	Description/definition	Code
Healthy	Crown transparency less than 50%, no top dieback	**1**
Declining health	Crown transparency approximately 50%, top dieback evident	**2**
Unhealthy	Crown transparency more than 50% and significant top dieback	**3**
Dying	Crown transparency more than 75%, increased dieback	**4**
Dead	Trees apparently killed in earlier growing season	**5**

- **Overall tree 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 other that have any substantial effect on the tree's growth and vitality	**1**
Slightly affected	A tree is slightly affected when it shows symptoms of disease or other 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 other 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. A tree is dying if it shows damage that will surely lead to death. 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. A tree is dying if it has damage that will surely lead to death. Fallen	**5**

- **Causative agents (65):** causative agents that have been identified (diseases, insects, animals, etc.) according to option list (multiple choice possible):

Options	Description/definition	Code
Not applicable	Healthy tree crown, with no symptoms orsigns of insects, disease or any stress including parasitic plants	**0**
Insects	Evidence of insect infestation (e.g. defoliation, leaf feeding)	**1**
Disease/Fungi	Presence of fungus such as leaf spots, leaf or needle discolouration	**2**
Fires	Burned	**3**
Animals	Damage due to wild or domestic animals	**4**
Humans	Human induced damage (cuttings, bark damage, logging...)	**5**
Climate	Damage caused by extreme climatic events (wind, snow, lightning, etc.) e.g. broken branches	**6**
Other	To be specified in the notes	**99**

Branches (F3b): up to four major branches (minimum diameter ≥ 20 cm and length ≥ 2 m) per tree should be measured if the branches represent a relatively large proportion of the tree woody volume.

- **D1, D2, D3, D4 (66a-d):** mean diameter, in centimetres, of the four measured part of branches.
- **L1, L2, L3 L4 (67a-d)**: length, in meters, of the four measured branches.
- **Tree Notes (68):** relevant notes concerning the trees and stumps, problems of species identification, particular trees or general health condition of trees.

5.4 Form F4: Subplots and measurement points

This form (see Annex 6.9, Figure 45, Figure 46 and Figure 47, p. 186-188) contains the information on tree regeneration and plant indicator species on the circular subplots (CSP), shrub measurements on Rectangular Subplots (RSP), as well as on edaphic and topographic variables from the measurement points (MP).

Plot identification

- **Country name (1)**.
- **SU Nº (2):** identification number of the SU (from 1 to total SU number).
- **Plot Nº (3):** identification number of the plot (1 to 4).

A. Measurement points: topography and soil (F4a)

Variables on topography and soil are collected in three fixed measurement points located in the centre of each subplot (measurement points).

The information is recorded in three boxes corresponding to the three measurement points. These include:

- **LUCS Nº** (4b): identification number (from 1 to number of land use/cover sections) of the LUCS where the measurement point is located.

Site information:

- **Slope (71):** the average inclination at the measurement point. To be indicated in **%.** The angle of slope is measured from the measurement point to a point at 20 m horizontal distance along the direction of the highest slope. If the slope is not homogeneous then the slope is an average of the up and down slope readings from the measurement point**.**
- **Slope orientation (70):** slope orientation at measurement point. To be indicated as compass bearing (from 0 to 360º). On flat terrain write "n.a." (not applicable).
- **Relief (72):** topography of subplots. Characterized by the position in the landscape, the landform and micro-relief. To be indicated according to option list:

Options	Description/definition	Code
Summit	Crest of any kind: sharp or rounded, usually referring to a steep-sided mountain or hill range	**1**
Mountain slope	Steep mountain slope with rocky boulders	**2**
Hill top or plateau	Rounded hilltop or level terrain at a higher altitude than the valleys	**3**
Upper slope	Upper slope of hillside	**4**
Middle slope	Mid slope of hillside (slope > 5 %)	**5**
Lower slope	Lower slope of hillside (piedmont)	**6**
Bench	Horizontal zone of average width over 30m interposed in the valley side (slope <=15%) or a terrace over 6 m width	**7**

Depression	Enclosed depression or confinement situation at the bottom of a small, narrow or anticlinal valley or distinct crater	**8**
Valley bottom or flood plain	Large flat area or very wide depression in the bottom of a valley part of which is the floodplain	**9**
Water course	Incised (V shaped) or meandering water course in the valley bottom or plain	**10**
Dunes	Sandy hills developed through sand deposits from wind erosion/storms, often unstable and moving	**11**

- **ID Photo (72b):** "three-digit SU number" + "-" + "plot number" + "." + "running photo number within plot" (e.g. 4th photo taken in the 2nd plot SU number 028 = 028-2.4). A photograph of the landscape taken at the MP location representing the site.
- **Photo bearing (72c):** compass bearing in which the photo is taken (from 0 to 360 degrees).

Soil information:

The biophysical and hydrological properties of the soil are assessed at the measurement points using observations and the rapid Soil Visual Assessment technique (VS-Fast, in ILUA).

ILUA

- **Soil type (73c)**: local name (often based on colour) given by land users of the soil type. To be asked to informants/ local guides. The language used should be specified into brackets. If available the scientific name is also indicated.
- **Soil surface condition (73d):** soil surface condition given by estimating % of bare soil (the part that is more vulnerable to erosion and degradation processes) and evidence of:
  - crusting or sealing, as this will impede rainwater infiltration into the soil which will increase runoff and vulnerability to erosion and drought conditions;
  - stoniness or lumpy, small soil clods on the surface which illustrate erosion, the washing out of fine materials, and other degradation processes.

  To be indicated according to option list:

Options	Description/definition	Code
Poor	Strong crusting/compacted soil surface or significant stoniness or firm clods on the soil surface or soil surface with complete absence or less than 30% cover by vegetation or residues	**0**
Moderate	Some stones or clods especially on bare areas and maybe light crusting or soil surface partially covered >30% and < 70%	**1**
Good	No evidence of crusts, very few clods or stones; or soil surface totally or more than 70% covered by vegetation or plant residues	**2**

- **Topsoil depth (75):** the thickness of the organic matter stratum, excluding litter, measured using a measuring tape ruler or stick graduated in centimetres. The amount of organic matter is also related to soil biological activity. To be indicated according to option list:

Options	Description/definition	Code
Absent	No distinct organic matter layer	**0**
< 1 cm	Very shallow organic matter layer (due to limited litter to decompose and to exposure to climatic elements (bare surface or by tillage) leading to high mineralization.	**1**
1-5 cm	Moderate layer rich in soil organic matter.	**2**
> 5 cm	Topsoil rich in organic matter indicated by friable, soft consistency.	**3**

- **Topsoil (73) and subsoil (73e) texture**: the texture class of the topsoil (top 5 cm layer, tends to be richer in organic matter due to plant decomposition and the action of soil organisms) and the tilled layer (5-30 cm). Refers to the relative proportions of sand, silt and clay size particles in a sample of soil. The texture can be determined by taking one or two table spoonfuls of soil in one hand and adding water drop by drop to the soil as it is being worked in the hand until a sticky consistence is reached (moody in press). The soil is then rolled into a ball and texture determined. To be described according to option list:

Options	Description/definition	Code
Sand	A wet sample does not stain hands and cannot be moulded when moist. Gritty sound when rubbed between the fingers close to the ear	**0**
Sandy loam/ loamy sand	Slightly sticky, can be moulded into a small ball but only small ribbons can be formed before cracking (e.g. stick of cigarette size). Makes a rasping sound when rubbed	**1**
Loam	A relatively thick ribbon can be formed which will easily break. Makes a very light sound only.	**2**
Clay loam	Very smooth, sticky and plastic. Forms a thin ribbon which will crack when bent into a "U" shape. No sound when rubbed between fingers	**3**
Clay	Very plastic, sticky and slippery when handled. Allows to be formed into a thin string or a shorter ribbon that can be bent into a full circle without breaking	**4**
Rock	Surface rock	**5**

- **Soil structural condition (73f):** assessed by conducting a "shatter test", based on size, porosity and abundance of soil aggregates and clods and consistency, whether it is friable and crumby or hard.

"**Shatter test":**

  - dig close to the measurement point but not within the subplot area, otherwise the plant indicator species can get affected;

- extract a block of soil about 20 cm square and 30 cm deep with vegetation being left intact on the block with a spade and hoe ("djembe");
- the soil block is dropped from a height of one meter onto the hard board in a plastic basin. Each large clod can be dropped up to 3 times (maximum) to break it into natural structural units. If the soil does not completely shatter into individual units, then gentle hand manipulation is used to break each clod of soil along natural breakage lines;
- once the soil is broken into individual aggregates, these are sorted with coarsest pieces one end of a plastic sheet and the finest material to the other- this shows the aggregate size distribution.

To be indicated according to option list:

Options	Description/definition	Code
Poor structure and consistency	Soils are massive (lack natural fracture planes), structureless, dominated by extremely coarse, angular, very firm clods with very few finer aggregates. The hard lumpy soil hinders root penetration and growth so roots will tend to be less developed and no fine hairs will be visible	**0**
Moderate structure and consistency	Soil contains significant proportions of both coarse firm clods and friable fine aggregates, the clods may be platy (layered) or prismatic in form. Roots are reasonably well developed but there will be less fine root hairs	**1**
Good structure and consistency	Good distribution of friable fine aggregates (crumby) with no significant clodding. The soil aggregates/lumps tend to be more rounded or granular in form that breaks easily. Roots are well developed laterally and vertically with visible fine root hairs	**2**

- **Soil porosity (73g)**: assessed by observing a few aggregates and clods of soil, from the soil used in the shatter test (see **73**f above), or a slice of soil from the side of the hole, and especially the large pores (macropores) and cracks. Attributes to be considered includes the degree of soil macro pores, compaction or clod aggregates of the soil under observation. To be described according to option list:

Options	Description/definition	Code
Little porosity / Poor condition	No soil macropore visible. Compact, massive, structureless clods with smooth surface and sharp angles	**0**
Moderate porosity / moderate condition	Some, but many less, macropores that are only visible on close examination of clods which show moderate amounts of consolidation and compaction	**1**
High porosity / Good condition	The soil has many macropores (large easily visible holes or fissures) between and within soil aggregates from the action of soil organisms and fine root growth	**2**

- **Soil colour (73h)**: the colour of a handful of soil from the soil structure test is compared to the soil from a relatively protected little used area (fence lines, etc.). The focus here is on the change compared to the control; which reflects trends in soil organic matter and hence nutrients. To be described according to option list:

Options	Description/definition	Code
Significantly paler colour / Poor condition	Significantly paler topsoil showing severe loss of soil organic matter and degradation	**0**
Paler colour / Moderate condition	Somewhat paler topsoil showing evidence of some decline in soil health and degradation	**1**
Similar dark colour / Good condition	Dark coloured topsoil/tilled layer, similar to the control, soil showing evidence of good soil organic matter content	**2**

- **Soil drainage (74)**: average soil drainage reflected by the time water remains on the surface after a heavy rainfall and resulting waterlogging. This is indicated by the number and colour of orange or grey mottles (spots, patches of different colour) in the soil and degree of soil compaction. Mottles are observed on the side of the soil profile or on and in a few soil clods from the extracted soil block. To be described according to option list:

Options	Description/definition	Code
No drainage	Land covered with water most of the year, such as lakes, swamps and mangroves, etc.	**0**
Poor drainage	Significant surface ponding (lying water) for several months. Soil has abundant medium and coarse orange and particularly grey mottles	**1**
Moderate drainage	Water/humidity may stay in the soil for several weeks. Soil has some (10-25%) fine and medium orange and grey mottles	**2**
Good drainage	No evidence of surface ponding after one day following heavy rain, however, water/ humidity may stay in the soil for several consecutive days. Mottles are generally absent	**3**
Very good drainage	No surface ponding. Moisture/water does not stay in the soil during more than a few consecutive hours. E.g. sandy soils will dry out rapidly. Mottles are absent	**4**

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- **Tillage pan (73j)**: presence of a tillage pan on the side of the hole exposed by removing the 20 cm3 soil block (*in situ*) or by removing a soil slice from the side of the exposed hole. To be described according to option list:

Options	Description/definition	Code
No tillage pan or natural hardpan	No tillage pan or other hard impervious layer, friable soil, good structure and porosity	**0**
Moderate tillage pan	Firm consolidate tillage pan at base of tilled soil with some areas with weak structure, some cracks and a few macropores	**1**
Very hard tillage pan	Very consolidated, hard pan at base of tilled layer, with no structure, cracks or macropores L shaped or thickened roots due to the obstructing layer	**2**

- **Soil pH (73k):** pH measure of a soil sample collected at the measurement point level (centre of Circular Subplot). It will be measured with pH paper. The actual pH value is recorded in the sheet.
- **Soil infiltration (73l)**: measure of soil infiltration rate (rate at which a particular soil is able to absorb rainfall or irrigation) (see Annex 6.5, p.162).

B. Land use/cover area in subplots (F4a)

This section contains 3 tables used to record land use/cover area in circular and rectangular subplots. One table must be filled for each group of subplots (subplots 1, 2 and 3).

- **LUCS No (4c/d/e):** identification number (from 1 to number of LUCS within the plot) of the LUCS found in the subplot. It can be up to two different LUCS covering each CSP and up to three different LUCS in each RSP. The number should correspond to the one given in F5 form.
- **Area % (54c/d/e):** percentage of the subplot area covered by the LUCS (1 to 100%).

C. Circular Subplots – Small trees measurements (trees above 1.3 m height with Dbh <10 cm) (F4b)

This section must be filled for the circular subplots (CSP) to count small trees, above 1.3m height and with Dbh <10cm (see also section 4.4.2D2, p. 49).

Each line of the table corresponds to one species found in any of the CSP. In the columns the tree species name and the corresponding number of individual found in each subplot are registered.

- **Species (77):** either common/local **(77a)** or scientific **(77b)** species name of the tree.
- **LUCS No (4g):** identification number (from 1 to number of land use/cover sections within the plot) of the forest LUCS where the trees are measured.
- **Counts (78a):** allows to count individual trees equal to or more than 1.3 m with a Dbh < 10 cm, per species, present in each Circular Subplot;
- **Total (78):** total number (sum of counts) of individual trees over 1.3 m with a Dbh < 7cm, per species, present in each Circular Subplot.
- **Notes (79b):** relevant notes concerning small trees measured in CSP.

D. Rectangular Subplot (RSP) –Indicator plant species (F4a/b)

This section must be filled for each rectangular subplot (RSP) except if it falls into a Land Use/Cover Section classified as "water" or "annual crop lands".

Each line of the table corresponds to one indicator **plant** species found in any of the RSP. Information might be provided by informants (local guide). In the columns the species name and the corresponding number of individual found in each subplot are registered.

- **Common/ local or scientific species name (300):** either common/local **(300a)** or scientific **(300b)** name of the indicator plant species. If a local name is used then specified between brackets the language.
- **Indicator (301a):** type of indicator. To be described according to option list (multiple choice possible):

Options	Description/definition	Code
Range land condition	The plant species is an indicator of range land condition	**1**
Crop land condition	The plant species is an indicator of crop land condition	**2**
Forest condition	The plant species is an indicator of forest condition	**3**
Salinity / Sodicity	The plant species is an indicator of salinity or sodicity condition	**4**
Other	To be specified in the notes	**99**

- **Quality (301b):** states if the plant indicates poor or good conditions by "P" (=poor) or by "G" (=good).
- **LUCS No (4f):** identification number (from 1 to number of land use/cover sections within the plot) of the LUCS where the plant indicator is found, for each Rectangular Subplot where the plant is identified. Up to three different LUCS can be specified (multiple choice).
- **Abundance (302):** quantity of plant found in the subplot. To be indicated according to option list:

Options	Description/definition	Code
Low	The plant is rare	**1**
Medium	The plant is common but not abundant	**2**
High	The plant is abundant	**3**

- **Notes (79a):** notes concerning measurement points and indicator plant species.

E. Rectangular subplots –Shrubs/Bushes measurements (optional)

- **RSP No (6):** identification number of the Rectangular Subplot where the shrub/bush is found (from 1 to 3).
- **LUCS No (4h):** identification number (from 1 to number of land use/cover sections within the plot) of the LUCS where the shrub/bush is found.
- **Species (56):** either common/local (**56a**) or scientific (**56b**) species name of the shrub/bush. In the case of local name, the language used should be specified into brackets.

- **No of stems/unit (58b):** the number of stems in the shrub/bush.
- **Average stem D0.5h** (**58**): the average diameter of the stems, in centimetres, measured at 0.5 meters height.
- **Diameter measurement height (59):** height of diameter measurement in meters, if different from 0.5 m.
- **Average height (61):** average height of the stems, in meters.
- **Notes (79c):** all relevant notes concerning shrubs/bushes measured in RSP.

5.5 Form F5: Land Use/Cover Section (LUCS)

Information on Land use/cover section (LUCS) found in a given Plot will be registered on this form (see Annex 6.9, Figure 48, p.189). It contains general data related to the LUCS as well as data on forest structure and management and on agriculture management and products. One form is used to record information on each LUCS.

Plot identification

- **Country name (1)**.
- **SU Nº (2):** identification number of the sampling unit (from 1 to total SU number).
- **Plot Nº (3):** identification number of the plot (1 to 4).
- **LUCS number (4)**: identification number of the LUCS, from 1 to the number of LUCS identified in the plot.

A. General

This section should be filled out for all LUCS.

- **Land use/cover class (80)**: code describing the land use/cover class (LUCC) in the LUCS, according to classification described in section 1, page 11. In case of inaccessible areas where the LU class cannot be specified, write "90" (="not know") in the box.
- **Accessibility (81c):** Condition of accessibility of the LUCS. To be indicated according to option list:

Options	Description/definition	Code
Accessible	Where topographic and road network makes it easy to access or reach the site	**0**
Inaccessible due to slope	Very steep slope making the field work dangerous	**1**
Inaccessible due to owner refusal	Where the owner does not allow one to enter the site either by fencing or by not giving permission	**2**
Inaccessible due to restricted area	E.g. military areas, border areas, land mines areas	**3**
Inaccessible due to water body	Where a water body does not allow to sample	**4**
Other inaccessibility	To be specified in the notes	**99**

- **Width (81a):** average width of the LUCS in meters.
- **Length (81b):** average length of the LUCS in meters.

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

Options		Description/definition	Code
Protection / conservation	**Strict nature reserve/ Wilderness area**	Strictly protected area, managed mainly for science or wilderness protection. Corresponds to IUCN category I (see Annex section 6.8 page 176)	**1**
	National Park	Protected area managed mainly for ecosystem protection and recreation. Corresponds to IUCN category II (see Annex section 6.8 page 176). Includes National Parks	**2**
	Natural monument	Protected area managed mainly for conservation of specific natural features. Corresponds to IUCN category III (see Annex section 6.8 page 176). Includes National Heritage Sites	**3**
	Habitat/ species management area	Conservation through active management - Protected area managed mainly for conservation through management intervention. Corresponds to IUCN category IV (see Annex section 6.8 page 176)	**4**
	Protected landscape / seascape	Protected areas managed mainly for landscape/seascape conservation and recreation. Corresponds to IUCN category V (see Annex section 6.8 page 176)	**5**
Production		Land designated primarily for production and extraction of products	**6**
Social services		Land area designated primarily for social services such as recreation, tourism, education, research and cultural/ spiritual sites	**7**
Multiple use		Land designated to more than one purpose (production, protection and social functions) and where none of these alone is considered as the predominant designated function. Encompasses IUCN category VI (see Annex section 6.8 page 176)	**8**
Not known		No information available	**90**
Other		To be specified in the notes	**99**

Land tenure:

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

Options		Description/definition	Code
Private	**Individual**	Land owned by individuals and families	**1**
	Industries	Land owned by private enterprises or industries	**2**
	Local communities	Land owned by a group of individuals belonging to the same community residing within or in the vicinity of the area. The community members are co-owners that share exclusive rights and duties, and benefits contribute to the community development	**3**
	Others private	Land owned by private co-operatives, corporations, religious and educational institutions, pension or investment funds, NGOs, nature conservation associations and other private institutions (religious, educational, etc.)	**4**
Public	**State**	Land owned by central government, or by government-owned institutions or corporations	**5**
	Local government	Land owned by local government (district, municipalities)	**6**
Indigenous / Tribal communities		Land owned by community of indigenous or tribal people	**7**
Not known		No information available on the land ownership	**90**
Other		To be specified. Also includes areas where ownership is unclear or disputed.	

- **Management agreement (93a):** management arrangement between the land owner and other groups. To be indicated according to option list:

Options		Description/definition	Code
Owner is the exclusive manager		The owner retains management rights and responsibilities within the limits specified by the legislation	**1**
Joint management	**with communities**	Management decisions remain with the owner and the management activities are executed by local communities (including indigenous and tribal communities), according to an agreement. The agreement allocates temporary exploitation rights for specific products or activities. Are included lands allocated for extraction purposes through licenses or concession	**2**
	with private companies/ private sector	Management decisions remain with the owner and the management activities are executed by private companies, according to an agreement. The agreement allocates temporary exploitation rights for specific products or activities. Are included lands allocated for extraction purposes through license or concession	**3**
Devolution of management rights	**to communities**	The owner devolves land management to the local communities (including indigenous and tribal communities) according to leases or management agreement	**4**
	to private companies/ private sector	The owner devolves land management to the private companies/private sector/individuals according to leases or management agreement, including rental	**5**
Not known		There is not enough information to obtain management agreement	**90**
Other		To be specified in notes	**99**

Vegetation cover:

- **Tree Canopy cover (92):** ground surface covered by the vertical projection of the tree canopies, expressed as percentage of the total ground area in the LUCS. To be indicated according to option list:

Options	Description/definition	Code
No trees		**0**
< 5%	Very few trees	**1**
5-10%	Sparse tree canopy cover	**2**
10-40%	Very open tree canopy cover	**3**
40-70%	Open tree canopy cover	**4**
>70%	Closed tree canopy cover	**5**

- **TOF distribution (92f):** spatial distribution of trees outside forest (TOF). To be indicated according to option list:

Options	Description/definition	Code
Not applicable	Forest LUCS or no tree	**0**
Scattered	TOF are sparse	**1**
Grouped	TOF are grouped in blocks	**2**
Lines	TOF are aligned (e.g. fences, roadside plantations,,,)	**3**
Other	To be indicated in the notes	**99**

- **Trees expected (88):** Trend in tree density expected in LUCS within 5 years. To be captured through interview and indicated according to option list:

Options	Description/definition	Code
Decreasing	Decreased tree density expected within 5 years	**1**
Stable	No change in tree density expected within 5 years	**2**
Increasing	Increased tree density expected within 5 years	**3**

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

Options	Description/definition	Code
No shrubs		**0**
< 5%	Very few shrubs	**1**
5-10%	Sparse shrub canopy cover	**2**
10-40%	Very open shrub canopy cover	**3**
40-70%	Open shrub canopy cover	**4**
>70%	Closed shrub canopy cover	**5**

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

- **Herbaceous cover (92d):** vertical projection of the herbaceous plants/ natural grass as percentage of the total ground area. To be indicated according to option list:

Options	Description/definition	Code
No herbaceous		**0**
< 5%	Very few herbaceous	**1**
5-10%	Sparse herbaceous canopy cover	**2**
10-40%	Very open herbaceous/ natural grass cover	**3**
40-70%	Open herbaceous/ natural grass cover	**4**
>70%	Closed herbaceous/ natural grass cover	**5**

ILUA

- **Plant residues cover (92d):** vertical projection of the plant residues as percentage of the total ground area. To be indicated according to option list:

Options	Description/definition	Code
No plant residues		**0**
< 5%	Very few plant residues	**1**
5-10%	Sparse plant residues canopy cover	**2**
10-40%	Very open plant residues cover	**3**
40-70%	Open plant residues cover	**4**
>70%	Closed plant residues cover	**5**

ILUA

- **Crop residues cover (92d):** vertical projection of the crop residues as percentage of the total ground area. To be indicated according to option list:

Options	Description/definition	Code
No crop residues		**0**
< 5%	Very few crop residues	**1**
5-10%	Sparse crop residues canopy cover	**2**
10-40%	Very open crop residues cover	**3**
40-70%	Open crop residues cover	**4**
>70%	Closed crop residues cover	**5**

Drainage:

- **Waterlogging (74b):** soil drainage reflected by the time water remains on the surface after a heavy rainfall and resulting waterlogging. Can be obtained from informants. To be described according to option list:

Options	Description/definition	Code
Not applicable	Includes urban areas, quarries	**0**
No drainage	Land covered with water most of the year, such as lakes, swamps and mangroves, etc.	**1**
Poor drainage	Significant surface ponding (lying water) for several months	**2**
Moderate drainage	Water/humidity may stay in the soil for several weeks	**3**
Good drainage	No evidence of surface ponding after one day following heavy rain However, water/ humidity may stay in the soil for a weeks	**4**
Very good drainage	Moisture/water does not stay in the soil during more than a few consecutive hours. E.g. sandy soils will dry out rapidly	**5**

- **Impeded/filtering capacity (74c):** filtering capacity of wetlands. To be described according to option list:

Options	Description/definition	Code
Not applicable	Not a wetland	**0**
Low filtering capacity	When it does not traps sediments, excess nutrients and other pollutants such as heavy metals. Therefore the water coming in the wetland has the same quality (e.g. colour) as the one going out	**1**
Medium filtering capacity	When it traps some amount of sediments and retains some excess nutrients and other pollutants such as heavy metals. Therefore the water coming in the wetland is slightly different in quality (e.g. colour) as the one going out	**2**
High filtering capacity	When it traps sediments and retains excess nutrients and other pollutants such as heavy metals. Therefore the water coming in the wetland is significantly different in quality (e.g. colour) as the one going out. High density of vegetation	**3**

Environmental problems:

- **Environmental problem category (84):** main environmental problems observed/identified within the LUCS. To be asked also to informants. To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
None identified		**0**
Reduced water levels in rivers / wetlands	When in a different period of time a considerable reduction of water levels can be noticed	**1**
Dried up of water source	When the main resources of water use have dried up	**2**
Rainfalls variability	When in a period of time a change pattern in rainfalls is noticed and is affecting agriculture production, other human activities and climate	**3**
Drought	Continuous periods of dry weather that usually affects agriculture, other human activities and climate	**4**
Floods	Seasons where a large quantity of water covers an area	**5**
Poor water quality	When the water does not meets the previous main quality needs for the population	**6**
Air pollution	Disturbances caused by air pollution	**7**
Erosion	When excessive soil is carried away in the landform to the extent that gullies and other erosion signs can be observed	**8**
Loss of soil fertility	When nutrients of soil are being reduced to the extent that the crop yields are reduced due to intensive use of chemical inputs, soil erosion, poor soil management practices	**9**
Reduced yields	When the production of certain crop is drastically reduced as compared to the previous seasons	**10**
Dust storm	Currents that creates winds carrying large amount of soil and dust particles	**11**
Hail storm	Frozen rain falling as little balls of ice that affect agriculture	**12**
Uncontrolled burning	Fire that has expanded and become difficult to extinct	**13**
Landslide	Mass movement of land resulting in the collapse of the hillsides	**14**
Wind fall/ wind blow	Including storms, cyclones…	**15**
Overexploiting resources	When a resource its used in a way that its natural recuperation its not enough to maintain it	**16**
Overgrazing	Excessive loss of herbaceous vegetation cover due to wildlife or livestock grazing	**17**
Loss of habitats	When ecosystems are being reduced	**18**
Reduced species diversity	When plant and animal species diversity is drastically reduced	**19**
Animal/wildlife	When diseases start decreasing the animal/wildlife	**20**

disease and mortality	population	
Plant pest	When pests start affecting plants in the area	**21**
Invasive species	When exotic species start growing and affecting native species in the area	**22**
Other	To be specified	

- **Severity (84c):** severity of identified problem. To be indicated according to the following option list:

Options	Description/definition	Code
Low	When the evidence of the problem is not so visible	**1**
Medium	There are some visible effects of the problem that are starting to affect	**2**
High	When is visible that the problem is strongly affecting	**3**

- **Trend (84d)**: trend in the severity of the problem during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Decreasing	When there are visible signs that the problem detected is reducing	**1**
No change	When there are visible signs that the problem has not change in the last 5 years	**2**
Increasing	When there are visible signs that the problem detected is increasing	**3**
Not known	There is not enough information to know the trend in the severity of the problem	**90**

ILUA

- **Soil erosion (84e):** type of erosion observed/identified within the LUCS. To be indicated by marking the appropriate checkboxes (multiple choice possible):

Options	Description/definition	Code
No soil erosion	No evidence of soil erosion	**0**
Gullies	Evidence of erosion shown by deep excavation of soils mainly caused by excessive water and exposing bare rocks at the bottom	**1**
Rills	Evidence of erosion shown by removal of surface soils and mainly caused by droplets of rain water	**2**
Sheet	Evidence of erosion shown by even removal of the surface layer of the soil mainly caused by water moving runoffs	**3**
Pedestals		**4**
Root exposure	When there is not enough soil therefore the roots of the plants are exposed	**5**
Sedimentation (behind trees)	Accumulation of sediments around the tree stem base	**6**
Sealing	Pores of surface soil are drastically reduced to the extent that infiltration is impeded	**7**
Water ponding	When pools of water accumulates in the surface soils	**8**

Siltation	Movement of fine soil particles that are accumulated along water channels, river banks and flat plains	**9**
Abrasion		**10**
Rock outcrops	Rocks protrusions from surface of the soil due to erosion processes	**11**
Dunes	Accumulation of sandy soils due to wind erosion resulting into hilly topography	**12**
Other	To be specified	

Fire:

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

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

- **Fire area (86):** surface of fire in the LUCS. To be indicated in square meters.
- **Fire type (87):** to be indicated according to option list (multiple choice possible):

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**

- **Fire purpose (87b):** main purposes for the fire. To be indicated according to option list (multiple choice possible):

Options	Description/definition	Code
Not applicable	No fire	**0**
Clearing of new land	When all the vegetation is removed for the purpose of changing the land use (e.g. forest to agriculture use)	**1**
Clearing of weeds and residues	When there is a dense vegetation of weeds and residues that want to be removed for planting or other use	**2**
Pasture regrowth	Fire that is created to stimulate pasture regeneration growth	**3**
Pest and vermines control	When vegetation is cleared by fire for the purpose of removing/managing rodents, snakes…	**4**
Arson / Malice	When in a premeditated way vegetation is cleared by fire for destruction purposes	**5**
Accidental	When vegetation is removed by accidental fire	**6**
Natural	When vegetation is removed by natural fire	**7**

Not known	There is not enough information to know the fire purpose	**90**
Other	To be specified in the notes	**99**

Wildlife (to be inserted in part B for an NFA):

- **Wildlife disturbances (94c)**: impact level of wildlife activity in the resources. To be indicated according to option list:

Options	Description/definition	Code
Not disturbed	No disturbance detected	**0**
Slightly disturbed	When there is minimal evidence that wildlife is disturbing the resources	**1**
Moderately disturbed	When there is some evidence of disturbance in the resources cause by wildlife	**2**
Heavily disturbed	When there is high evidence of disturbance to resources by wildlife	**3**

Grazing / rangeland (to be inserted in part B for an NFI):

- **Grazing activity (138):** indicates if grazing activity (domestic animals) is carried out in the Land Use/Cover Section (Y/N).

ILUA

- **Grazing overall quality (139a):** indicates the overall quality of land resources for grazing. To be indicated according to an option list:

Options	Description/definition	Code
Not applicable	Urban area, water course	**0**
Low	Evidence that the grazing land has poor pasture quality (e.g. few pasture species and sparse, < 20% pasture cover)	**1**
Medium	Evidence that the grazing land has moderate pasture quality (between 20-49% pasture cover)	**2**
High	Evidence that the grazing land has good pasture quality (abundant and dense pasture, > 50% pasture cover)	**3**

ILUA

- **Quality trend (139b)**: trend in the quality of the grazing/ rangeland during the last 5 years. To be asked to informant and indicated according to option list:

Options	Description/definition	Code
Not applicable	Urban area, water course	**0**
Decreasing	When there are visible signs that the quality trend is reducing in the last 5 years	**1**
No change	When there are visible signs that the quality has not change in the last 5 years	**2**
Increasing	When there are visible signs that the quality trend is increasing in the last 5 years	**3**
Not known	There is not enough information to know the quality trend of the grazing/rangeland	**90**

B. Forest and other wooded land management and structure

This section should be filled out only for LUCS within forest and other wooded land.

- **Stand origin (90):** to be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Natural	Natural regeneration of stand by seed	**N**
Plantation	Artificial regeneration by seeding or planting	**P**
Coppice	Regeneration by shoots from stump or roots	**C**
Not known	There is not enough information to know about the stand origin	**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% crown cover) and a lower layer (under storey)	**2**
Three-layer vegetation	Stand with three distinct canopy layers each with at least 20% crown cover: - a dominant upper layer two thirds above the lowest layer - an intermediate layer where the canopies is from one to two thirds above the lower layer - a lowest layer (under storey) growing at a maximum height of one third of the dominant layer	**3**
Multilayer	Stand with more than three distinct canopy layers	**4**

- **Forest ownership (83b):** legal right to freely and exclusively use, control, transfer, or otherwise benefit from a forest. It refers to the ownership of the **trees** regardless of whether or not it coincides with the land ownership. To be indicated according to option list:

Options		Description/definition	Code
Private	Individual	Forest owned by individuals and families	1
	Industries	Forest owned by private enterprises or industries	2
	Local communities	Forest owned by a group of individuals belonging to the same community residing within or in the vicinity of a forest area. The community members are co-owners that share exclusive rights and duties, and benefits contribute to the community development	3
	Others private	Forest owned by private co-operatives, corporations, religious and educational institutions, pension or investment funds, NGOs, nature conservation associations and other private institutions (religious, educational, etc.)	4
Public	State	Forest owned by central government, or by government-owned institutions or corporations	5
	Local government	Forest owned by local government (district, municipalities)	6
Indigenous / Tribal communities		Forest owned by community of indigenous or tribal people	7
Not known		No information available on the forest ownership	90
Other		To be specified. Also includes areas where ownership is unclear or disputed.	

- **Management plan (93):** any existing forest or woodland management plan.

Options	Description/definition	Code
No formal management plan	No formal management plan formulated or formal management plan formulated but not implemented	0
Formal management plan	Formal management plan formulated and implemented	1
Not known	There is not enough information to know about any existing management plan in the area	90

- **Human 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	**0**
Slightly disturbed	Exploitation of goods and services is carried out according to management plans	**1**
Moderately disturbed	Many products collected without conforming to management plans, notion of sustainability not respected	**2**
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	**3**

- **Disturbance types (94b)**: the types of human disturbances affecting the forest or other wooded land. To be indicated according to option list:

Options	Description/definition	Code
Not disturbed		**0**
Encroachment by agriculture	Conversion of forests into agricultural land	**1**
Overexploitation	When the forest resource is extracted at a rate higher than the rate of regeneration	**2**
Settlements	When settlement activities cause disturbances	**3**
Quarry and mineral exploration	When forests resources are cleared to pave way for querying and mining	**4**
Urban infrastructure development	When forests resources are cleared to pave way for infrastructure development (e.g. roads, water treatment plants...)	**5**
Other	To be specified in the notes	**99**

- **Timber exploitation (95):** exploitation system applied in the LUCS. To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
No felling		**0**
Clear-cutting	Felling of most commercial-sized trees in a stand	**1**
Selective felling	Selective felling extracting only trees of certain species, dimensions, value, etc., not taking into account silvicultural needs	**2**
Group felling	Extraction of groups of trees that have certain species, dimensions, value, etc., not taking into account silvicultural needs	**3**
Strip felling	Extraction of strips of trees that have certain species, dimensions, value, etc., not taking into account silvicultural needs	**4**
Other	To be specified	

- **Stumps removal (95b):** indicate if the stumps are removed after exploitation by "**Y**" (=**yes**) and "**N**" (=**no**).
- **Branches and tops removal (95c):** indicate if the branches and top trees are removed after exploitation by "**Y**" (=yes) and "**N**" (=**no**).
- **Notes (98a):** notes concerning forest and OWL.
- **Silviculture (96):** visible silvicultural practices (cutting). To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
No practice		**0**
Pruning	To cut away some of the branches to improve the tree bole quality	**1**
Thinning	Reduction of trees within a plantation to allow for the development of desired future trees	**2**
Coppicing	Cutting the main stem to allow regeneration	**3**
Pollarding	Cutting branches of a tree to allow for straight growth of the tree	**4**
Cleaning /Weeding	Intervention aimed at freeing trees from disturbing vegetation layer (e.g. lianas)	**5**
Enrichment planting/seeding – Indigenous sp	Supplementary planting or seeding of indigenous species for increasing the percentage of desirable species	**6**
Enrichment planting/seeding – Exotic sp	Supplementary planting or seeding of exotic species for increasing the percentage of desirable species	**7**
Sanitary cutting	Removal of dead, damaged or unhealthy trees, with the aim of stopping or preventing the spreading of insects and diseases	**8**
Prescribed burning	Controlled application of fire to vegetation in either their natural or modified state, under specified environmental conditions which allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to attain planned resource management objectives	**9**
Other	To be specified	

- **Logging technology (97)**: technology used for tree exploitation (cutting and removal). To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Not applicable	No timber exploitation	**0**
Manual	Manual saw, axe, machete, etc.	**1**
Chainsaw	Chainsaw	**2**
Mechanized	Tractors, mechanization, etc.	**3**
Animal	Oxen	**4**
Not known	There is not enough information to know about the logging technology	**90**
Other	To be specified	

C. Crop management

This section should be filled out only for LUCS classified as crops (annual, perennial and mixed crops) and improved pastures. It contains information on products provided by land as well as on crop management. Most of the information will be collected through observations and possibly through interviews with farmers.

- **Current and other Crop (146a /146b):** categories of crops cultivated in the Land Use/Cover Section at the moment of the assessment (**146a**) or during the past one year (one line for each product category). To be indicated according to option list:

Options		Description/definition	Code
Annual crops products	**Food crops**		
	Wheat		**1**
	Barley		**2**
	Oats		**3**
	Maize		**4**
	Rye		**5**
	Millet	Includes bulrush and finger millet	**6**
	Sorghum		**7**
	Rice, paddy		**8**
	Beans		**9**
	Soya beans		**10**
	Other pulses	Chick pea, cowpea, lentils, green gram, etc	**11**
	Groundnuts		**12**
	Sweet potatoes		**13**
	Irish potatoes		**14**
	Cassava		**15**
	Sugar cane		**16**
	Cabbage		**17**
	Tomatoe		**18**
	Crotolaria		**19**
	Spider lant		**20**
	Amaranthus		**21**
	Cluster bean		**22**
	Sunflower		**23**
	Paprika		**24**
	Arrow root		**25**
	Other annual food crop	To be specified	**91**
	Non-food crops		
	Cotton		**27**
	Tobacco		**28**
	Flowers		**29**
	Other non food annual crops	To be specified	**92**

Perennial crops	**Fruit trees**		
	Mango trees		**30**
	Guava trees		**31**
	Citrus trees		**32**
	Papaya trees		**33**
	Avocado trees		**34**
	Banana		**35**
	Plantain		**36**
	Other fruit trees	To be specified	**93**
	Other perennial crops		
	Vineyards		**40**
	Tea		**41**
	Coffee		**42**
	Oil Palm		**43**
	Coconuts		**44**
	Pineapple		**45**
	Sisal		**46**
	Aloe vera		**47**
	Pigeon pea		**48**
	Berry bushes		**49**
	Cashewnut		**50**
	Agroforestry species	Intercropped species such as Leucaena, Gliricidia, Sesbania spp.	**51**
	Other perennial crops	To be specified	**94**

- **Number of harvest / year (147)**: number of harvest of the product per year of the crops cultivated at the moment of the survey **(147a)** or during the past one year (**147b**).
- **Cropping system (140):** To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Mono-cultures	Sole stands and several seasons	**1**
Multiple cropping	Many storeys or layers in the same field and at the same time	**2**
Mixed cropping	Mixed annuals or mixed annual and perennials	**3**
Crop rotation	Includes sequential cropping	**4**
Mixed crop/livestock	Mixed crops with livestock	**5**
Agroforestry	Mixed production system between annual/perennial crops and trees	**6**
Improved cultivars	From research, extension, private sector not from local participatory breeding	**7**
Fallow	Area that was used for agriculture and its in a reconstitution phase but it is going to be used in the future for agriculture	**8**
Not known	There is not enough information to know about the cropping system	**90**
Other	To be specified	

- **Water management (141):** water treatment, drainage and use. To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Rain fed	Agricultural production purely based on rainfall	**1**
Irrigation – manual construction, gravity fed	Generally small-scale systems	**2**
Irrigation – major equipment	Usually external investment	**3**
Water harvesting – micro/macro catchment	When water is harvested from roof and rock catchment	**4**
Water harvesting – Spate or flood flow	When water is impounded by building small dams or dams on flood flows resulting into reservoirs and ponds	**5**
Artificial drainage of excess water	When excess of water has to be drained artificially	**6**
Not known	There is not enough information to know about the water management	**90**
Other	To be specified	

- **Nutrients (142):** Use of fertilizer or other soils amendments. To be indicated by indicating **Low** (=code **1**), **Medium** (=code **2**), **High** (=code **3)** in the appropriate box(es) (multiple choice possible):

Options	Description/definition	Code
None		**0**
Adequate fallow	Soil quality improved by allowing enough fallow period	**1**
Organic fertilizers	Soil quality improved by use organic fertilizer	**2**
Mineral fertilizers	Soil quality improved by use inorganic fertilizer	**3**
Liming	Soil quality improved by liming	**4**
Not known	There is not enough information to know about the nutrients for soil amendment	**90**
Other soil amendments	To be specified	

- **Pest/Weeds (143):** Pest, weed and disease management applied. To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
None		**0**
Chemical pesticides	Chemicals for controlling pests	**1**
Chemical fungicides	Chemicals for controlling fungi	**2**
Chemical herbicides	Chemical for controlling weeds	**3**
Manual control	When the control is done manually	**4**
Mechanical control	Control by use of machinery	**5**
Biological control	Control of pest by use of biological agents (e.g. predators)	**6**
Local knowledge for pest control	Using substances such as soap, ash, pepper, Mexican marigold…	**7**
Not known	There is not enough information to know about the pest/weeds control management	**90**
Other	To be specified	

- **Soil and water conservation (144):** Protection against erosion, terrain and slope modifications**.** To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
None		**0**
Levelling	Reduction of sloppiness of the land	**1**
Contour farming	Includes ridges, bunds, contour tillage, contour strips, stone lines	**2**
Contour strips	Planting crops along contour lines	**3**
Terracing	Terracing of the land	**4**
Crop residue incorporation	When crop residues are left on the soil to become part of the organic matter	**5**
Cover crops / vegetation	Maintenance of dense vegetation to prevent soil from erosion	**6**
Mulching	Incorporation of vegetation materials in the farm land to reduce moisture lose	**7**
Windbreak	Trees planted on strips to reduce crop lodging by wind	**8**
Grassed waterways / Check dams	Grass planted on water ways to reduce the rate of water flow	**9**
Tree planting / Agroforestry	Reforestation for soil and water conservation	**10**
Not known	There is not enough information to know about the soil and water conservation	**90**
Other	To be specified	

- **Land preparation / Tillage (145b):** Protection against erosion, terrain and slope modifications**.** To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Zero tillage	Direct seeding without tilling e.g. broadcast, digging stick, seed drill	**0**
Minimum tillage	Direct seeding with minimal tilling e.g. broadcast, digging stick, seed drill	**1**
Manual (hoe)	Use of a hoe for tilling land	**2**
Animal draught	Use of animals, oxen, donkeys for land tillage	**3**
Mechanized means	Use of machinery, tractor for land tillage	**4**
Slashing	Clearing of vegetation	**5**
Burning	Starting fire to burn crops residues/vegetation	**6**
Herbicides	Chemical input to destroy vegetation	**7**
Not known	There is not enough information to know about land preparation/tillage	**90**
Other	To be specified	

- **Notes (98b):** general notes concerning the LUCS, forest management, cropping activities, reasons and problems concerning the choice of the LUCC.

5.6 Form F6: Land Use/Cover Class (LUCC) – Products and Services

This form (see Annex 6.9, Figure 49 p. 190) contains the information on services and forest and tree products provided by lands and water. Crop, wildlife and fish products are also included in ILUA, while livestock products are excluded. The form also includes information on invasive, threatened and extinct species as well as on land use conversion trends.

One form will be completed for each land use/cover class found in the SU (in all 4 plots). Most of the information will be collected through interviews (key informants, focus groups, individuals) and observations and organized in a table. Primary data from the interview will be recorded in the **F6p** form (see Annex 6.9, Figure 50, p. 191).

Plot identification

- **Country name (1).**
- **SU Nº (2):** identification number of the sampling unit (from 1 to total SU number).
- **Plot Nº (3):** identification number of the plot (1 to 4).
- **Land use (80):** code describing the land use (LU) class, according to classification given in section 1, page 17.

A. Products harvested in the land use class

This table is used to record the products (forest, trees, crop , wildlife and fish products) harvested in the land use class (livestock products are excluded). If the table is not big enough, the field form F6b can be used to record other products.

- **Product/service category (99):** categories of products harvested in the Land use class (one line for each product category). To be indicated according to option list:

Options		Description/definition	Code
Wood products	Industrial wood	Includes timber, chips	101
	Fuelwood		102
	Charcoal		103
	Wood carvings	Tools, household equipment, carvings and other small woods	104
Cash crops ILUA		Crops used mainly for sale (oil, fibber, food, beverage...)	200

Plant products (other than cash crops)	**Human plant food**	Vegetable foodstuffs and beverages including fruits, nuts, seeds, roots, mushrooms, food crops, etc.	**201**
	Fodder	Animal and bee fodder provided by leaves, fruits, flowers, etc.	**202**
	Plant medicines	Medicinal plants (e.g. leaves, bark, roots) used in traditional medicine and/or for pharmaceutical companies	**203**
	Soap / cosmetics	Aromatic plants providing essential (volatile) oils and other products used for cosmetic purposes such as soaps, perfumes	**204**
	Dying / tanning	Plant material (bark and leaves) providing tannins and other plant parts (especially leaves and fruits) used as colorants	**205**
	Herbs and spices	Food additives	**206**
	Exudates	Substances such as gums (water soluble), resins (water insoluble) and latex (milky or clear juice), released from plants by exudation	**207**
	Utensils, handicrafts	Non wood products	**208**
	Construction material	Includes thatch, bamboo, rattan, wrapping, leaves and fibres	**209**
	Ornamentals	Entire plants (e.g. orchids) and parts of plants (e.g. pots made from roots) used for ornamental purposes	**210**
	Seeds	Seeds collected for regeneration purposes	**211**
	Fuel	Combustion materials	**212**
	Fibber	For instance for making clothes	**213**
	Fertilizer	Additives to improve soil fertility	**214**
	Other plant products	To be specified	**299**
Animal products	**Living animals**	Mainly vertebrates such as mammals, birds, reptiles kept/bought as pets	**301**
	Honey, beeswax	Products provided by bees	**302**
	Bush meat	Meat provided by vertebrates, mainly mammals	**303**
	Other edible animal products	Mainly edible invertebrates such as insects (e.g. caterpillars) and other “secondary” products of animals (e.g. eggs, nests)- To be specified	**398**
	Hides / skins	Hide and skin of animals used for various purposes. Includes trophies	**304**
	Medicines from animals	Entire animals or parts of animals such as various organs used for medicinal purposes	**305**
	Colorants	Entire animals or parts of animals such as various organs used as colorants	**306**
	Fuel	Biogas, dung	**307**
	Other non-edible animal products	E.g. bones used as tools – To be specified	**399**

- **Product category ranking (99a):** ranking of the product category according to importance. To be indicated according to option list:

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

- **Species / Varieties (111):** local or scientific name of species and varieties (crops) in the product category harvested in the land use class (one line per species/ varieties). If only a part (seed, bark, leaves...) of the product is harvested then it will be indicated into parenthesis. If a local name is used then the language used to name the species should be specified into brackets.

- **Species ranking (111a):** ranking of the species according to importance. To be indicated according to option list:

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

- **Commercial end-use (102):** main end-use of the product. To be indicated according to option list:

Options	Description/definition	Code
Only domestic use	The product is only used for home consumption. No commercial use of the product	**0**
<25% commercial use	Less than 25% of the product is sold in markets (more than 75% of the product is used for home consumption)	**1**
25-50% commercial use	25% to 50% of the product is sold in markets (50% to 75% of the product is used for home consumption)	**2**
50-75% commercial use	50% to 75% of the product is sold in markets (25% to 50% of the product is used for home consumption)	**3**
>75% commercial use	More than 75% of the product is sold in markets (less than 25of the product is used for home consumption)	**4**
Only commercial use	All harvested product is sold. The product is not used for home consumption	**5**
Not known	There is not enough information to know about the commercial use of the specie	**90**

- **Conflicts (104):** existence of conflicts between different users/harvesters of the product. To be indicated according to option list:

Options	Description/definition	Code
No	No conflicts due to use/harvest of the product	**1**
Yes	Conflicts due to use/harvest of the product	**2**
Not known	There is not enough information to know about conflicts of harvesting the product	**90**

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

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there are signs that the demand trend of product is decreasing for the last 5 years	**1**
No change	When there are signs that the demand trend of product has been the same for the last 5 years	**2**
Increasing	When there are signs that the demand trend of product is increasing for the last 5 years	**3**
Not known	There is not enough information to know about demand trend	**90**

- **Supply trend (106):** trend of product supply or stock during the last 5 years. This variable should not to be recorded for crop products (ILUA). To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there are signs that the supply trend of product is decreasing for the last 5 years	**1**
No change	When there are signs that the supply trend of product has been the same for the last 5 years	**2**
Increasing	When there are signs that the supply trend of product is increasing for the last 5 years	**3**
Not known	There is not enough information to know about supply trend	**90**

- **Period (107b-107c):** period of harvest of the product, indicated as starting month and end month (Month-Month). For instance, if the harvest is done from September to December then indicate "09-12".

- **Frequency (108):** frequency of harvesting of the product. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Daily	Product is harvested practically every day	**1**
Weekly	Product is harvested practically every week	**2**
Seasonally	Product is harvested every year during well defined seasons	**3**
Intervals larger than 1 year	Product is not harvested every year	**4**
Not known	There is not enough information to know about frequency of harvesting the product	**90**
Other	To be specified in the notes	**99**

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

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there are signs that the trend in harvesting the product is decreasing for the last 5 years	**1**
No change	When there are signs that the trend in harvesting the product has been the same for the last 5 years	**2**
Increasing	When there are signs that the trend in harvesting the product is increasing for the last 5 years	**3**
Not known	There is not enough information to know about the trend in harvesting the product	**90**

- **Change reason (110)**: main reason of change in harvesting of the product during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Change in benefits	Less benefits were perceived for the product	**1**
Change in market	Change in market forces (supply and demand)	**2**
Substitution by other products	More benefits were perceived for other products	**3**
Change in the quantity of product in the surroundings	Reduced yield/availability of the product in the surrounding	**4**
Change in the access to the resource	Access to the resource made difficult due to exploitation, natural disaster, climate change…	**5**
Change in land quality	Change in land quality (fertility, salinity...)	**6**
Climate change / variability	Reduce productivity due to changes in climate	**7**
Not known	There is not enough information to know about the change reason in harvesting the product	**90**
Other	To be specified in the notes	**99**

- **Market price (266a):** market price of the product in national currency per Unit.
- **Market price unit (266b):** market price unit of the product (eg. kg, unit, dozen...).

User group: each line from this section of the table corresponds to a user group for the **product category** (not anymore to the product species).

- **User group (101):** the user group of the product category is indicated by marking the following codes:

Options	Description/definition	Code
Individuals	Individuals and families	**I**
Communities	Group of families living together	**C**
Enterprise	Includes public or private enterprises, industries and organizations	**E**
Nomadic	Nomadic or transhumant user (individuals or communities)	**N**

- **User group ranking (101a):** ranking of the user groups according to the harvested quantity of the product category. To be indicated according to option list:

Options	Description/definition	Code
Low	User group with low harvest of the product	**1**
Medium	User group with medium harvest of the product	**2**
High	User group with high harvest of the product	**3**

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

Options	Description/definition	Code
Individual rights	The harvester is the land owner or has been transferred property rights	**1**
Rent	Pays a fee, percentage of harvest….for having the right of harvest the product	**2**
Product lease	Pays a fee for harvesting the product	**3**
Land lease	Pays a fee for leasing the land	**4**
Customary or common rights	Rights to harvest the product based on tradition or habit, to satisfy local people's needs or a specific group. Might be regulated through permits and licenses	**5**
Open access	The harvest of the product is a common right. Everybody has the right to harvest/use the product.	**6**
No right	The harvest of the product is prohibited	**7**
Not known	There is not enough information to know about the user rights	**90**

- **Sale to (268):** main destination of sold product (by product category). To be indicated according to option list:

Options	Description/definition	Code
Not applicable	The product is not sold	**0**
Local market	Product sold mainly to local market > 70%	**1**
Regional market	Product sold mainly to regional market > 70%	**2**
Middleman	Over 70 % of the product sold to an intermediate person(s) involved in the chain between the producer and the final buyer e.g. exporters, cooperatives…	**3**
Not known	There is not enough information to know about where the product is sale to	**90**

- **Organization level (101b):** level of organization in which the harvest is carried out. To be indicated according to option list:

Options	Description/definition	Code
Organized	Harvesting is carried out in a coordinated manner	**1**
Spontaneous	Harvesting is carried out in a spontaneous, non organized manner	**2**
Organized and spontaneous	Harvesting is carried out both in a coordinated and spontaneous manner	**3**

- **Gender balance (101c):** gender balance of harvesters of the product. To be indicated according to option list:

Options	Description/definition	Code
No women	Women don't harvest the product	**0**
<30% women	Less than 30% of the women living in the place participate in the harvest of the product	**1**
30 – 70% women	Between 30 – 70% of the women living in the place participate in the harvest of the product	**2**
>70% women	More than 70% of the women living in the place participate in the harvest of the product	**3**
Only women	Only women harvest the product	**4**

- **Child participation (101d):** proportion of children involved in the work related to harvest. To be indicated according to option list:

Options	Description/definition	Code
No children	Children don't harvest the product	**0**
<30% children	Less than 30% of the children living in the place participate in the harvest of the product	**1**
30 – 70% children	Between 30 – 70% of the children living in the place participate in the harvest of the product	**2**
>70% children	More than 70% of the children living in the place participate in the harvest of the product	**3**
Only children	Only children harvest the product	**4**

Legislation:

- **Awareness (101e):** awareness of the legislation related to the harvest of the product. When major parts of the user group restrictions this should be indicated by marking the checkbox. When there are no legislation related to the harvest of the product then "n.a." (not applicable) should be indicated.
- **Compliance (101f):** compliance to legislation for the product. If the majority of the user group acts in compliance with the legislation this should be indicated by marking the checkbox. When there are no legislation related to the product then "n.a." (not applicable) should be indicated.

Incentives:

- **Awareness (101g):** awareness of incentives related to the product. If the majority of the user group is aware of the incentives this should be indicated by marking the checkbox.
- **Application (101h):** application to incentive for the product by legal users. If the majority of the user group has applied or is applying for incentives this should be indicated by marking the checkbox.

B. Services provided by the forest and trees (or land use/cover class in ILUA)

- **Service category (148):** service provided by the forest and trees (or land use/cover class in ILUA). To be indicated by marking the appropriate checkbox, according to the importance of the service (multiple choice possible):

Options	Description/definition	Code
None identified		**0**
Soil protection	Including soil conservation, watershed protection, protection against erosion and landslides	**1**
Soil fertility	Contributes to good fertility	**2**
Fresh water / water conservation	Contributes to fresh water/water conservation	**3**
Detoxification / water purification	Contributes detoxification/water purification	**4**
Climate regulation	Contributes to regulates climate	**5**
Disease control	Provides a barrier from diseases	**6**
Windbreak	Acts as a windbreaker	**7**
Shade	Provides shade	**8**
Religious/Spiritual	Use for religious purposes	**9**
Cultural heritage	For cultural heritage	**10**
Recreation / Tourism	Including ecotourism, hunting or fishing as leisure activity	**11**
Aesthetic	Provides landscape beauty	**12**
Education / Scientific studies	Use for education, researches, including bio-prospecting	**13**
Employment	Provides local employment	**14**
Other	To be specified	

- **Service importance (148b):** importance of the service provided. To be indicated according to option list:

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

Service legislation:

- **Awareness (101e):** awareness of the legislation related to the service provided. When major parts of the user group are aware of the legal restrictions this should be indicated by marking the checkbox. When there are no legislation related to the service then "n.a." (not applicable) should be indicated.
- **Compliance (101f):** compliance to legislation for the service provided. If the majority of the user group acts in compliance with the legislation this should be indicated by marking the checkbox. When there are no legislation related to the product then "n.a." (not applicable) should be indicated.

Service incentives:

- **Awareness (101g):** awareness of incentives related to the service provided. If the majority of the user group is aware of the incentives this should be indicated by marking the checkbox.
- **Application (101h):** application to incentive for the service provided by legal users. If the majority of the user group has applied or is applying for incentives this should be indicated by marking the checkbox.

C. Biodiversity indicators

Insect pests, diseases and invasive species (160):

- **Insect pest, diseases and invasive species category (160a):** category of major diseases, pests and invasive species observed/identified within the land use class. To be indicated according to option list:

Options	Description/definition	Code
Insect pest	Exotic insect species in the habitat that is exponential increasing in population	**1**
Disease	Bacterial, virus or fungal agents causing diseases	**2**
Fish invasive sp.	Exotic fish species in the habitat that is exponential increasing in population and whose spread cause, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health	**3**
Animal wildlife invasive sp.	Exotic animal wildlife species in the habitat that is exponential increasing in population and whose spread cause, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health	**4**

Woody invasive sp.	Exotic woody species in the habitat that is exponential increasing in population and whose spread cause, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health	**5**
Herbaceous invasive sp.	Exotic herbaceous species in the habitat that is exponential increasing in population and whose spread cause, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health	**6**

- **Species (160b):** either common/local or scientific name of the disease, pest or invasive species.
- **Affects (160c):** category affected by insect pest or disease. To be indicated according to option list:

Options	Description/definition	Code
Not applicable	Fish, wildlife, woody or herbaceous invasive species	**0**
Humans	The insect pest or disease affects humans	**1**
Livestock	The insect pest or disease affects livestock	**2**
Fishes	The insect pest or disease affects fishes	**3**
Animal wildlife	The insect pest or disease affects animal wildlife	**4**
Herbaceous plants	The insect pest or disease affects herbaceous plants	**5**
Woody plants	The insect pest or disease affects woody plants	**6**
Other	To be specified in the notes	**99**

- **Severity (160d):** severity of the invasion/ disease. To be indicated according to option list:

Options	Description/definition	Code
Low	There are few visible signs that the disease, pest or invasive specie is affecting the area of land use class	**1**
Medium	There are visible signs that the disease, pest or invasive specie is affecting the area of land use class	**2**
High	The area of land use class is severely affected by the disease, pest or invasive species	**3**

Threatened and extinct species and varieties (161):

- **Threatened and extinct species category (161a):** category of threatened and extinct species or varieties identified within the land use class. To be indicated according to option list:

Options	Description/definition	Code
Fish sp.	Fish species in the habitat that is declining exponentially in population within the land use	**1**
Animal sp.	Animal species in the habitat that is declining exponentially in population within the land use	**2**
Woody sp.	Woody species in the habitat that is declining exponentially in population within the land use	**3**
Herbaceous sp.	Herbaceous species in the habitat that is declining exponentially in population within the land use	**4**

- **Species (161b):** either common/local or scientific name of the threatened and extinct species or varieties.
- **Status (161c):** indicate if the specie or variety is extinct or threatened. To be indicated according to option list:

Options	Description/definition	Code
Extinct	When population no longer exists	**E**
Threatened	When population is being reduced to a level that in short term can disappear	**T**

Wildlife abundance (162) (Optional):

- **Local or scientific name (112):** name to the main animal wildlife species (big mammals such as e.g. antelope, gazelle...) present in the land use area
- **Abundance (113b):** extent of existence of the named species. To be indicated according to option list:

Options	Description/definition	Code
Low	Low population of the species in the area	**1**
Medium	Medium population of the species in the area	**2**
High	High population of the species in the area	**3**

- **Land use/cover change:** indicates if there are any conversion trends from the land use to another and the extent of the conversion process.

- **Conversion (80b):** indicates the rate of conversion according to option list:

Options	Description/definition	Code
None	No conversion from the land use to another over the last 5 years i.e. the land use has been stable	**0**
Low	The extent of conversion from one land use to another is low i.e. few signs of changes	**1**
Medium	The extent of conversion from one land use to another is medium over the last 5 years i.e. gradual signs of changes	**2**
High	The extent of conversion from one land use to another is high over the last 5 years i.e. there has been significant and rapid changes in land use	**3**

- **To land use (80c):** indicates the land use converted to according to the list options (see codes in Table 4).
- **Notes (98):** notes regarding products and services in the land use class and land use/cover change.

5.7 Form F7: Household Survey ILUA

This form (see Figure 51, Figure 52, Figure 53 and Figure 54, p. 192-195) contains information collected from the household survey for an ILUA, mainly on livelihood and resources uses and management, in particular livestock. One form will be completed for each interviewed household. The order of the questions is not rigid and depends on the context and interviewees (see interview recommendations in section 4.4.1 and in Annex 6.7).

Plot identification

- **Country name (1)**.
- **SU Nº (2):** identification number of the sampling unit (from 1 to total SU number).
- **Household Nº (201):** identification number of the household (from 1 to 15 household).
- **Enumerator(s) (200)**: name of interviewer.
- **Date (206a)**: date of interview (day / month / year).
- **Start time (206b)**: time when starting the interview (hour : minutes).
- **End time (206c)**: time when ending the interview (hour : minutes).

A. General information on household (Form F7a)

- **Village (202**): village name.
- **UTM E (203a) and UTM N (203b):** coordinates of the household according to the projection system adopted (UTM system in meters).
- **Distance to SU (203)**: distance from the household to the SU center, in kilometres ("0 Km" if the household is in the SU).
- **Type (212**): level of sedentarity of the household. To be indicated by marking the appropriate checkbox:

Options	Description/definition	Code
Sedentary	The household remains at a single location, leads a settled, non-migratory lifestyle	**1**
Transhumant/ Nomadic/	The household moves from place to place, rather than settling down in one location. Depending on the season and availability of resources. It doesn't have a permanent home but has designated emigration areas	**2**

A1. Household composition (Form F7a)

The table gives detail on all usual household members, including those who are temporarily absent.

- **Member name (15a/b):** full name of all persons who usually live in the household. This field is optional.

- **Relationship to head (205)**: member's relationship to head of household. To be indicated according to option list:

Options	Description/definition	Code
Head		**1**
Spouse		**2**
Own son/ daughter		**3**
Step son/ daughter		**4**
Parent		**5**
Brother / Sister		**6**
Nephew/ Niece		**7**
Son/ Daughter in Law		**8**
Grandson/ Granddaughter		**9**
Other relative		**10**
Unrelated		**11**

- **Sex (15c):** male ("M") or female ("F").
- **Age (15g):** age in completed years. "0" if less than one year.
- **Education (15h):** indicates if the education level of the household member. To be indicated according to option list:

Options	Description/definition	Code
Illiterate	Does not know how to read and write	**0**
Literate	Knows how to read and write but has not attended formal education	**1**
Primary school	Has attained some levels of primary school	**2**
Secondary school or above	Has attained some levels of secondary school or above	**3**

- **Respondent (209):** if the person is the respondent to the interview, then "respondent" will be ticked.

A2. Household activities (Form F7a)

- **Activities (210a):** income generation sources and activities contributing to food security for the household. To be indicated by marking appropriate checkboxes according to following option list (multiple choice possible):

Options	Description/definition	Code
Crop production	Livelihood and income generation provided by cropping activities	**1**
Livestock / Herding	Livelihood and income generation provided by livestock, pasture, herding	**2**
Forestry	Livelihood and income generation provided by the forest and related activities, including processing and marketing of forest products	**3**
Aquaculture	Livelihood and income generation provided by aquaculture activities (fish farming, mariculture, algaculture)	**4**
Fishing	Livelihood and income generation provided by fishing	**5**
Industry	Work in the industrial sector	**6**
Handicraft	Livelihood and income generation provided by handicraft	**7**
Trade	Livelihood and income generation provided by trade in goods or services	**8**
Services	Income generated from services (doctor, lawyer, teacher...)	**9**
Tourism	Income generated from tourism or activities related to recreation.	**10**
Mining / Extraction	Livelihood and income generation provided by mining and extraction activity	**11**
Hunting	Livelihood and income generation provided by hunting	**12**
Gathering	Livelihood and income generation provided by collecting fruits, plants, nuts, fibre from a wide area	**13**
Others	To be specified. Includes subsidies, etc.	

- **Main activity for income generation (210b):** main income generation source for the household. To be indicated by marking the appropriate checkbox according to the list.
- **Main activity for food security (210c):** main activity contributing to food security for the household. To be indicated by marking appropriate checkbox according to the list.

A3. Livelihood (Form F7a)

- **Total annual household income (211):** range of the total household income from all activities, in national currency. As this can be a sensitive question, it might be asked at the end of the interview, or deduct from other answers. To be indicated by marking appropriate checkboxes according to following option list:

Options	Description/definition	Code
<xxxx	Equivalent to <xxxx per month	**1**
xxxx-xxxx	Equivalent to xxxx – xxxx per month	**2**
xxxx-xxxx	Equivalent to xxxx – xxxxx per month	**3**
xxxx-xxxx	Equivalent to xxxx – xxxx per month	**4**
≥ xxxx	Equivalent to ≥ xxxx per month	**5**

- **Livelihood trend (211b):** trend of livelihood of the household during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When the interviewed person has the perception that his trend of livelihood is decreasing in the last five years	**1**
No change	When the interviewed person has the perception that his trend of livelihood is still the same in the last five years	**2**
Increasing	When the interviewed person has the perception that his trend of livelihood is increasing in the last five years	**3**
Not known	There is not enough information to know the trend in livelihood	**90**

- **Change reason (273c):** main reason of change in the livelihood of the household during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
No change		**0**
Change in household composition	There is a change in the household composition (death, new employment, age, household requirements...) that makes a change in the livelihood of the household	**1**
Change in harvest quantity	Increase or decrease in the harvest quantity	**2**
Change in resource access	Increase or decrease in the resource access (land, water, crop inputs…) that makes a change in the livelihood of the household	**3**
Change in education / technology	Change in access to education/technology	**4**
Not known	There is not enough information to know the change reason	**90**
Other	To be specified in the notes	**99**

A4. Land area and land tenure (Form F7a)

- **Total area (270):** total farm size, in acres (or m^2 for ponds), and area of crop land, fallow land, forest, pond and other (to be specified) managed by the household.
- **Area trend (271):** trend in the area managed by the household as crop land, fallow land, forest, pond and other, during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	Area managed has been reducing in the last 5 years	**1**
No change	Area managed has not change in the last 5 years	**2**
Increasing	Area managed has been increasing in the last 5 years	**3**
Not known	There is not enough information to know about the trend in the area managed	**90**

- **Change reason (272):** main reason of change in the area managed by the household as crop land, fallow land, forest, pond and other, during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
No change		**0**
Change in labour	Increase or decrease in labour availability (i.e. can no longer pay for labour or labour directed to other activities, etc.)	**1**
Change in land tenure	Increase or decrease in land owned by the household (i.e. land sold, subdivided, leased, etc.)	**2**
Not known	There is not enough information to know about the change reason in the area managed	**90**
Other	To be specified in the notes	**99**

- **Land tenure (273a):** land tenure of the land managed by the household. To be indicated by marking the appropriate checkbox according to option list:

Options	Description/definition	Code
Individual ownership	Land owned by the household	**1**
Others private ownership	When the household has an agreement with the owner to use the land	**2**
Customary	The household is part of a collective, a group of co-owners, a community who own the land, hold exclusive rights and share duties	**3**
Rent	The household rents the land (lease)	**4**
Squatter	The household is a squatter	**5**
Other	To be specified	**99**

- **Land tenure security trend (273b):** trend in the security for the land tenure of the household during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When the interviewed person has the perception that his security for land tenure is decreasing	**1**
No change	When the interviewed person has the perception that his security for land tenure is stable	**2**
Increasing	When the interviewed person has the perception that his security for land tenure is increasing	**3**
Not known	There is not enough information to know the land security trend	**90**

- **Change reason (211c):** main reasons of change in the security for land tenure during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
No change		**0**
Change owner	When a new owner does not give permission to the household to stay in the land	**1**
Reduce of income	The person does not has enough income to pay the rent or has to sell its land	**2**
Land legalization process	When is a squatter and the land is going to be legalized	**3**
Conflict	When there is a conflict between ethnic groups for land	**4**
Insecurity	When the place the household is located is a dangerous area because of war, delinquency…	**5**
Not known	There is not enough information to know about the change reason	**90**
Other	To be specified in the notes	**99**

A5. Health (Form F7a)

Questions related to health are very sensitive so the enumerator should be careful in formulating this question and should not insist if the interviewee doesn't want to give the information. They might be asked at the end of the interview. Some of the options can be obtained by observation or by doing research of the history of illness in the area.

- **Illness (213a):** illness that affects or has seriously affected one or several household members during the past 5 years. To be specified by checking appropriate checkboxes according to option list (multiple choice possible):

Options	Description/definition	Code
Unspecified long term disease	When a household member has a disease but does not has enough information to know the name	**1**
Bilharzias	When a household member has had Bilharzias in the last five years	**2**
Malaria	When a household member has had Malaria in the last five years	**3**
Typhoid / Diarrhea	When a household member has had Typhoid / Diarrhea in the last five years	**4**
HIV	When a household member has had HIV in the last five years	**5**
Tuberculosis / Pneumonia	When a household member has had Tuberculosis/Pneumonia in the last five years	**6**
No answer	When the interviewed person refuses to answer	**90**
Other	To be specified	

- **Seriously affected members (213b):** number of household's members who are or have been seriously affected by the illness during the past 5 years.
- **Died (213c):** number of household's members who died from the illness during the past 5 years. This question is optional.

A6. Food security (Form F7a)

- **Food shortage frequency (215a):** frequency of food shortage in the household. To be indicated according to option list:

Options	Description/definition	Code
No food shortage	When the household does not experience food shortage	**0**
Once every 10 year	When there are seasons once every ten years that the household experience food shortage	**1**
Once every 5 year	When there are seasons once every five years that the household experience food shortage	**2**
Once every 2 year	When there are seasons once every two years that the household experience food shortage	**3**
Once every year	When there are seasons once every year that the household experience food shortage	**4**
Not known	There is not enough information to know about the food shortage frequency	**90**

- **Food shortage period (215b1-215b2):** usual period of food shortage, if it happens frequently. To be indicated by mentioning the starting month and ending month (e.g. August to October will be 08-10).

- **Alternative food sources (215c):** alternative food sources in case of food shortage. To be indicated according to option list:

Options	Description/definition	Code
No food shortage	When the household does not experience food shortage	**0**
Buy	Food is bought in the nearest market	**1**
Famine relief	Including aids by NGOs, associations	**2**
Neighbours donation	Neighbours donate food to the household	**3**
Not known	There is not enough information to know about the alternative food sources	**90**
Other	To be specified in the notes	**99**

- **Food security trend (216a):** trend in food security of the household during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When the household perceives that their food security trend is decreasing	**1**
No change	When the household perceives that their food security trend is static	**2**
Increasing	When the household perceives that their food security trend is increasing	**3**
Not known	There is not enough information to know about the food security trend	**90**

- **Change reason (216b):** main reason of change in the food security of the household during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
No change		**0**
Economic change	Income reasons	**1**
Social / Health change	When change in social/health condition is the reason e.g. death, illness	**2**
Change in the access to the resources	Change in access to the resource made difficult or easier due to exploitation, natural disaster, climate change...	**3**
Natural event	Plague, climatic change	**4**
Not known	There is not enough information to know about the change reason in the security for land tenure	**90**
Other	To be specified in the notes	**99**

A7. Fuel and energy (Form F7a)

- **Main fuel source (217):** main source of fuel use for cooking (**214a**) and for lighting (**214b**) in the household. To be indicated according to option list:

Options	Description/definition	Code
Fuelwood		**1**
Charcoal		**2**
Crop residues		**3**
Dung / Biogas		**4**
Kerosene		**5**
Electricity		**6**
Not known	There is not enough information to know about the fuel source	**90**
Other	To be specified in notes	**99**

- **Energy saving (217):** indicate if the household use an energy saving stove (**217c**) by "**Y**" (=**Yes**) and "**N**" (=**No**) or another energy saving device (**217d**), to be specified.

A8. Expenses for inputs including labour during the last 1 year (Form F7a)

- **Input category (226):** inputs that have been used main income generating activities during the last 1 year. To be specified by checking appropriate checkboxes according to option list (multiple choice possible):

Options	Description/definition	Code
Hired persons, labour	When the service of other persons to do certain job is hired	**1**
Feeds, fodder	When the service of feeds and fodder is hired	**2**
Veterinary fees, drugs, vaccinations	When services of a veterinary and products like drugs, vaccinations, etc. were purchased in the last one year	**3**
Tools	When necessary tools for activities were purchased	**4**
Spare parts, maintenance of machinery, housing	All expenses for maintenance of machinery	**5**
Hiring of power sources (animals, machinery...)	When the service of other sources of power were hired	**6**
Transport, storage	Expenses for transport and storage	**7**
Herbicides, pesticides, fertilizer	Expenses for chemical inputs	**8**
Irrigation facilities	Expenses for irrigation systems	**9**
Seeds, seedlings, germplasms	Expenses for seeds, seedlings, germplasms	**10**
Other	To be specified	

- **Expenses (227):** expenses from inputs to activities during the last year, in national currency, to be specified according to the input category. The total expenses are to be calculated by enumerator for subsequent cross-checking.

A9. Other general information on household

- **Development /welfare associations (204):** participation or membership of the household in development /welfare associations. To be indicated according to option list:

Options	Description/definition	Code
No participation		**0**
Farmer innovation	Participation in Projects or Farmers associations	**1**
Farmer field school/ group	When a member of the household participates on farmer field schools/group	**2**
Farmer association / cooperative	When a member of the household participates on farmer association/cooperative	**3**
Not known	There is not enough information to know about participation or membership of the household in development activities	**90**
Other	To be specified in notes	**99**

- **Production system trend (208a):** indicate by Y (=yes) or N (=no) if there has been a change in the production system of the household during the last 5 years.

- **Change reason (208b)**: main reason of change in the production system during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
No change		**0**
Economic change	Income reasons	**1**
Social / Health change	When social/health condition is the reason e.g. death, illness	**2**
Change in the access to the resources	Access to the resource made difficult due to exploitation, natural disaster, climate change….	**3**
Natural event	Plague, climatic	**4**
Incentives	When government gives incentives for certain production system	**5**
Capacity building	When government, NGOs or other institutions teach about other production system that the household did not know	**6**
Not known	There is not enough information to know about change reason	**90**
Other	To be specified in the notes	**99**

- **Management plan (219c)**: involvement of the household in management plan of natural resources. To be specified by marking the appropriate checkbox(es) according to option list (multiple choice possible):

Options	Description/definition	Code
Farm	Management plan at a farm level	**1**
Community	Management plan of natural resource at community level	**2**
Catchment	Management plan of natural resource at catchment level	**3**

- **Notes (290):** any pertinent notes concerning the household.

A10. Access to services (Form F7b)

- **Service category (218):** indicates the service categories, according to the following list:

Options	Description/definition	Code
Credit services	When the household has access to credit services	**1**
Saving services	When the household has access to saving services	**2**
Extension services	When the household has access to extension services	**3**
Veterinary services	When the household has access to veterinary services	**4**
Veterinary drugs	When the household has access to veterinary drugs	**5**
Cattle dip	When the household has access to cattle dip	**6**
Local market place	When the household has access to local market	**7**
Regional market place	When the household has access to regional market	**8**
Seed provision	When the household has access to seed provision	**9**
Health service	When the household has access to health services	**10**
Education - Primary	When the household has access to education primary	**11**
Education - Secondary	When the household has access to education secondary	**12**
Other	To be specified	

- **Use frequency (228):** specifies with what frequency the household uses the service. To be indicated according to option list:

Options	Description/definition	Code
Not used	The service is not used	**0**
Daily	Service used practically every day	**1**
Weekly	Service used practically every week	**2**
Monthly	Service used practically every month	**3**
Twice a year	Service used twice a year	**4**
Once a year	Service used once a year	**5**
Intervals larger than 1 year	Service not used every year	**6**
Not known	There is not enough information to know about use frequency	**90**
Other	To be specified in the notes	**99**

- **Service need (229):** specifies if the household needs the service by indicating "**Y**" (**yes**) or "**N**" (**no**).
- **Service accessibility (230):** indicates how accessible the service is to the household. To be indicated according to option list:

Options	Description/definition	Code
Not accessible	When the service is not available to the household	**0**
Available	When the service is available to the household	**1**
Available but costly	When the service is available to the household but costly	**2**
Available but distant	When the service is available to the household but distant	**3**
Available but distant and costly	When the service is available to the household but distant and costly	**4**

- **Distance to service (231):** distance to the service from the house, in km.
- **Service quality (264):** quality of the service used according to the household. To be indicated according to option list:

Options	Description/definition	Code
Not used	Service not used by the household	**0**
Low	Service with low quality	**1**
Medium	Service with medium quality	**2**
High	Service with high quality	**3**

A11. Accessibility to water resources (form F7b)

- **Water sources type (217):** indicates the type of water source, according to the following list:

Options	Description/definition	Code
Well	Is an artificial excavation or structure put down by any method such as digging or drilling for the purposes of withdrawing water from underground aquifers	**1**
Borehole	Narrow shaft drilled in the ground for the extraction of water	**2**
Pond	Freshwater or slightly saline	**3**
River / Stream	Large natural stream of water flowing in a channel, i.e. Tana, Nyando	**4**
Lake	Small body of still water formed naturally or by hollowing or embankment	**5**
Springs	A place where the water comes naturally to the surface from under the ground	**6**
Rock catchment	Rock catchments providing water	**7**
Dam	Barrier constructed to hold back the water and raise its level to form a reservoir. Natural or artificial lake used as source of water or store of water for a settlement.	**8**
Piped water	Supply of water dependent upon a pumping installation and/or conduits	**9**
Other	To be specified	

- **Water source access (232):** indicates which type of water source is used by the household during the dry season (**232a**) or during the wet season (**232b**) by marking the appropriate checkboxes (multiple choice possible).
- **Distance to water resources (233):** distance to the water resources, in km, from the house during dry (**233a**) and wet (**233b**) season.
- **Time (284):** time to reach the water resources, in km, from the house during dry (**284a**) and wet (**284b**) season.
- **Water source uses (281, 282, 283):** indicates if the water source is used by the household for livestock (**281**), crop (**282**) and human consumption (**283**) during the dry (-a) or the wet (-b) season by marking the appropriate checkboxes (multiple choice possible).
- **Water source conflict (280):** indicates if there are conflicts regarding the use of the water source during the dry season (**280a**) or during the wet season (**280b**) by marking the appropriate checkboxes.

A12. Conflicts human / wildlife / livestock (Form F7b)

- **Problem (253a):** type of problems / conflicts affecting the household. To be indicated by marking the appropriate check boxes according to the following list (multiple choice possible):

Options	Description/definition	Code
No conflict		**0**
Damage to crops	When either human, wildlife or livestock causes damage to crops	**1**
Damage to trees	When either human, wildlife or livestock causes damage to trees	**2**
Damage / Destruction of property/ infrastructures	When either human, wildlife or livestock damages or destroys property or infrastructure	**3**
Land degradation/ erosion	When either human, wildlife or livestock causes land degradation/erosion	**4**
Livestock death/ injury	When either human or wildlife causes livestock death/injury	**5**
Livestock disease	When wildlife causes livestock disease	**6**
Human death/ injury	When wildlife causes human/death injury	**7**
Competition for resources (space, forage, water)	When either human, wildlife or livestock causes competition for forest resources (space, forage, water)	**8**
Other	To be specified	

- **Conflict origin (253b):** indicates if the problem/ conflict affecting the household are caused by human, livestock or wildlife by marking the appropriate checkboxes (multiple choice possible).

A13. Benefits from wildlife and tourism (Form F7b)

- **Benefits from wildlife/tourism (254):** benefits that the household receives / has received from wildlife or tourism. To be specified by checking appropriate checkboxes according to option list (multiple choice possible):

Options	Description/definition	Code
Infrastructure development	Including health and water facilities, schools, roads...	**1**
Sale of curios / handicrafts	Benefits increased due to sale of curios/handicrafts	**2**
Employment	Hotels...	**3**
Bushmeat	Benefits increased due to sale of bushmeat	**4**
Other	To be specified	

B. Cropping management (Form F7b)

B1. Crop production system

- **Cropping system (140):** To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Mono-cultures	Sole stands and several seasons	**1**
Multiple cropping	Many storeys or layers in the same field and at the same time	**2**
Mixed cropping	Mixed annuals or mixed annual and perennials	**3**
Crop rotation	Includes sequential cropping	**4**
Mixed crop/livestock	Mixed crop and livestock	**5**
Agroforestry	Annual or perennial crops mixed with trees	**6**
Improved cultivars	From research, extension, private sector not from local participatory breeding	**7**
Fallow	Area that was used for agriculture and its in a reconstitution phase but it is going to be used in the future for agriculture	**8**
Not known	There is not enough information to know about the cropping system	**90**
Other	To be specified	

- **Water management (141):** water treatment, drainage and use. To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Rain fed	Agricultural production purely based on rainfall	**1**
Irrigation – Manual construction, gravity fed	Generally small-scale systems	**2**
Irrigation – Major equipment	Usually external investment	**3**
Water harvesting – Micro/macro catchment	When water is harvested from roof and rock catchment	**4**
Water harvesting – Spate or flood flow	When water is impounded by building small dams or dams on flood flows resulting into reservoirs and ponds	**5**
Adequate drainage of excess water	When due to topographic conditions excess of water is drained adequately	**6**
Not known	There is not enough information to know about the water management	**90**
Other	To be specified	

- **Nutrients (142):** Use of fertilizer or other soils amendments. To be indicated by indicating Low (=code 1), Medium (=code 2), high (=code 3) in the appropriate box(es) (multiple choice possible):

Options	Description/definition	Code
None		**0**
Adequate fallow	Significant fallow period which allows the soil fertility to regenerate	**1**
Organic fertilizers	Organic inputs are added to the soil for increasing production	**2**
Mineral fertilizers	Mineral inputs are added to the soil for increasing production	**3**
Liming	Application of carbonate compounds in the soils to reduce acidity of the soil	**4**
Not known	There is not enough information to know about nutrients	**90**
Other soil amendments	To be specified	

- **Pest/Weeds (143):** Pest, weed and disease management applied. To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
None		**0**
Chemical pesticides	Chemicals for controlling pests	**1**
Chemical fungicides	Chemicals for controlling fungi	**2**
Chemical herbicides	Chemical for controlling weeds	**3**
Manual control	When the control is done manually	**4**
Mechanical control	Control by use of machinery	**5**
Biological control	Control of pest by use of biological agents (e.g. predators)	**6**
Local knowledge for pest control	Using substances such as soap, ash, pepper, Mexican marigold…	**7**
Not known	There is not enough information to know about the pest/weeds control management	**90**
Other	To be specified	

- **Soil and water conservation (144):** Protection against erosion, terrain and slope modifications**.** To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
None		**0**
Levelling	Reduction of sloppiness of the land	**1**
Contour farming	Includes ridges, bunds, contour tillage, contour strips, stone lines	**2**
Contour strips	Planting crops along contour lines	**3**
Terracing	Terracing of the land	**4**
Crop residue incorporation	When crop residues are left on the soil to become part of the organic matter	**5**
Cover crops / vegetation	Maintenance of dense vegetation to prevent soil from erosion	**6**
Mulching	Incorporation of vegetation materials in the farm land to reduce moisture lose	**7**
Windbreak	Trees planted on strips to reduce crop lodging by wind	**8**
Grassed waterways / Check dams	Grass planted on water ways to reduce the rate of water flow	**9**
Tree planting/ Agroforestry	Reforestation for soil and water conservation	**10**
Not known	There is not enough information to know about the soil and water conservation	**90**
Other	To be specified	

- **Land preparation / tillage (145):** Protection against erosion, terrain and slope modifications**.** To be indicated by marking the appropriate checkbox (multiple choice possible):

Options	Description/definition	Code
Zero tillage	Direct seeding without tilling e.g. broadcast, digging stick, seed drill	**0**
Minimum tillage	Direct seeding with minimal tilling e.g. broadcast, digging stick, seed drill	**1**
Manual (hoe)	Use of a hoe for tilling land	**2**
Animal draught	Use of animals, oxen, donkeys for land tillage	**3**
Mechanized means	Use of machinery, tractor for land tillage	**4**
Slashing	Clearing of vegetation	**5**
Burning	Starting fire to burn crops residues/vegetation	**6**
Herbicides	Chemical input to destroy vegetation	**7**
Not known	There is not enough information to know about land preparation/tillage	**90**
Other	To be specified	

B2. Role distribution (form F7b)

- **Activity (158):** indicates the type of enterprise/activity related to the crops according to the following list:

Options	Description/definition	Code
Management decision	Consists on the activities involved for the production of the crop (e.g. inputs, type of crop, sales)	**1**
Land preparation	Activities done to the land before planting the crop (ploughing of land and preparation for planting crops)	**2**
Planting / Seeding	Incorporating plant/seed on soil	**3**
Weeding	Removal weeds from crop land	**4**
Harvesting	Collection of the yields from the farm	**5**
Marketing	Activities that involve the search of a buyer	**6**
Watering	Irrigating cropland	**7**
Processing	Transformation of farm produce to semi processed or processed products	**8**
Other	To be specified	

- **Cash crops (155):** main person in the household taking care of the activity for the cash crops, according to gender and age. To be specified according to option list:

Options	Description/definition	Code
Not carried out	The activity is not carried out	**0**
Household's men	The activity is mainly carried out by men in the household	**1**
Household's women	The activity is mainly carried out by women in the household	**2**
Household's adults	The activity is mainly carried out by adults (women and men) in the household	**3**
Household's children	The activity is mainly carried out by children in the household	**4**
All household's members	All household's members carry out the activity	**5**
Hired laboured	The activity is mainly carried out by hired labour	**6**
Not known	There is not enough information to know about the main person in household that takes care of cash crops	**90**
Other	To be specified	

- **Subsistence crops (155):** main person in the household taking care of the activity for the subsistence crops, according to gender and age. To be specified according to option list:

Options	Description/definition	Code
Not carried out	The activity is not carried out	**0**
Household's men	The activity is mainly carried out by men in the household	**1**
Household's women	The activity is mainly carried out by women in the household	**2**
Household's adults	The activity is mainly carried out by adults (women and men) in the household	**3**
Household's children	The activity is mainly carried out by children in the household	**4**
All household's members	All household's members carry out the activity	**5**
Hired laboured	The activity is mainly carried out by hired labour	**6**
Not known	There is not enough information to know about the main person in household that takes care of subsistence crops	**90**
Other	To be specified	

- **Organization level (101b):** level of organization in which the harvest is carried out. To be indicated according to option list:

Options	Description/definition	Code
Organized	Harvesting is carried out in a coordinated manner	**1**
Spontaneous	Harvesting is carried out in a spontaneous, non organized manner.	**2**
Organized and spontaneous	Harvesting is carried out both in a coordinated and spontaneous manner	**3**

- **Crops notes (291):** any pertinent notes concerning the crop management.

C. Livestock management (form F7c)

C1. Livestock production system (form F7c)

The table contains information related to the livestock production system. One row of the table corresponds to a livestock category (excluding beekeeping).

- **Livestock category (219):** indicates the livestock category according to the following list:

Options	Description/definition	Code
Cattle		**1**
Sheep		**2**
Goat		**3**
Camel		**4**
Donkey		**5**
Pigs		**6**
Poultry		**7**
Other	To be specified	

- **Grazing (220)**: type of grazing system used, by livestock category. To be indicated by marking the appropriate checkboxes, according to option list (multiple choice possible):

Options	Description/definition	Code
Free ranging	Livestock are permitted to roam freely instead of being contained in any manner	**1**
Fenced unimproved pastures	Livestock confined in paddocks with natural growing grass/fodder	**2**
Fenced Improved pastures	Livestock confined in paddocks with planted grass/fodder	**3**
Tethering	Animals tied to a tree or peg	**4**
Zero grazing	Livestock confined in zero grazing units	**5**

- **Feeds (221):** feed supply used for the livestock. To be indicated by marking the appropriate checkboxes, according to option list (multiple choice possible):

Options	Description/definition	Code
Crop residues	Use of crops residues	**1**
Fallow land for grazing	Use of fallow land for grazing	**2**
Specific fodder	Use of specific fodder	**3**

- **Livestock Housing at Night (222):** if the livestock is housed at night this should be indicated by marking the appropriate checkbox.

Local breeds:

- **Local breeds proportion (223):** proportion of local breeds, in percent.
- **Local breeds trend (223b):** trend in the proportion of local breeds, in percent during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there is a decline in the proportion of local breeds in the farmers heard during the last five years	**1**
No change	When there is no change in the proportion of local breeds in the farmers heard during the last five years	**2**
Increasing	When there is a increase in the proportion of local breeds in the farmers heard during the last five years	**3**
Not known	There is not enough information known about the trend in local breeds	**90**

- **Local breeds change reason (223c):** main reason of change in the proportion of local breeds during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
No change		**0**
Market forces	Market demand reasons	**1**
Government support/ incentives	When Government participates giving/not giving support/incentives for local breeds	**2**
Improved production	When the production (inputs vs outputs) from a particular breed acts as an incentive.	**3**
Cultural reason	Certain breeds with cultural attachment e.g. used in rituals	**4**
Risk aversion	Fear of changing to unknown/uncertainty	**5**
Climatic change	Change the climatic trends	**6**
Taste preference	Taste preference	**7**
Not known	There is not enough information known about the local breeds change reason	**90**
Other	To be specified in the notes	**99**

- **Local breeds maintain reason (223d):** main reason for maintaining the proportion of local breeds during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Change		**0**
Market forces	Market demand reasons	**1**
Government support/ incentives	When Government participates giving/not giving support/incentives for local breeds	**2**
Improved production	When the production (inputs vs outputs) from a particular breed acts as an incentive.	**3**
Cultural reason	Certain breeds with cultural attachment e.g. used in rituals	**4**
Risk aversion	Fear of changing to unknown/uncertainty	**5**
Climatic change	Change the climatic trends	**6**
Taste preference	Taste preference	**7**
Not known	There is not enough information known about the local breeds change reason	**90**
Other	To be specified in the notes	**99**

Management:

- **Management decisions (224)**: person making decisions for livestock management in the household. To be specified according to option list:

Options	Description/definition	Code
Household's men	The activity is mainly carried out by men in the household	**1**
Household's women	The activity is mainly carried out by women in the household	**2**
Household's adults	The activity is mainly carried out by adults (women and men) in the household	**3**
Household's children	The activity is mainly carried out by children in the household	**4**
All household's members	All household's members carry out the activity	**5**
Hired labour	The activity is mainly carried out by hired labour	**6**
Not known	There is not enough information known about the management decisions	**90**
Other	To be specified in the notes	**99**

- **Management working / herder (225)**: person who looks after the animals in the household. To be specified according to option list:

Options	Description/definition	Code
Household's men	The activity is mainly carried out by men in the household	**1**
Household's women	The activity is mainly carried out by women in the household	**2**
Household's adults	The activity is mainly carried out by adults (women and men) in the household	**3**
Household's children	The activity is mainly carried out by children in the household	**4**
All household's members	All household's members carry out the activity	**5**
Hired laboured	The activity is mainly carried out by hired labour	**6**
Not known	There is not enough information known about the management working	**90**
Other	To be specified in the notes	**99**

- **Access to grazing (220):** indicate if the household has access to grazing land by "**Y**" (=**Yes**) or "**N**" (=**No**).
- **Average distance to grazing land** (**220c**/**220d**): average walking distance for the livestock, in km, to reach the grazing land from the household during the wet (**220c**) and dry season (**220d**). To be filled in only if there is common grazing practices.

C2. Beekeeping management (form F7c)

- **Feed (255):** indicate if the bees are fed by "**Y**" (=**Yes**) or "**N**" (=**No**).
- **Beehive (256)**: indicate whether the bees are kept in beehives or not by "**Y**" (=**Yes**) or "**N**" (=**No**).
- **Extraction techniques (257)**: type of technique used for extracting honey. To be indicated by marking the appropriate box:

Options	Description/definition	Code
Traditional	Use of traditional techniques such as fire, scooping with the hands	**1**
Modern	Use of modern techniques such as centrifugal honey extractor or solar wax-melter	**2**

- **Processing (258)**: indicate whether the honey is processed or not by the household by "**Y**" (=**Yes**) or "**N**" (=**No**).

C3. Total sales of livestock, poultry and bee-keeping products during the last year (form F7c)

- **Livestock product category (234):** Type of products provided by livestock. To be specified according to option list (multiple choice possible):

Options	Description/definition	Code
Meat		**1**
Milk		**2**
Cheese / dairy products		**2**
Eggs		**3**
Hides and skins		**4**
Honey		**5**
Other	To be specified	

- **Unit of quantity (234b):** unit in which the quantity is expressed for the product category.
- **Quantity sold (235):** quantity of product sold during the dry (**235a**) or wet (**235b**) season.
- **Income from sale (236):** Income from sale of product sold during the dry (**236a**) or wet (**236b**) season, in national currency. Total income is to be calculated by enumerator for subsequent crosschecking.
- **Ranking importance (237):** importance of the product to the household during the dry (**237a**) and wet (**237b**) season. To be indicated according to option list:

Options	Description/definition	Code
Low	The least important product provided by livestock	**1**
Medium	Intermediate product provided by livestock	**2**
High	The most important product provided by livestock	**3**

C4. Total sales of poultry and livestock during the last year (form F7c)

The table gives the quantity and values of holdings and sales for different livestock categories. Each row of the table corresponds to a livestock category.

- **Livestock category (241)**: types of domestic or domesticated animals in the household. Non domesticated animals are excluded unless they are kept or raised in captivity. Specified according to following list:

Options		Description/definition	Code
Cattle	Young stock	< 1 year	1
	Weaner male	From 1 year to breeding	2
	Weaner female	From 1 year to breeding	3
	Adult male	Breeding	4
	Adult female	Breeding	5
	Oxen		6
Sheep			7
Goat			8
Pig			9
Chicken	Layer	Chicken kept for egg production	10
	Broiler	Chicken kept for meat production	11
	Free range	Traditionally managed chicken	12
Camel			13
Donkey			14
Rabbit			15
Other		To be specified	

- **Unit of quantity (242):** unit in which all quantities will be expressed for a given livestock category.
- **Current stock (243)**: total livestock holdings, in number of heads (according to selected unit of quantity), on date of interview.

Inputs:

- **Purchased quantity (244a):** total number of heads, in selected unit, purchased during the last one year.
- **Expense of purchase (244b):** expense of livestock heads purchased during the last one year, in national currency. The total expense is to be calculated by the enumerator for subsequent crosschecking.
- **Born (245):** total number of heads, in selected unit, born during the last one year.
- **Gifted in (246):** total number of heads, in selected unit, gifted in during the last one year.

Outputs:

- **Died (247):** total number of heads, in selected unit, that have died during the last one year.
- **Stolen (248):** total number of heads, in selected unit, that have been stolen during the last one year.

- **Consumed (249):** total number of heads, in selected unit, consumed during the last one year.
- **Given out (250):** total number of heads, in selected unit, given out during the last one year.
- **Sold quantity (251a):** total number of heads, in selected unit, sold during the last one year.
- **Income from sale (251b):** value of heads sold during the last one year, in national currency. The total income is to be calculated by the enumerator for subsequent crosschecking.
- **Opening stock (252):** total livestock holdings, in number of heads (according to selected unit of quantity), one year ago. This should be asked at the end, as verification or calculated by the enumerator.

C5. Income received other than through sale of products during the last one year (form F7c)

- **Other income sources (238):** description of income source from livestock, other than sale of products, used through over the last 1 year. To be specified by marking appropriate checkboxes according to option list (multiple choice possible):

Options	Description/definition	Code
Hire of draft power	For animal traction	**1**
Rental of bulls	For breeding	**2**
Sports/recreation	For sport/recreation purposes e.g. bull fighting, hen fighting, racing	**3**
Other	To be specified	

- **Income value (239):** value of corresponding income during the last one year, in national currency.
- **Notes (292):** notes on livestock production.

D. Aquaculture (form F7c)

- **Aquaculture (600):** indicate if the household carries out aquaculture (farming of aquatic organisms such as fish, shellfish and aquatic plants) by **Y** (= **Yes**) or **N** (=**No**).
- **Culture type (601):** indicate the type of aquaculture applied by the household. To be specified by marking appropriate checkboxes according to option list (multiple choice possible):

Options	Description/definition	Code
Monoculture	A single fish species is cultivated	**1**
Polyculture	Various fish species are cultivated simultaneously in the same pond	**2**

- **Production system (602):** indicate if the type of production system applied by the household for aquaculture according to the level of inputs of feed and/or fertiliser. To be indicated according to option list (multiple choice possible):

Options	Description/definition	Code
Extensive	Natural foods	**1**
Semi-intensive	Supplementary feeds are used to complement natural foods	**2**
Intensive	Fishes are fed essentially through supplementary feeds	**3**

- **Species culture name (603):** local or scientific name of cultured species.
- **Stocking density (604):** number of fishes stocked in the pond, by cultured species.

E. Products (form F7d)

This table is used to record the products (forest, trees, crop, wildlife and fish products) harvested by the household (livestock products are excluded, as they are recorded in F7c). If the table is not big enough, extra field forms can be used.

- **Land Use/Cover (80):** land use/ cover (LUC) class where the product is harvested, according to classification described in section 1, page 17 (codes given there).
- **Product/service category (99):** categories of products harvested in the Land use class (one line for each product category). To be indicated according to option list:

Options		Description/definition	Code
Wood products	**Industrial wood**	Includes timber, chips	**101**
	Fuelwood		**102**
	Charcoal		**103**
	Wood carvings	Tools, household equipment, carvings and other small woods	**104**
Cash crops		Crops used mainly for sale (oil, fibber, food, beverage...)	**200**

Plant products (other than cash crops)	**Human plant food**	Vegetable foodstuffs and beverages including fruits, nuts, seeds, roots, mushrooms, food crop	**201**
	Fodder	Animal and bee fodder provided by leaves, fruits, flowers, etc.	**202**
	Plant medicines	Medicinal plants (e.g. leaves, bark, roots) used in traditional medicine and/or for pharmaceutical companies	**203**
	Soap / cosmetics	Aromatic plants providing essential (volatile) oils and other products used for cosmetic purposes such as soaps, perfumes	**204**
	Dying / tanning	Plant material (bark and leaves) providing tannins and other plant parts (especially leaves and fruits) used as colorants	**205**
	Herbs and spices	Aromatic and flavour plants use for flavouring/spicing food	**206**
	Exudates	Substances such as gums (water soluble), resins (water insoluble) and latex (milky or clear juice), released from plants by exudation	**207**
	Utensils, handicrafts	Non wood products	**208**
	Construction material	Includes thatch, bamboo, rattan, wrapping, leaves and fibres	**209**
	Ornamentals	Entire plants (e.g. orchids) and parts of plants (e.g. pots made from roots) used for ornamental purposes	**210**
	Seeds	Seeds collected for regeneration purposes	**211**
	Fuel	Plant materials used in the production of fuel	**212**
	Fibber	Plant materials used in the production of fibber	**213**
	Fertilizer	Plant materials incorporated in the soil to improve fertility	**214**
	Other plant products	To be specified	**299**
Animal products	**Living animals**	Mainly vertebrates such as mammals, birds, reptiles kept/bought as pets	**301**
	Honey, beeswax	Products provided by bees	**302**
	Bush meat	Meat provided by vertebrates, mainly mammals	**303**
	Other edible animal products	Mainly edible invertebrates such as insects (e.g. caterpillars) and other "secondary" products of animals (e.g. eggs, nests)- To be specified	**398**
	Hides / skins	Hide and skin of animals used for various purposes. Includes trophies	**304**
	Medicines from animals	Entire animals or parts of animals such as various organs used for medicinal purposes	**305**
	Colorants	Entire animals or parts of animals such as various organs used as colorants	**306**
	Fuel	Biogas, dung	**307**
	Other non-edible animal products	E.g. bones used as tools – To be specified	**399**

- **Product category ranking (99a):** ranking of the product category according to importance. To be indicated according to option list:

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

- **Species / Varieties (111):** local or scientific name of species and varieties (crops) in the product category harvested in the land use class (one line per species/ varieties). If only a part (seed, bark, leaves...) of the product is harvested then it will be indicated into parenthesis. If a local name is used then the language used to name the species should be specified into brackets.
- **Species ranking (99a):** ranking of the species/varieties according to importance. To be indicated according to option list:

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

- **Number of fields (151):** number of fields of the crop species / varieties cultivated by the household. This variable is to be recorded only for crop products.
- **Total area (152):** cultivated area of the corresponding crop species/ varieties cultivated by the household, in hectares. This variable is to be recorded only for crop products.

Distance to product (165): distance to the Product, in km, from the house.

- **Product origin (262):** main source of seeds /seedlings / germplasms for the harvested species. To be indicated according to option list:

Options	Description/definition	Code
Product harvest (wild)	The product is harvested in the wild	**1**
Seed harvest (wild)	Seeds / seedlings are harvested in the wild	**2**
Purchase	Seeds / seedlings are bought from shops or markets	**3**
Local breeding	Seeds / seedlings are obtained by the household from breeding	**4**
Gift	When seeds/seedlings/germplasms were obtained from donations, friends, neighbours…	**5**
Exchange	When seeds/seedlings/germplasms were exchanged with other product	**6**
Extension services	Seeds / seedlings were provided to the household by extension services	**7**
Not known	There is not enough information known about the product origin	**90**
Other	To be specified in the notes	**99**

Local varieties: These variables are to be recorded only for crop products.

- **Local varieties proportion (159a):** proportion of local varieties, in percent. This variable is to be recorded only for crop products.
- **Local varieties trend (159b):** trend in the proportion of local varieties, in percent during the last 5 years. This variable is to be recorded only for crop products. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there are signs that the proportion of local varieties has been decreasing in the last 5 years	**1**
No change	When there are signs that the proportion of local varieties has not changed in the last 5 years	**2**
Increasing	When there are signs that the proportion of local varieties has been increasing in the last 5 years	**3**
Not known	There is not enough information known about the proportion trend in local varieties	**90**

- **Local varieties change reason (159c):** main reason of change in the proportion of local varieties during the last 5 years. This variable is to be recorded only for crop products. To be indicated according to option list:

Options	Description/definition	Code
No change	No change in the proportion of local varieties	**0**
Market forces	Market demand reasons	**1**
Government support/ incentives	When Government participates giving/not giving support/incentives for local breeds	**2**
Improved production	When the production (inputs vs outputs) from a particular breed acts as an incentive	**3**
Cultural reason	Certain breeds with cultural attachment e.g. used in rituals	**4**
Risk aversion	Fear of changing to unknown/uncertainty	**5**
Climatic change	Change the climatic trends	**6**
Taste preference	Taste preference	**7**
Not known	There is not enough information known about the local varieties change reason	**90**
Other	To be specified in the notes	**99**

- **Local varieties maintain reason (159d):** main reason for maintaining local varieties during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Change	Change in the proportion of local varieties	**0**
Market forces	Market demand reasons	**1**
Government support/ incentives	When Government participates giving/not giving support/incentives for local breeds	**2**
Improved production	When the production (inputs vs outputs) from a particular breed acts as an incentive.	**3**
Cultural reason	Certain breeds with cultural attachment e.g. used in rituals	**4**
Risk aversion	Fear of changing to unknown/uncertainty	**5**
Climatic change	Change the climatic trends	**6**
Taste preference	Taste preference	**7**
Not known	There is not enough information known about the local varieties change reason	**90**
Other	To be specified in the notes	**99**

- **Commercial end-use (102):** main end-use of the product. To be indicated according to option list:

Options	Description/definition	Code
Only domestic use	The product is only used for home consumption. No commercial use of the product	**0**
<25% commercial use	Less than 25% of the product is sold in markets (more than 75% of the product is used for home consumption)	**1**
25-50% commercial use	25% to 50% of the product is sold in markets (50% to 75% of the product is used for home consumption)	**2**
50-75% commercial use	50% to 75% of the product is sold in markets (25% to 50% of the product is used for home consumption)	**3**
>75% commercial use	More than 75% of the product is sold in markets (less than 25of the product is used for home consumption)	**4**
Only commercial use	All harvested product is sold. The product is not used for home consumption	**5**
Not known	There is not enough information known about the commercial end use	**90**

- **Conflicts (104):** existence of conflicts between different users/harvesters of the product. To be indicated according to option list:

Options	Description/definition	Code
No	No conflicts due to use/harvest of the product	**1**
Yes	Conflicts due to use/harvest of the product	**2**
Not known	There is not enough information known about the conflicts between users/harvesters of the product	**90**

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

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there are signs that the demand trend has been decreasing in the last 5 years	**1**
No change	When there are signs that the demand trend has not changed in the last 5 years	**2**
Increasing	When there are signs that the demand trend has been increasing in the last 5 years	**3**
Not known	There is not enough information known about the demand trend of product	**90**

- **Supply trend (106):** trend of product supply or stock during the last 5 years. This variable should not to be recorded for crop products. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there are signs that the supply trend has been decreasing in the last 5 years	**1**
No change	When there are signs that the supply trend has not changed in the last 5 years	**2**
Increasing	When there are signs that the supply trend has been increasing in the last 5 years	**3**
Not known	There is not enough information known about the supply trend of product	**90**

- **Period (107):** period of harvest of the product, indicated as starting month and end month (Month-Month). For instance, if the harvest is done from September to December then indicate "9-12".

- **Frequency (108):** frequency of harvesting of the product. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Daily	Product is harvested practically every day	**1**
Weekly	Product is harvested practically every week	**2**
Seasonally	Product is harvested every year during well defined seasons	**3**
Intervals larger than 1 year	Product is not harvested every year	**4**
Not known	There is not enough information known about the frequency of harvesting the product	**90**
Other	To be specified in the notes	**99**

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

Options	Description/definition	Code
Not applicable		**0**
Decreasing	When there are signs that the trend in harvesting of the product has been decreasing in the last 5 years	**1**
No change	When there are signs that the trend in harvesting of the product has been stable in the last 5 years	**2**
Increasing	When there are signs that the trend in harvesting of the product has been increasing in the last 5 years	**3**
Not known	There is not enough information known about the trend in harvesting of product	**90**

- **Change reason (110)**: main reason of change in harvesting of the product during the last 5 years. To be indicated according to option list:

Options	Description/definition	Code
Not applicable		**0**
Change in benefits	Less benefits were perceived for the product	**1**
Change in market	Change in market forces (supply and demand)	**2**
Substitution by other products	More benefits were perceived for other products	**3**
Change in the quantity of product in the surroundings	Reduced yield/availability of the product in the surrounding	**4**
Change in the access to the resource	Access to the resource made difficult due to exploitation, natural disaster, climate change…	**5**
Change in land quality	Change in land quality (fertility, salinity...)	**6**
Climate change / variability	Reduce productivity due to changes in climate	**7**
Not known	There is not enough information to know about the change reason in harvesting the product	**90**
Other	To be specified in the notes	**99**

- **Harvest quantity (163a):** harvest quantity of the product during the last one year, in the unit specified in the next column (**163b)**.
- **Unit harvest quantity (163b):** unit for the harvest quantity of the product.
- **Average fish size (164):** average size, in centimetres, of fishes harvested. This variable is to be recorded only for fish products.
- **Incomes from product (262b):** income received during the past 1 year from sale of the products, in national currency, by species. If the value cannot be given by species but for the whole product category, then this variable is not recorded and the next column will be compiled (column **262**). Total income is to be calculated by the interviewer/enumerator for subsequent crosschecking.

- **Incomes from product category (262):** income received during the past 1 year from sale of the product category, in national currency. This variable is to be recorded only if the income from product by species (column **262b**) cannot be compiled. Total income is to be calculated by the interviewer/enumerator for subsequent crosschecking.
- **Sale to (268):** main destination of sold product. To be indicated according to option list:

Options	Description/definition	Code
Not applicable	The product is not sold	**0**
Local market	Product sold mainly to local market > 70%	**1**
Regional market	Product sold mainly to regional market > 70%	**2**
Middleman	Over 70 % of the product sold to an intermediate person (s) involved in the chain between the producer and the final buyer e.g. exporters, cooperatives…	**3**
Not known	There is not enough information to know about where the product is sale to	**90**

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

Options	Description/definition	Code
Individual rights	The harvester is the land owner or has been transferred property rights	**1**
Rent	Pays a fee, percentage of harvest….for having the right of harvest the product	**2**
Product lease	Pays a fee for harvesting the product	**3**
Land lease	Pays a fee for leasing the land	**4**
Customary or common rights	Rights to harvest the product based on tradition or habit, to satisfy local people's needs or a specific group. Might be regulated through permits and licenses	**5**
Open access	The harvest of the product is a common right. Everybody has the right to harvest/use the product.	**6**
No right	The harvest of the product is prohibited	**7**
Not known	There is not enough information to know about the user rights	**90**

- **Organization level (101b):** level of organization in which the harvest is carried out. This variable should not to be recorded for crop products. To be indicated according to option list:

Options	Description/definition	Code
Organized	Harvesting is carried out in a coordinated manner	**1**
Spontaneous	Harvesting is carried out in a spontaneous, non organized manner	**2**
Organized and spontaneous	Harvesting is carried out both in a coordinated and spontaneous manner	**3**

- **Gender balance (101c):** gender balance of harvesters of the product. This variable should not to be recorded for crop products. To be indicated according to option list:

Options	Description/definition	Code
No women	Women don't harvest the product	**0**
<30% women	Less than 30% of the women living in the place participate in the harvest of the product	**1**
30 – 70% women	Between 30 – 70% of the women living in the place participate in the harvest of the product	**2**
>70% women	More than 70% of the women living in the place participate in the harvest of the product	**3**
Only women	Only women harvest the product	**4**

- **Child participation (101d):** proportion of children involved in the work related to harvest. To be indicated according to option list:

Options	Description/definition	Code
No children	Children don't harvest the product	**0**
<30% children	Less than 30% of the children living in the place participate in the harvest of the product	**1**
30 – 70% children	Between 30 – 70% of the children living in the place participate in the harvest of the product	**2**
>70% children	More than 70% of the children living in the place participate in the harvest of the product	**3**
Only children	Only children harvest the product	**4**

- **Notes (240b):** notes regarding products harvested by the household.

6. Annexes

6.1 Global Land use/ cover classes definitions (FRA 2010)

Categories	Definition
Total area	Total area (of country), including area under inland water bodies, but excluding offshore territorial waters.
Forest	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use. **Explanatory notes:** 1. Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 meters *in situ*. 2. Includes areas with young trees that have not yet reached but which are expected to reach a canopy cover of 10 percent and tree height of 5 meters. It also includes areas that are temporarily unstocked due to clearcutting as part of a forest management practice or natural disasters, and which are expected to be regenerated within 5 years. Local conditions may, in exceptional cases, justify that a longer time frame is used. 3. Includes forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific environmental, scientific, historical, cultural or spiritual interest. 4. Includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 hectares and width of more than 20 meters. 5. Includes abandoned shifting cultivation land with a regeneration of trees that have, or is expected to reach, a canopy cover of 10 percent and tree height of 5 meters. 6. Includes areas with mangroves in tidal zones, regardless whether this area is classified as land area or not. 7. Includes rubber-wood, cork oak and Christmas tree plantations. 8. Includes areas with bamboo and palms provided that land use, height and canopy cover criteria are met. 9. Excludes tree stands in agricultural production systems, such as fruit tree plantations, oil palm plantations and agroforestry systems when crops are grown under tree cover. Note: Some agroforestry systems such as the “Taungya” system where crops are grown only during the first years of the forest rotation should be classified as forest.

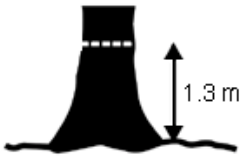
Other wooded land	Land not classified as "Forest", spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds *in situ*; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use. **Explanatory notes:** 1. The definition above has two options: • The canopy cover of trees is between 5 and 10 percent; trees should be higher than 5 meters or able to reach 5 meters *in situ.* or • The canopy cover of trees is less than 5 percent but the combined cover of shrubs, bushes and trees is more than 10 percent. Includes areas of shrubs and bushes where no trees are present. 2. Includes areas with trees that will not reach a height of 5 meters *in situ* and with a canopy cover of 10 percent or more, e.g. some alpine tree vegetation types, arid zone mangroves, etc. 3. Includes areas with bamboo and palms provided that land use, height and canopy cover criteria are met.
Other land	All land that is not classified as "Forest" or "Other wooded land". **Explanatory notes:** Includes agricultural land, meadows and pastures, built-up areas, barren land, land under permanent ice, etc.
Inland water	Inland water bodies generally include major rivers, lakes and water reservoirs.
Outside land area	Sea, ocean or neighbouring countries.

6.2 Tree height and diameter measurements

6.2.1 Tree diameter (Dbh) measurement

Tree diameter is measured over bark, at 1.3m breast height above the ground (see Figure 20) 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 20. 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 21):

- 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.

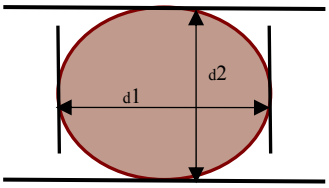
Figure 21. Calliper

The side in cm will be used.

Some preventive measures must be taken into account:

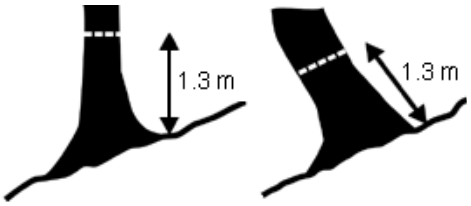
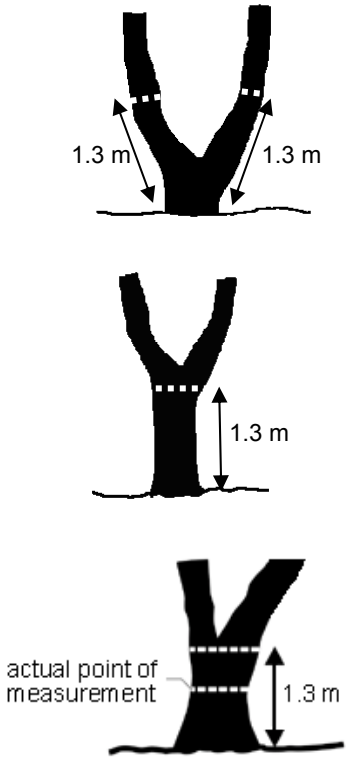
- Measurement instruments are kept in a position that perpendicularly cuts the tree axe at 1.3 m;
- Make sure the calliper tightly holds the stem, in order to prevent the calliper clasps from grasping without compressing the bark;
- If the diametric tape is used, make sure it is not twisted and is well stretched around the tree in a perpendicular position to the stem. Nothing must prevent a direct contact between the tape and the bark of the tree to be measured.
- If the **calliper** is used, **non circular trees** are to be measured in two perpendicular diameters located as close as possible to the largest and the smallest diameter in that point, the average of these two is thus retained.

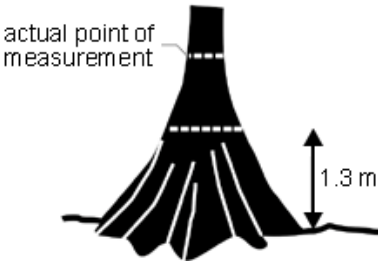
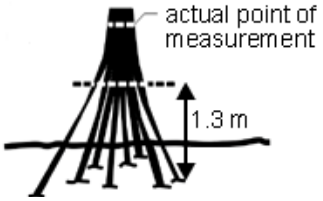
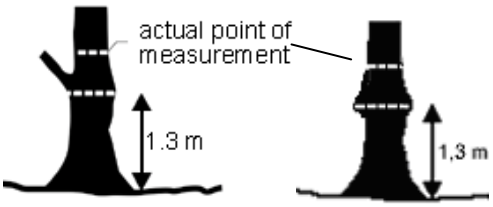
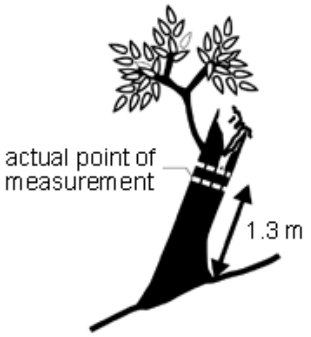
Figure 22. Non circular tree measurement with calliper

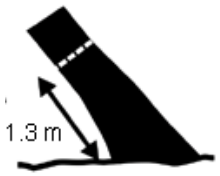
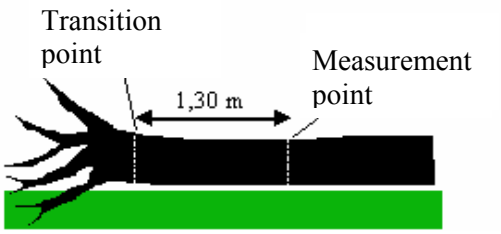
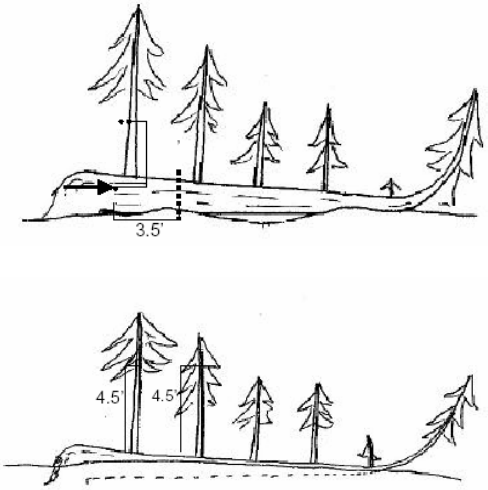


$$d = (d1 + d2)/2$$

- **Particular cases of diameter(Dbhmeasurement**

Case	Description of diameter measurement	Figure *Note: see Figure 20.*
On inclined terrain	Dbh tree measurement at 1.3 m is taken from an uphill position	**Figure 23. Dbh measurement position for a tree on steep terrain** 
Fork tree	Several cases exist, according to the point where the fork divides the stem. • If the **fork begins** (the point where the core is divided) **below 1.30 m height**, each stem having the diameter required (≥20 cm in the whole plot, ≥10 cm for rectangular subplots) will be considered as a tree and will be measured. Diameter measurement of each stem will be taken at 1.3 m height. • **If the fork begins higher 1.3 m height**, the tree will be counted as a single tree and diameter measurement is carried out at 1.3 m. • **If a fork occurs at or immediately above 1.3 m**, diameter is measured below the fork just beneath any swelling that could inflate the Dbh.	**Figure 24. Dbh measurement position for fork trees** 
Coppice	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 1.3 m above the ground; those that originate between 30 cm and 1.3 m are measured at 1 meter above the originating point**.**	

Trees with an enlarged stem base or buttressed tree	Diameter measurement is made at 30 cm above the enlargement or main width of buttress, if the buttress/enlargement reaches more than 90 cm height above the ground	**Figure 25. Dbh measurement position for buttressed tree** 
Trees with aerial roots	Diameter measurement is done at 1.3m from the limit between the stem and roots.	**Figure 26. Dbh measurement position for a tree with aerial roots** 
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 27. Dbh measurement position for a tree with branch enlargement at 1.3m**  **Figure 28. Dbh measurement position for a tree with branch at 1.3m. on a inclined terrain** 

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	**Figure 29. Dbh measurement position for a inclined tree** 
Fallen tree	Diameter measurement is made at 1.3 m from the transition point between the stem and the root	**Figure 30. 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° 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.	**Figure 31. Dbh position for tree lying on th ground with branches in the shape of vertical trees** 

- **If the Dbh is not measured at 1.3 m from the ground**, indicate the height where it was measured in the the form F3 (field "Diameter height"). Measure and separately indicate the branch Dbh that originates at a lower height than 1.3 m.

- **Case of stump**: if the stump height is less than 1.30 m, stump diameter is measured outside bark at stump height, immediately under the cutting point (felling cut) and perpendicular to the longitudinal. If the bark is damaged or missing, a judged addition for bark is done.

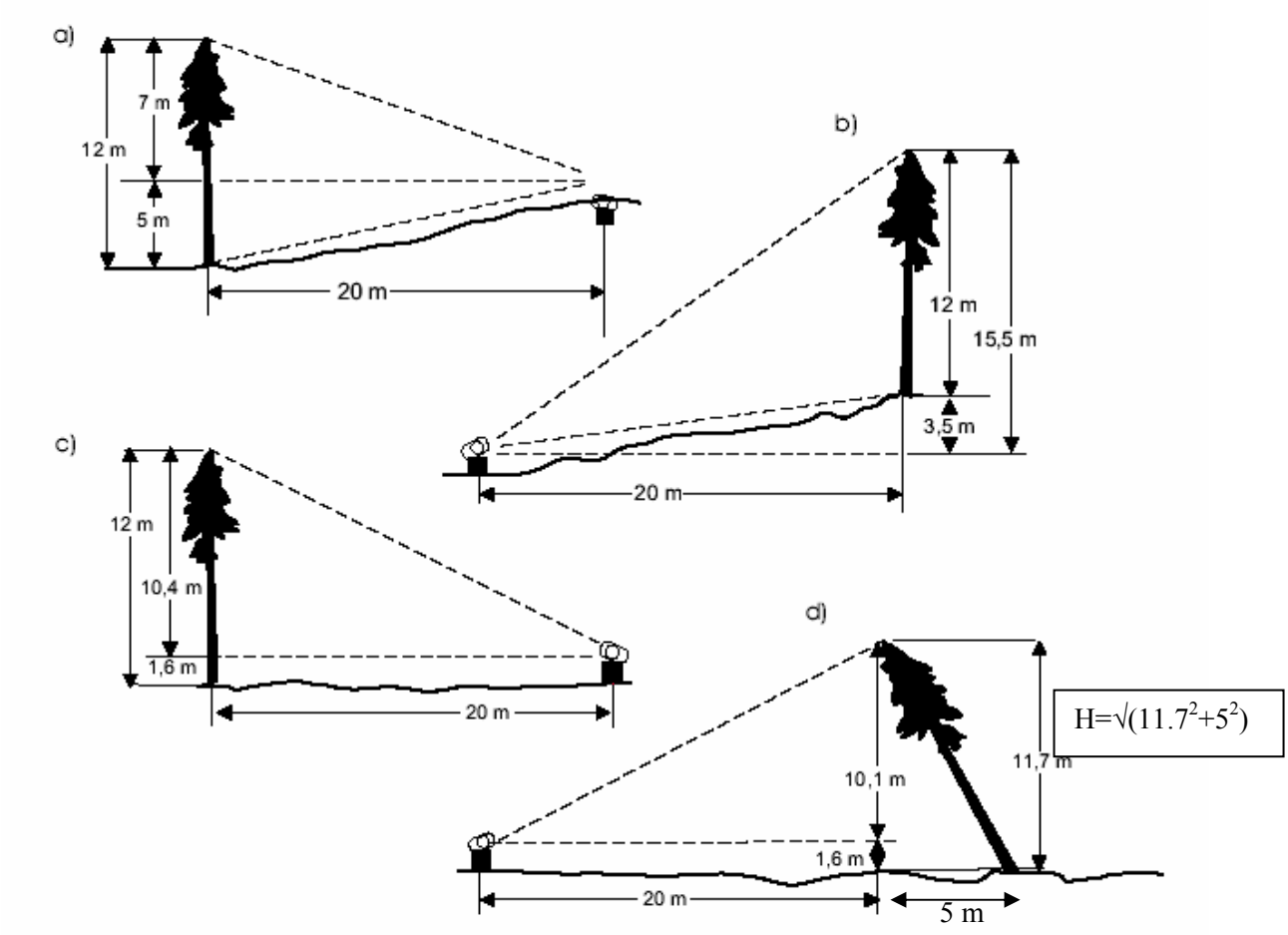
6.2.2 Tree height measurement

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 32a), subtraction if the operator is standing downhill in relation to the tree (see Figure 32b);
5. Slope correction.

Figure 32. Tree height calculation



Note: You may find out the height of a tree (12 m for a, b, and c, and 12.7 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), the height is Ho. If D is the distance from the base of the tree to the point located below the horizontal of the top of the tree then the tree height H is calculated by applying the formula: $H= \sqrt{(H^2+D^2)}$

Measurement with a Blume-Leiss dendrometer

This dendrometer is mainly composed of:

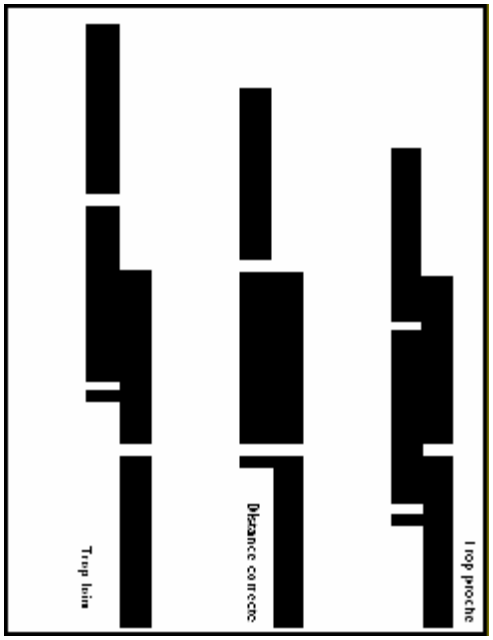
- A dioptric viewer providing two shifted images.
- Four height scales and one angle scale (the height scales correspond to a tree distance to measure at 15, 20, 30, and 40 m).
- An oscillating pendulum placed in front of the scales. The pendulum may be stopped as required with the help of a trigger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

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

On terrain with no or slight slope:

1. Choose 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. Place 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 dioptric 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 33. 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 top 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 added. 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 top 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:

$$h' = h - hk$$

in which h' = is the real height h = measured height k = coefficient correction

Height measurement with a Suunto

1. **Distance:** in order to carry out this measurement, a rod is fixed to the tree in a vertical position and at operator's eye height. The Suunto must be held firmly in vertical position.
2. **Height determination:** target the tree top, 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 Suunto 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.

Estimating tree heigth

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.

6.3 Use of receivers for Global Positioning Systems (GPS)

6.3.1 What is a GPS?

GPS is a satellite-based radionavigation system where the GPS receiver determines its geographical X, Y and Z position by measuring its distance to different satellites. There are 24 operational GPS satellites circulating around the globe in different orbits and they all transmit their spatial position. By deciding the timing to different satellites, which corresponds to the distance, the geographical position is obtained. The error in the estimation of the field positions lies within of a few meters depending on the quality of the receiver. Further details about GPS can be obtained at http://tycho.usno.navy.mil/gpsinfo.html

6.3.2 When to use it?

The field teams use GPS receivers in field:

- to navigate to the plot and reach the starting point for every plot;
- to verify the position of the plot after 125 meters (halfway) and after 250 meters (the end of the plot);
- to get the coordinate of the reference points (market position and while accessingto the sampling unit). With the recorded field positions of the plots their actual extension can be applied in a GIS (Geographic Information System) to make overlays with other geographical data as satellite images, air photo, maps, etc., for further analyses.

The control teams are also using GPS receivers to locate the start positions of the field plots. Since the GPS position can differ with some meters, the control teams are also equipped with metal detectors to find the metal bar (permanent marker) that is put at the start position by the field teams.

6.3.3 GPS Guide

The guide, including functions and buttons depends on GPS model.

6.3.4 Use of GPS in the inventory (for each sampling unit)

- **Preparation:**

1. Initialise the GPS (first use only).
2. Set up units. Appropriate coordinate system and datum should be selected.
3. Enter the starting point coordinates of the plots into the GPS receiver as waypoints. The point name will be given in the following way: (three digits SU number) + “P” (=Plot) + (Plot number) + “S” (= Starting), e.g. for SU 13, plot 3: 013P3S. This can be done either manually, one waypoint by one, or automatically for a bunch of waypoints, connecting the GPS handset with a computer and using appropriate software.

- **In the field**

1. Read the coordinates and Mark the position of the starting position of where the field team starts accessing the SU by foot (i.e. at the closest road accessible by motor

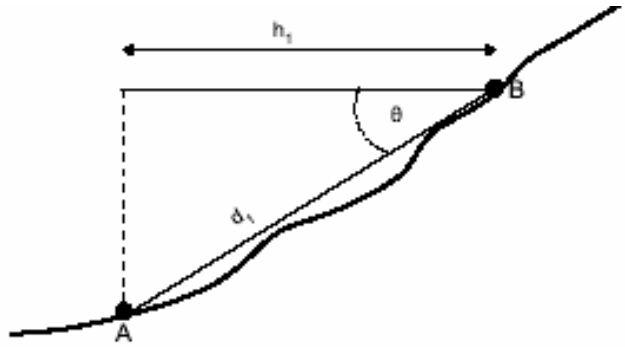
vehicle). The point name will be given in the following way: (three digits SU number) + "V" (=Vehicle) , e.g. for SU 13: 013V.

2. Identify the closed plot starting point (find nearest).
3. Navigate to the starting point of the first plot to be inventoried (Go To function). Use the compass / navigation page).
4. Read and Mark the position of the reference point during access to the SU. The point name will be given in the following way: (three digits SU number) + "R" (=Reference) + « reference point ID number (from 1 to total number of reference points" , e.g. for SU 13, second reference point: 013R2.
5. Read and Mark the position of the marker. The point name will be given in the following way: (three digits SU number) + "P" (=Plot) + (Plot number) + "M" (=Marker), e.g. for SU 13, plot 2: 013P2M.
6. Read and Mark the position of the middle and end of the plot. The point name will be given in the following way: (three digits SU number) + "P" (=Plot) + (Plot number) + "H" (=half) or "E" (= End), e.g. for SU 13, plot 2: 013P2H or 013P2E.
7. Navigate to the next plot starting point (Go To).

6.4 Horizontal distance measurements

All reference distances, such as plots and subplot dimensions, tree coordinates, are horizontal distances. When the terrain is flat, these distances can be measured directly. Nevertheless, in steep terrain, horizontal distances differ from distances covered, measured in the field (see Figure 34). 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. **Slope corrections will be made for all slopes above or equal to 15 percent**.

Figure 34. 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/cosine (Θ).

The following procedure is applied to calculate corrected distances:

1. Measure the slope angle of landmark *A* in direction of point *B* with the help of a clinometer (or other slope measuring device); it is important to make sure that the measurement is taken along a parallel observation line to the average slope of the ground. The instrument must be located at the same height level of the target.

2. When the slope angle has been determined, find out the corrected distance d1 which corresponds to the desired horizontal distance, by using the slope correction table (see Table 13).
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.

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.

Table 13. Slope correction table

Slope	Degree	Factor	Horizontal distances										Slope
%	°	f_s	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.*

6.5 Rapid Visual Soil Assessment technique

The methodology is designed to provide a cheap repeatable quick and immediate means of land degradation monitoring and assessment (McGarry and Sharp, 2001). It identifies the constraints to agricultural production; particularly water and nutrients in any land use type and applies robust "key" indicators for the constraints. Is a simple low cost monitoring system for capturing conditions and trend, extent and ramifications of soil degradation and organic matter decline in the cropping grazing and wood lands.

This method has a simple presentation but scientifically acceptable assessment as compared to the conventional sets of soil physical measurements commonly used, e.g. bulk density, disc permeameters, etc. VS-Fast focuses on qualitative and quantitative aspects of soil physical conditions (soil structure units and porosity) as well as soil colour, root development, slaking and dispersion, organic matter status and organic infiltration.

ILUA

- **Soil surface condition**

This are important set of visible surface "clues" observed and recorded as one walks into a site. The indicators includes both negative and positive such as clods/rough soil surface, soil dispersion (white sand grains) on soil surfaces, water ponding on surface or in wheel tracks, hard setting surface or crust, poor crop growth in patches or strips, earth worm castes or burrows, standing (living) cover crops/plants.

- **Soil depth**

Using a measuring tape ruler or stick graduated in centimetres assess and measure the location of any visible soil layers in terms of colour, soil structure, root density, etc.

- **Soil texture**

Refers to the relative proportions of sand, silt and clay size particles in a sample of soil. Soil texture has important effects on soil water holding capacity, aeration and porosity conductivity compaction potential and resistance to root penetration, nutrient holding capacity and resistance to acidification.

The texture can be determined by taking one or two table spoonfuls of soil in one hand and adding water drop by drop to the soil as it is being worked in the hand until a sticky consistence is reached (moody in press). The soil is then rolled into a ball and texture determined.

ILUA

- **Soil structural condition**

Is the shape that the soil takes based on his physical and chemical properties. Each individual unit of soil structure is called a ped. Soil structure determines the development of root systems into the soil. The root system actively demonstrates current soil conditions. Absence of fine root hairs or abundance of strong primary roots shows difficulties experienced by the fine root penetrating the soils, evidence of squashed roots between strong soil units demonstrates the inability to penetrate into this units.

Dig out a block of soil with vegetation being left intact on the block. Take the block of an undisturbed soil sample into your hand. Apply the "drop shatter" test (Shepherd, 2000). In this a spadeful of soil is dropped three times from a uniform height either onto a plastic sheet or into a rectangular shaped "washing up" basin. If the soil does not completely shatter into individual units, then gentle hand manipulation is used to break the soil along natural breakage lines. Once the soil is broken into individual aggregates this are sorted such that the smallest are placed at the top and the coarsest at the bottom. Degraded soil tends to have more coarse structures units than well structure soils.

- **Soil porosity**

This can be easily observed from the soil block. Attributes to be considered includes the degree of soil macro pores, compaction or clod aggregates of the soil under observation.

- **Soil colour**

This provides many important soil properties of the soil e.g. the source material, climatic and human factors (i.e. soil water and organic matter status of the soil) that have altered the original rocks and sediments to give the current soil condition.

Generally, bright colours, and reds and oranges in particular, show good soil aeration and drainage (the iron in the soil is in the ferrous state). Dull and grey colours shows reduce aeration and a tendency for low-oxygen status and waterlogging. The darker the soil is the greater organic matter content. Also the darker the soil is the greater the organic matter content.

- **Soil drainage**

This is an important visible surface clue commonly observed and recorded as one walks at the site. Observation and record of the incidences of waterlogging on the soil surface are recorded.

One either observes incidences of waterlogging on the soil surface and/or observes the soil (mottles orange, grey, etc.) colour mainly from the soil block obtained during soil structural test.

ILUA

- **Tillage pan**

Tillage pans are located and described by comparing the lower and upper parts of the excavated spadeful of soil. The methodology records and scores the presence/degree of a tillage pan, recognising it as both an important negative indicator of soil condition as well as being symptomatic of non sustainable land management practices.

The top layers of the soil (15-20 cms depth) are mechanically loosened but the layer immediately beneath is consolidated (compacted) from the downwards pressures of the metal implement. Well developed tillage pans impede the movement of water, air and plant roots through the soil (Shepherd, 2000). The cumulative effects include increased risk of water logging (as water tends to lie on top of the compacted pan) and erosion (as the loosened top soil can be readily detached from the compacted sub soil) as well as yield reductions and crop losses (through shallow and “right angle” root systems, less able to survive dry periods).

- **Soil pH**

It measures the molar activity (concentration) of hydrogen ions in the soil solution (Moody in press). At pH values less than 7 the soil is acidic whereas at pH values greater than 7 the soil is alkaline.

Take a small amount of soil from the centre of a layer of interest. Crumb it up and place onto a white tile or a piece of flat plastic. Add the universal indicator (the black purple liquid) and then mix the soil and the indicator. Add enough of the liquid to thoroughly moisten the soil without flooding.

Allow the mixture to settle for about two minutes and the using the "puffer" bottle gently puff a fine layer of barium sulphate powder over the mix a colour will develop in the powder match this colour with the closest match on the test kit colour chart.

ILUA

- **Soil infiltration measurement (optional)**

Infiltration is measured four times on each SU, one time per plot, on the first Measurement Point. Infiltration measurement will need 12 inch (30 cm) diameter infiltration rings and approximately 25 litres per SU of water per ring. It will be recorded on **form F4 part A**). The soil infiltration measurements will be the most time consuming aspect of the soil field measurements, therefore this should be set as soon as possible.

1. The infiltration ring should be placed at the first measurement point located in the RSP. The ring should be driven at least 2 centimetres into the soil with a sledge hammer. This is to ensure that the ring does not leak. Remove any vegetation, litter and large stones inside the ring but do not disturb the soil surface by digging out large stones or uprooting vegetation. If the soil surface is accidentally disturbed reset the ring at another location.
2. Pre wet the soil with 2 to 3 litres of water. Let the water soak in for between 15 to 20 minutes then slowly pour water into the ring to a level of 20 centimetres.
3. The infiltration rate at the beginning of the test will be quite variable therefore for the first half hour of the test record at one to five minutes interval.
4. After each record top up the water level to 20 centimetres after the first half hour record at 10 to 20 minutes interval for an additional 2 and a half hours or the infiltration rate has stabilized. Top up the water level to 20 centimetres after each reading.

6.6 Instructions for using a random numbers table

Determine how many digits you need your random number to be, based on the total number of households. For instance, if you have 123 households you will need three digits, if you have 9 households, you need two digits.

With your eyes closed, use a pointed object, such as a pen or pencil, to touch the random numbers table. Your starting point is the digit closest to the point where you touched the table.

Reading to the right, read the number of digits required. Numbers that are not within the range needed (more than the total number of households) are discarded. Continue reading the numbers in the chosen direction until a random number within the range has been selected.

6.7 Interviewing and group-discussions techniques

6.7.1 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.
    - Go over the topics and sub-topics and prepare 'helper questions' to be explored.
    - Each team member, who interviews, carries out the interview/visual tool following one's own line of questioning and reasoning.
- **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 resource users on how they are using and benefiting from their local resources.
- **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 right to end an interview. The so called unscheduled interviews are also important. They may take the form as informal dialogue with people that are met when walking in the field, buying drinks in the local shop, etc.
- **The number of** interviewers in each household must be as few (i.e. two persons) where possible to avoid giving the impression that the outsiders dominate the process.
- **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. When using an interpreter it is important to use simple language, and ensure that there is a good mutual understanding about procedures and what information is needed to be obtained. It must be remember that the role of the interpreter is to interpret, not to interview. Asking the same question in different ways (a form for cross-checking) is a way to check that communication is working. Other hints suggested are: have the translator sit behind you, maintain eye-contact with the respondent, even though you do not understand what exactly is being said. Often it is important, to take your time, making sure that you understand what was being said and what this means, and that the interpreter understands what you mean. Interviewing with translators is, of necessity even slower, more difficult and more sensitive process than if in original language.

- There are different opinions on **taking notes and filling out field forms or questionnaires in front of the respondents**. In semi-structured interviews many argue that one should never pull up an official-looking questionnaire form. And it is often recommended not to take note until rapport has been built (ask permission) as people are often reluctant to talk freely if notes are taken. If you take notes explain clearly for what use they are, and after an interview sum up what you have written. Doing visual exercises, such as RRA1 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 that yes-or-no-answers. Ask, for example, "where do you collect fuelwood?" Rather than, "do you cut fuel wood from the government forest?"(IUCN, 1998). To relate it to the sample site, follow up with "Do you also collect in this part of the forest" (pointing on a map at the sample site).

- **Probing and the use of non-leading 'helper questions':** Probing is an art that is learned through careful practise and means delving into a subject. Often topics are not easily comprehended at first; thus several questions around a sub-topic might be useful to ensure understanding (both yours and the participants'). Use such non-leading helper questions as: "Who?" "What?" "Where?" "When?" "Why?" "How?" "How many?" "How often?" And so forth. What are the implications, aims, intent, significance, or explanations of something? Ask yourself frequently – are you on the right track? (Messerschmidt, 1995). But it is also important to bear in mind that we do not need more information than the objectives have set out.

[1] [1] For this study, the participatory techniques are referred to as Rapid Rural Appraisal (RRA) as it involves field workers learning from local people according to the field workers' agenda (IUCN, 1998). RRA uses a variety of tools and techniques to gather information. All its tools are designed to promote the participation of local people in both the collection and the analysis of the information. The tools approach facilitates questioning from different angles. Some are particularly helpful in addressing spatial issues, some gather more temporal information, and others help local people to analyse their situation by ranking issues or problems (Freudenberger, K, 1995).

- **Sampling unit 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 nwfp'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 behavior or attitudes (Molnar, 1989).

- **A common mistake in interview situations is to promise respondents** that they will achieve tangible profits from co-operation. Never promise anything that cannot come true. As a general rule, explain that the best effort you can make is to relay a true picture of the situation that you encounter during the study. The field teams' task is to let the outside world know about local uses and importance of forest or other natural resources, and at best the decision-makers will be better informed about the issues of land resources.

6.7.2 Tool: stakeholder identification and analysis (Venn diagram)

This exercise identifies and provided information about the different resource user groups that can be important to schedule and plan interview with.

1. Organize a meeting with the local people (those who live close to the sampling unit, women, men, and maybe some key informants as well), and explain to them the objectives of the interview. During this brainstorming session, the group may be encouraged to work with the help of a flipchart or a similar tool.

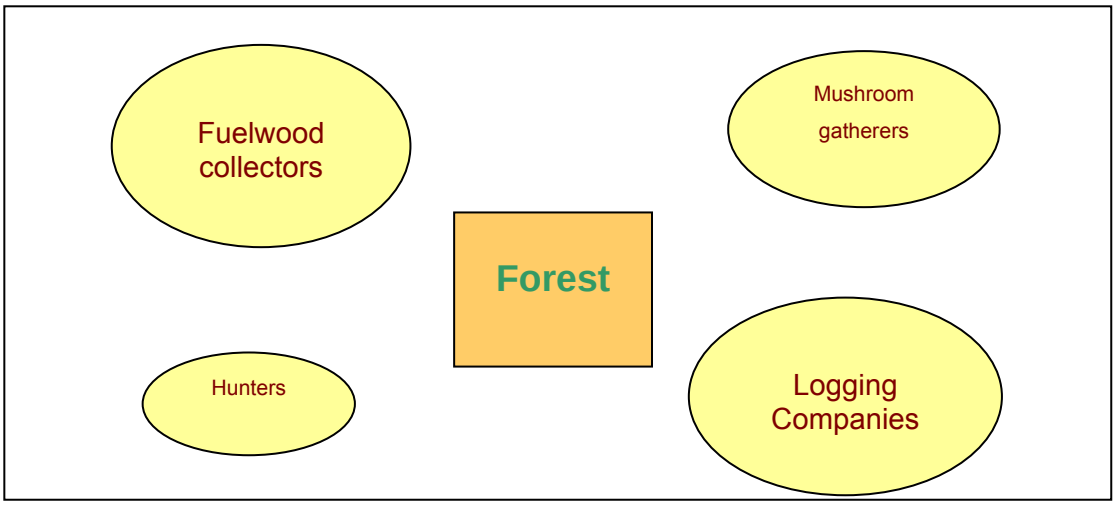
2. List the users or groups of people, institutions who have an interest in the forest. Ensure that external stakeholders (those not physically represented, such as logging or pharmaceutical companies) are mentioned. Can large groups of stakeholders be divided into smaller groups? Are there certain groups who depend more on forest than others, or groups that use the forest more frequently?

3. Rank the groups, organizations, institutions and individuals.

4. Draw the sampling site in the shape of a box (for example), at the center of the paper sheet or flip chart. Explain that each stakeholder group should be represented as a circle. The size of the circle represents how big their interests to the forest are: if their interests are large, intermediate or small draw respectively a big, medium or small circle.

5. Arrange the stakeholders circles in or around the sampling site square, to show the link existing between them and the sampling site under analysis. Discuss the rights that different stakeholders have on the products and what products and services they are interested in.

Figure 35. Example of Venn diagram



6.7.3 Tool: Participatory analysis of aerial photographs and maps

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).

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.

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 the context of the NFI 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.

6.7.4 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 favored. 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):

- Triangulation of the perspectives on the field team by having at least three people with different points of view (women/men, social scientist/technical specialist, insiders/outsiders, youth/elders, etc.).

- 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.).

- 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.

6.7.5 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.

6.7.6 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 across contour lines with 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 context of the

National Assessment, it is useful to go to the centre of the sample site (SU), or sometimes better, to a high point in the SU 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:

- 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 field team a chance to show what they are doing, and also a chance to clarify queries after observations from the field measurements.

6.7.7 Tool: Identifying the products, services and their use

This exercise may be carried out with different focus groups to collect data on the products, services and their use for the different land use class in the plot. Gender issues should be considered and it may be more reliable to organize focus groups by groups of men and women separately, at least when discussing preference and importance of the products and services.

Steps and recommendations of the exercise are described below:

1. Make a list of the Land use/cover classes (if necessary). It is important to clarify with the users whether the different land use/cover means that they collect different products.
2. Ask which are the products and services used in the Land use/cover: "*Here, where we are standing* (if in the SU) – *or in this area on the aerial photograph/map* (point it), *what are the products that your family (/you/the village) extract?", "What is the local name?" "What do you use the product for?"*
3. Let the focus group brainstorm on 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. If different types of forest have been identified, *"Do different forest products belong to specific forest type?"*
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.
6. If possible, an attempt must be done to find the species in the field.

6.7.8 Examples of how to phrase questions

A. Questions to key informants

- **Background information on the sampling unit (form F1, section A):**

Administrative divisions (7-10): "*What are the names of the administrative unit/ province/ district/ sublocation/ village and the local name of the area?"*

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

- Population on SU (21): *"How many people live in this area?"* (The area refers to the SU).
- Year of settlement (22): *"How long (from what year) have people lived here?"*
- Population dynamics (23): *"Have most people in the area been living here for the past 5 years?" or "Have you seen a lot of changes during the last 5 years of people coming or going?" If there have been changes "Why?"*
- Main activity (24): *"How would you describe the livelihood of the majority of the people living in the area surrounding the SU?"* 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 SU (form F1, section C):**

Distance to the permanent road, seasonal road, inhabited area, school, market, hospital (26-31): "*What is the distance from the SU to the closest permanent road, etc.?"*

- **General information on the land use/cover section (form F5, section A):**

  - Designation/protection status (82): "*What is the legal designation of the forest? Is it a gazetted forest, a community [communal] Forest, a village forest, National Park, etc.?"*
  - Ownership (83): *"Who is the legal owner of the land (forest) in the sample area? Is it public, is it private" If private "Do people have land titles?"* But it is not recommended to ask directly questions about ownership, especially in areas where it is known that persons are mostly squatters.

- **Other variables**

Key informants may also have an opinion on variables asked to the focus groups, such as: most important resource 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.

- Legislation and incentives awareness (101e and 101g): *"Are there any laws/ incentives concerning this product/service? If yes, which one?" "Are the local people aware of this legislation?"*
- Compliance (101f): *"Is the legislation concerning this product/activity respected?"*
- Application to forestry incentive (101h): *"Have the people applied for incentives concerning this product/service?*

Information that will help identifying important user groups. This information will help select individuals and focus groups to be interview.

B. Questions to focus groups and individuals

- **Land resources uses and products and services (form F6):**

  - Products and services category (99): *"What products do you collect in this part of the land/forest?"*
  - P/S Rank (99a)/ Species Rank (111a): "*Of all the products that have been identified, for your household/village/group, what is the most important product that is obtained/produced?"*
  - Harvester / User (101): "*Who are the persons that harvest or use the product/ practise this activity?*
  - Gender balance (101c)/Children (101d): "*Do the women harvest the product? Are the harvesters mainly women? "Do the children participate in harvesting the product?"*
  - End-use (102): "*Do you sell this product?" if yes, "to whom?"*

- 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 harvest it, is it because you are also the owner?" "Are the harvesting rights by tradition or are they legal?"*
- User conflicts (104): *"Related to the product that we have been discussing, do you feel that there exist any disagreements, either with other local people or with externals, about harvesting or using this product?"*
- Demand trend (105): *"Do you need more of this product?" or "Is the quantity you extract nowadays enough to satisfy your need?"*
- Last activity/extraction (108*): "When did you last collect this product?" "How often do you harvest this product/practise this activity?"*
- Trend (109*): "Did you (or your family) harvest as much of this product today as 5 years ago?"*
- Change reason (110): if there has been any change in the quantity produced/ extracted/ frequency of activity, *"Why is it so?"*

• Questions related to the SU (form F1, section C) may also be asked to the focused groups, when analysing the maps, especially:

- Population dynamics (23): *"5 years ago, 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?"*
- Settlement history (25): *"What are the main historic events that you remember from this area, such as for example, conflicts, change of land tenure, natural disasters etc."*

• Other questions related to the LUCS (form F5), which also may be asked or cross checked with observations or information provided by external key informant:

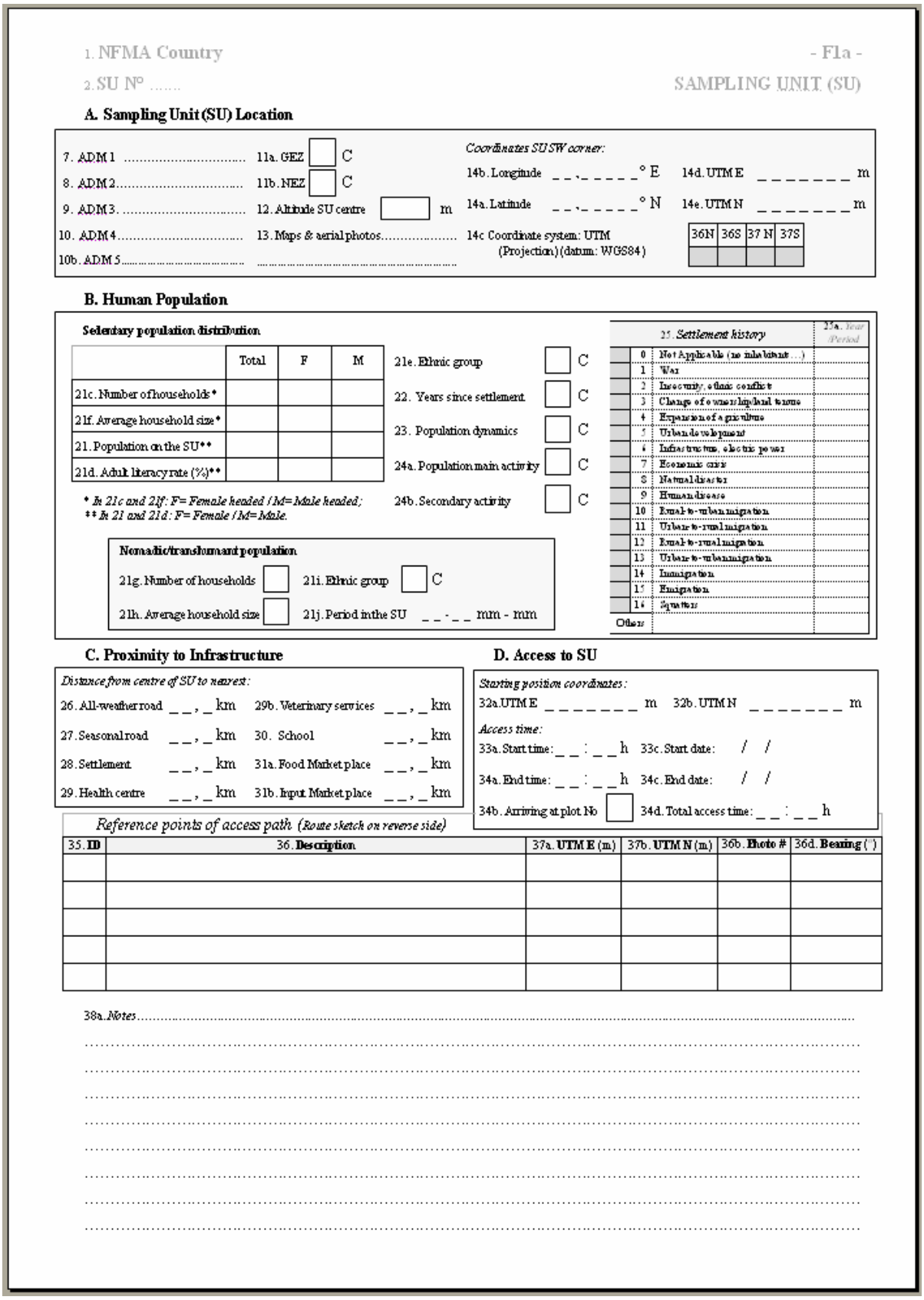
- Environmental problems (84): "W*hat is the most important [ecological] problem in forest around in the area where you live? How does it affect the land? Have you seen any changes that are affecting your day to day life? Change in yield?"*

6.8 IUCN protected area management 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.

6.9 Field forms

Figure 36. Field form F1a – Sampling Unit (front side)



1. NFMA Country — - F1a -

2. SU N° ..... — SAMPLING UNIT (SU)

A. Sampling Unit (SU) Location

7. ADM 1 ..... 11a. GEZ ☐ C
8. ADM 2 ..... 11b. NEZ ☐ C
9. ADM 3 ..... 12. Altitude SU centre ☐ m
10. ADM 4 ..... 13. Maps & aerial photos .....
10b. ADM 5 .....

Coordinates SU SW corner:

14b. Longitude _ _ . _ _ _ _ _ ° E
14a. Latitude _ _ . _ _ _ _ _ ° N
14c Coordinate system: UTM (Projection) (datum: WGS84)

36N	36S	37 N	37S

14d. UTM E _ _ _ _ _ _ _ m
14e. UTM N _ _ _ _ _ _ _ m

B. Human Population

Sedentary population distribution

	Total	F	M
21c. Number of households *			
21f. Average household size *			
21. Population on the SU**			
21d. Adult literacy rate (%)**			

* *In 21c and 21f: F= Female headed / M= Male headed;*
** *In 21 and 21d: F= Female / M= Male.*

21e. Ethnic group ☐ C
22. Years since settlement ☐ C
23. Population dynamics ☐ C
24a. Population main activity ☐ C
24b. Secondary activity ☐ C

Nomadic/transhumant population

21g. Number of households ☐ 21i. Ethnic group ☐ C
21h. Average household size ☐ 21j. Period in the SU _ _ - _ _ mm - mm

25. *Settlement history*		25a. *Year / Period*
0	Not Applicable (no inhabitant ...)	
1	War	
2	Insecurity, ethnic conflicts	
3	Change of ownership/land tenure	
4	Expansion of agriculture	
5	Urban development	
6	Infrastructure, electric power	
7	Economic crisis	
8	Natural disaster	
9	Human disease	
10	Rural-to-urban migration	
11	Urban-to-rural migration	
12	Rural-to-rural migration	
13	Urban-to-urban migration	
14	Immigration	
15	Emigration	
16	Squatters	
Other:		

C. Proximity to Infrastructure

Distance from centre of SU to nearest:

26. All-weather road _ _ , _ km
27. Seasonal road _ _ , _ km
28. Settlement _ _ , _ km
29. Health centre _ _ , _ km
29b. Veterinary services _ _ , _ km
30. School _ _ , _ km
31a. Food Market place _ _ , _ km
31b. Input Market place _ _ , _ km

D. Access to SU

Starting position coordinates:

32a. UTM E _ _ _ _ _ _ _ m
32b. UTM N _ _ _ _ _ _ _ m

Access time:

33a. Start time: _ _ : _ _ h
33c. Start date: / /
34a. End time: _ _ : _ _ h
34c. End date: / /
34b. Arriving at plot No ☐
34d. Total access time: _ _ : _ _ h

Reference points of access path (Route sketch on reverse side)

35. **ID**	36. **Description**	37a. **UTM E** (m)	37b. **UTM N** (m)	36b. **Photo #**	36d. **Bearing** (°)

38a. *Notes* .....

Figure 37. Field form F1a – Sampling Unit (reverse side)

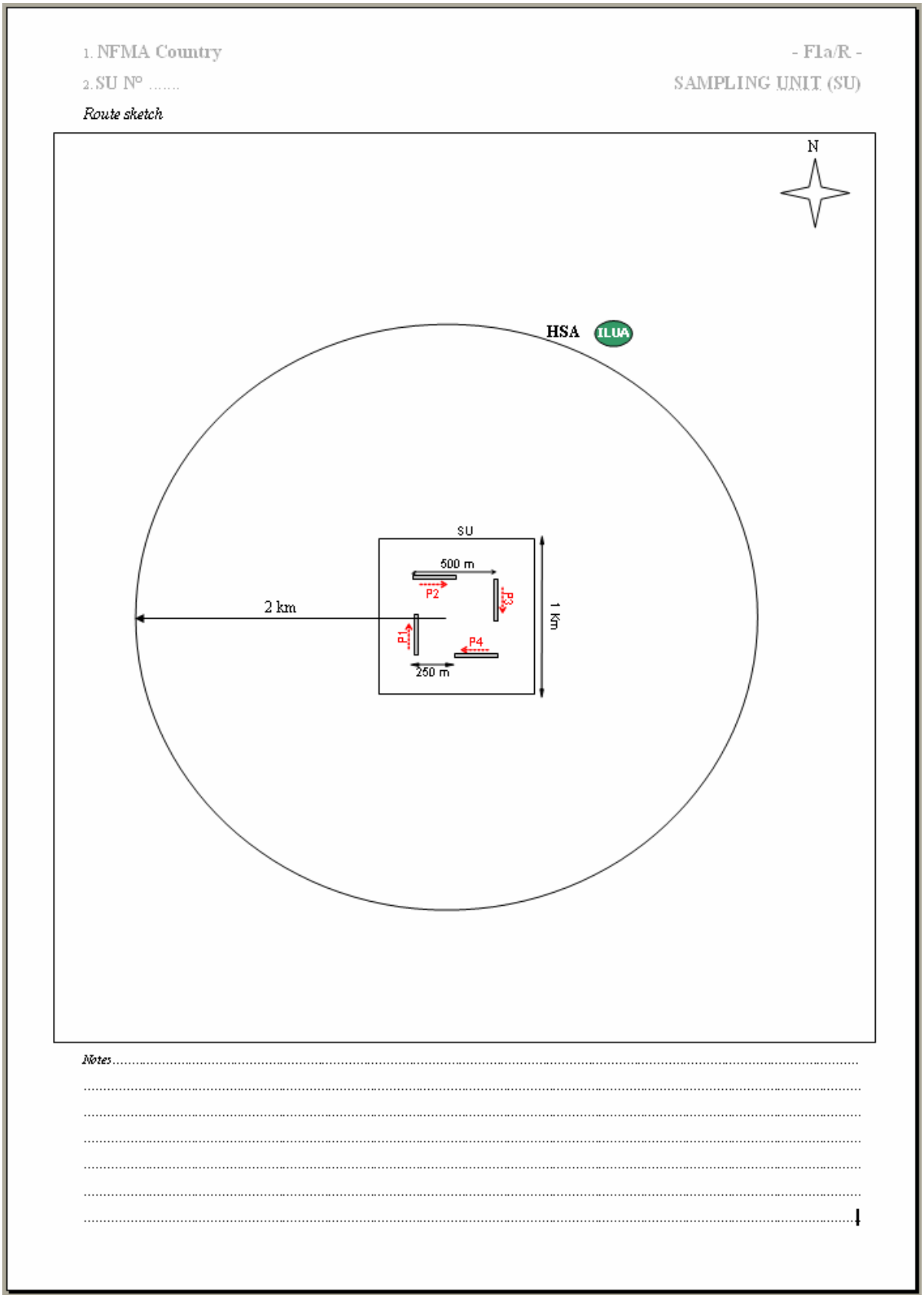


Figure 38. Field form F1b – Sampling Unit

1. NFMA Country — F1b -

2. SU N° ……

SU –PERSONS INVOLVED IN THE ASSESSMENT

P…/…

E. Team/Owner/Informant list

15. Name	16. Address	16b. Title / Function	17. Phonenumber	18a. Team leader	18b. Team member	19. Owner	20. Informant*					
							O	E	M	S	I	X

**Code indicates the informant's relation to the area, i.e. O = Estate Owner, E = Employee, M = Manager of site, S = Settler, I = Internal key informant; X = External key informant*

38b. *Notes:* ……………………………………………………………………………………………………

……

……

……

ILUA

Figure 39. Field form F1c – SU - Household selection (front side)

1. NFMA Country

2. SU N° ……

ILUA - F1c -

SU – HOUSEHOLD SELECTION

P…./….

F. Household selection for household survey in HSA (2 km radius circle of SU centre)

201b. Total household number in HSA (THSD) [ ]

201c. Sampling interval (=THSD/16) [ ] (Case A: Only if TSHD ≤ 80, otherwise see case B on reverse side)

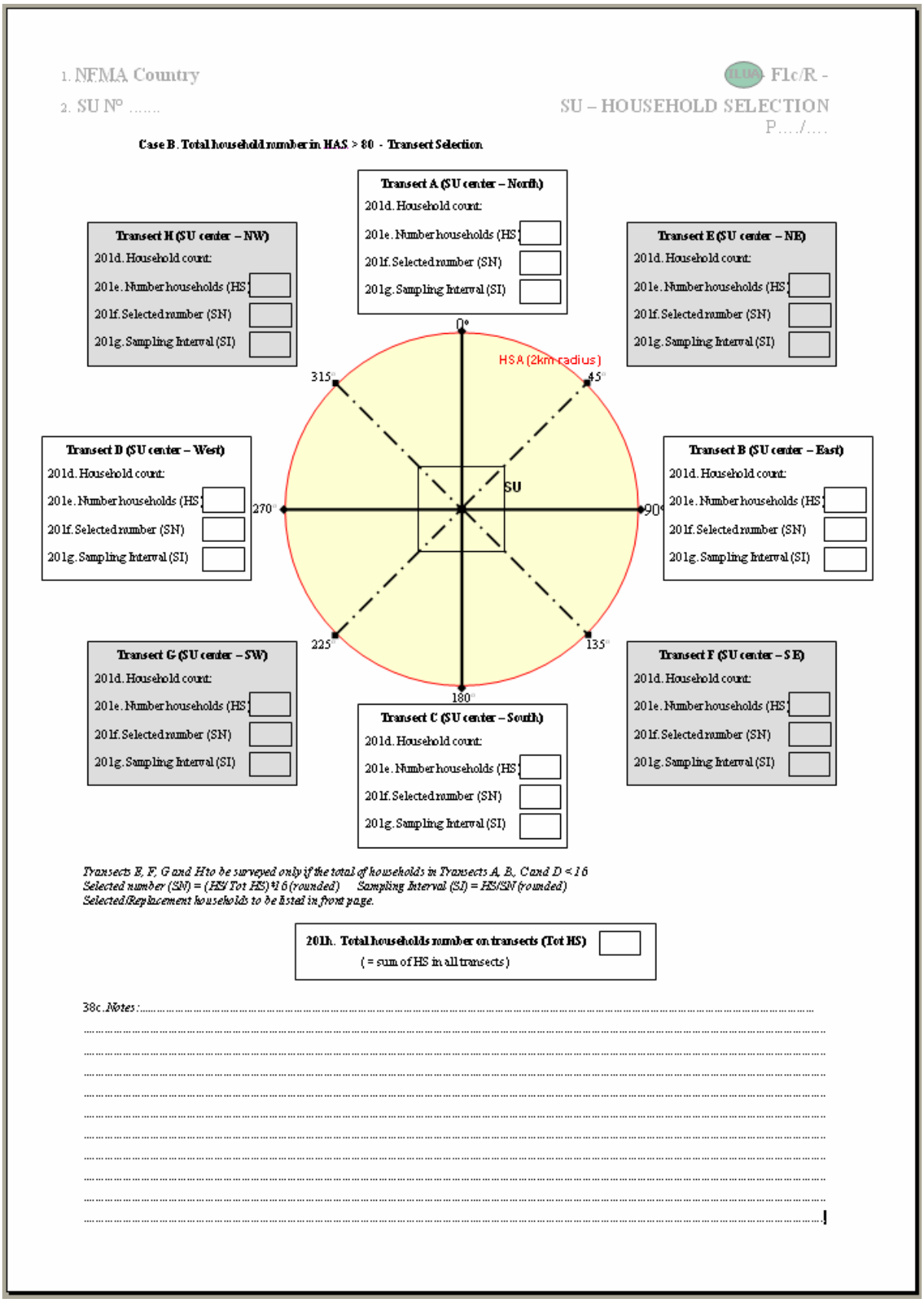
List of households within the HSA:

All households in case A (TSHD in HSA ≤ 80) or only selected/replacement household in case B (TSHD > 80)

195. No	196. Name of household head[1]	197a. UTM E	197b. UTM N	201a. Selected household S/R	199. Interview status C	195. No	196. Name of household head[1]	197a. UTM E	197b. UTM N	201a. Selected household S/R	199. Interview status C

[1] In Case A, ensure that all households are listed (updated list), including female headed and nomadic/transhumant households.

Figure 40. Field form F1c – SU - Household selection (reverse side)



1. NFMA Country

2. SU Nº .....

F1c/R -

SU – HOUSEHOLD SELECTION

P..../....

Case B. Total household number in HAS > 80 - Transect Selection

Transect A (SU center – North)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transect H (SU center – NW)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transect E (SU center – NE)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transect D (SU center – West)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transect B (SU center – East)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transect G (SU center – SW)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transect F (SU center – SE)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transect C (SU center – South)
201d. Household count:
201e. Number households (HS)
201f. Selected number (SN)
201g. Sampling Interval (SI)

Transects E, F, G and H to be surveyed only if the total of households in Transects A, B, C and D < 16
*Selected number (SN) = (HS/Tot HS)*16 (rounded) Sampling Interval (SI) = HS/SN (rounded)*
Selected/Replacement households to be listed in front page.

201h. Total households number on transects (Tot HS)
(= sum of HS in all transects)

38c. *Notes*:

Figure 41. Field form F1d – SU – Water

1. NFMA Country

2. SU N° .....

- F1d -

SU - - WATER

G. Water and Catchment Conditions

G1. Catchment Conditions

500a. Season ☐ W/D

500b. Date of last rain __/__/__(dd/mm/yy

501. Land degradation/ erosion ☐ C

502. SU flooded ☐ Y/N

525a. Note (Catchment conditions).....

G2. Water Points Use

503. Water point type		Number of water points: 504. Total number[1]	505a. In-use during dry season	505b. In-use during wet season	506. Abandoned
1	Natural water course (springs, rivers, streams)				
2	Lake				
3	Ponds				
4	Dam / reservoir				
5	Rock catchment				
6	Borehole				
7	Well				
8	Piped water				
Other:					

[1] Including abandoned (not used since more than 1 year)

507. Water Use		508. Pressure on water: 508a. Wet season C	508b. Dry season C
1	Human consumption		
2	Livestock		
3	Wildlife		
4	Water abstraction (irrigation)		
5	Industrial		
Other:			

Pressure trend

509a. Trends ☐ C

509b. Change reason ☐ C

Water legislation

530a. Awareness ☐

530b. Compliance ☐

G3. State of Water Resources

Surface Water Measurements (Rivers/ Streams, lakes, ponds, spring, rock catchment)

Measurement Point 1

510. Water point type ☐ C

511a. UTM E _ _ _ _ _ _ _ m

511b. UTM N _ _ _ _ _ _ _ m

512a. Width ☐ m 512b. Depth ☐ m

513a. Turbidity ☐ JTU 513b. pH ☐

513c. DO ☐ mg/l

514. Sources of contamination ☐ C[1]

515. Flow ☐ l/min

Measurement Point 2

510. Water point type ☐ C

511a. UTM E _ _ _ _ _ _ _ m

511b. UTM N _ _ _ _ _ _ _ m

512a. Width ☐ m 512b. Depth ☐ m

513a. Turbidity ☐ JTU 513b. pH ☐

513c. DO ☐ mg/l

514. Sources of contamination ☐ C[1]

515. Flow ☐ l/min

Boreholes / Wells

Measurement Point 3

520. Water point type: ☐ Well ☐ Borehole

511a. UTM E _ _ _ _ _ _ _ m

511b. UTM N _ _ _ _ _ _ _ m

513a. Turbidity ☐ NTU 513b. pH ☐

513c. DO ☐ mg/l

514. Source of contamination ☐ C

521. Ground water depth ☐ m

522. Number of people[1] ☐ 523. Number of animals[1] ☐

Measurement Point 4

520. Water point type: ☐ Well ☐ Borehole

511a. UTM E _ _ _ _ _ _ _ m

511b. UTM N _ _ _ _ _ _ _ m

513a. Turbidity ☐ NTU 513b. pH ☐

513c. DO ☐ mg/l

514. Source of contamination ☐ C

521. Ground water depth ☐ m

522. Number of people[1] ☐ 523. Number of animals[1] ☐

[1] Multiple choice [1] At pick watering time

Figure 42. Field form F2 – Plot

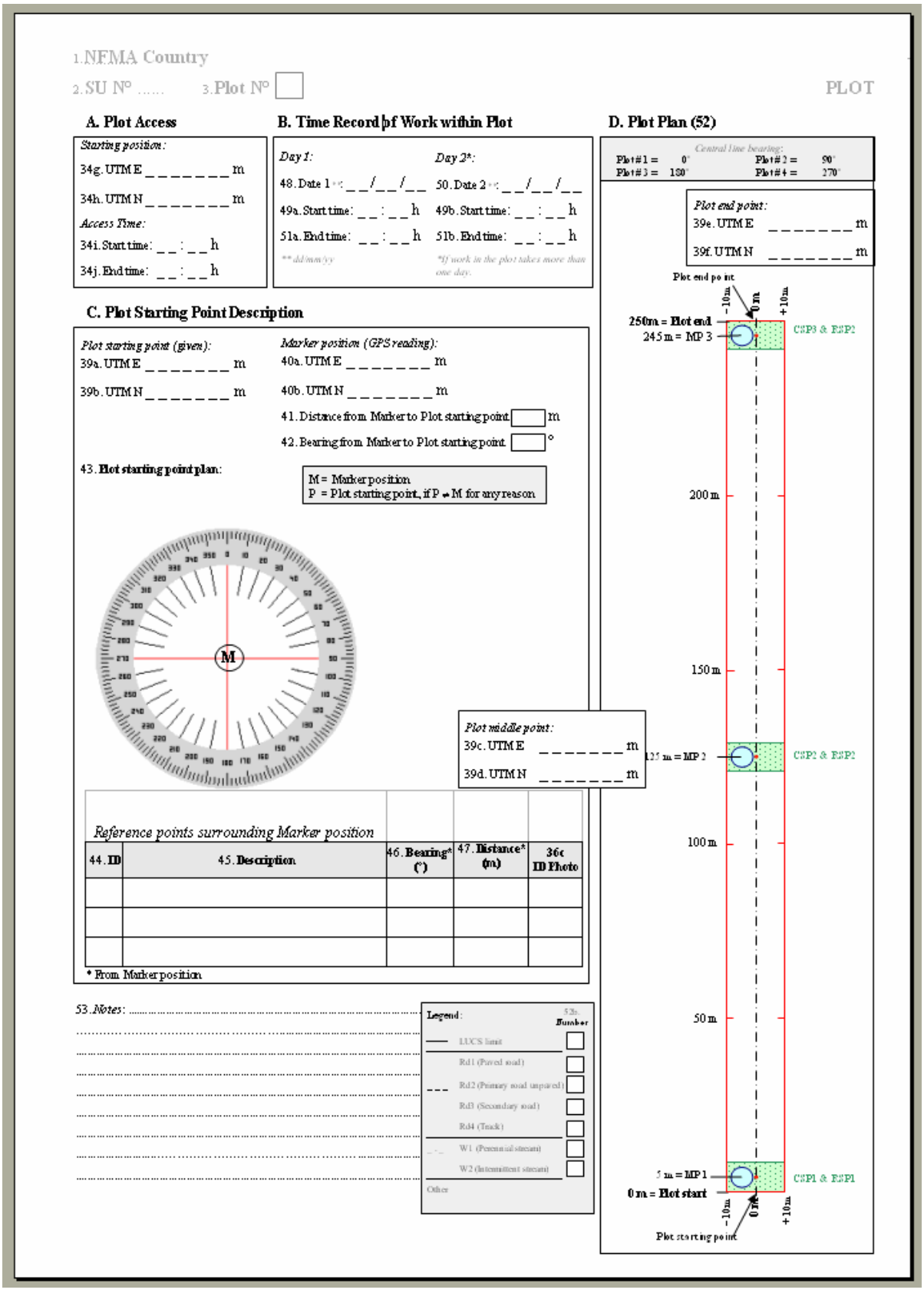


Figure 43. Field form F3a – Plot – Tree and stump measurements

1. NFMA Country - F3 -

2. SU N° …… 3. Plot N° ☐ PLOT – TREE AND STUMP MEASUREMENTS

P…./….

			56. *Species name*		57. *Tree/Stump location*									*Health*		
4a. **LUCS N°**	55. **Tree N°**	55b **Stump**	56a. **Common/local** (language)	56b. **Scientific**	57a. **Along plot axis**	57b **Left axis**	57c. **Right axis**	58. **Dbh**[1]	59. **Diameter height**[2]	60. **Year(s) since cut**	61. **Total height**	62. **Bole height**	63. **Stem quality**	64b. **Crown condition**	64. **Overall tree Condition**	65b **Causative agents**[3]
					m	m	m	cm	m	C	m	m	C	C	C	C

[1] Or Dsh if stump height < 1.3m [2] To be indicated if different from breast height (1.3 m) [3] Multiple choice

68. Notes: ……………………………………………………………………………………

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Figure 44. Field form F3b – Plot – Trees measurements (Branches)

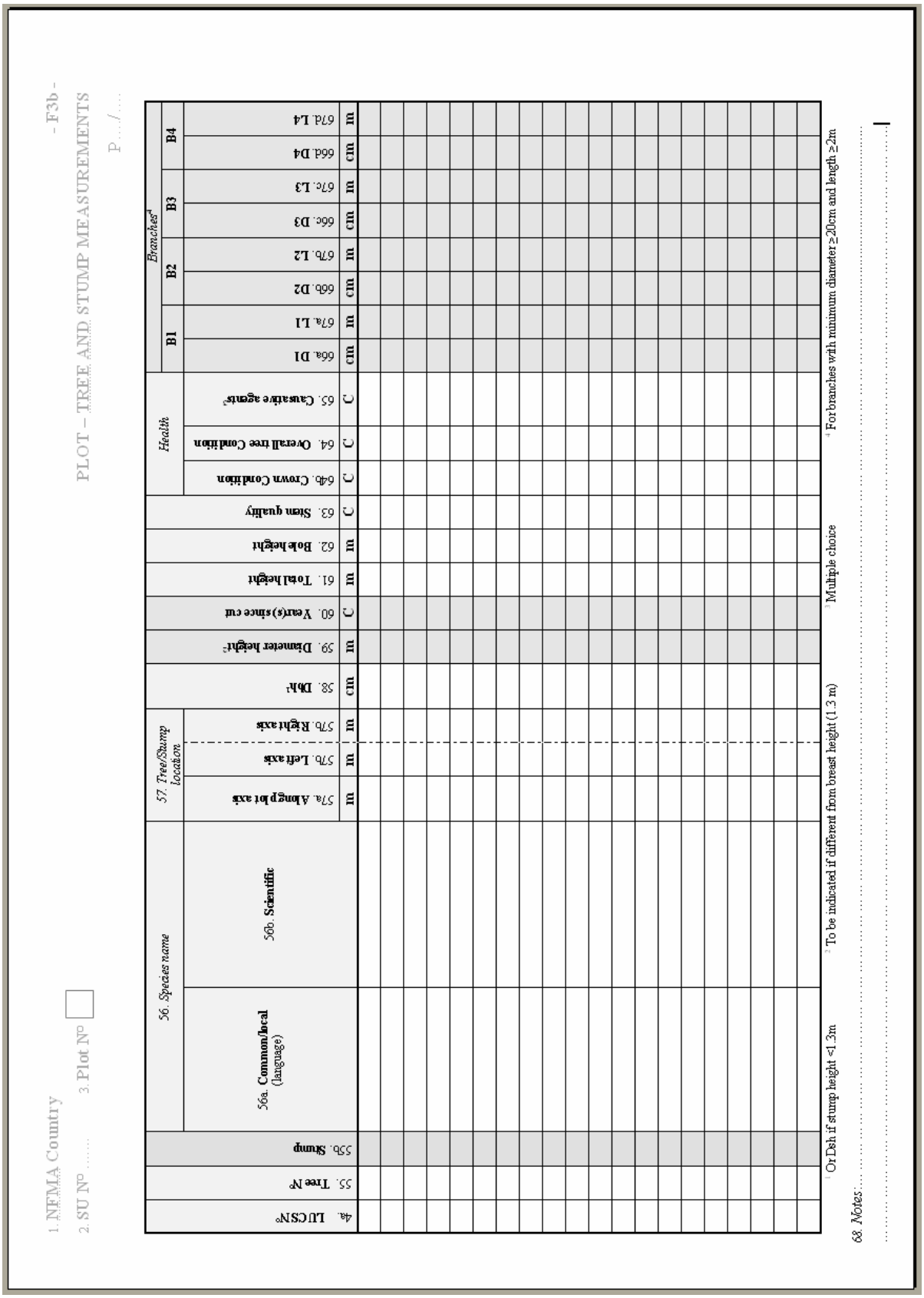
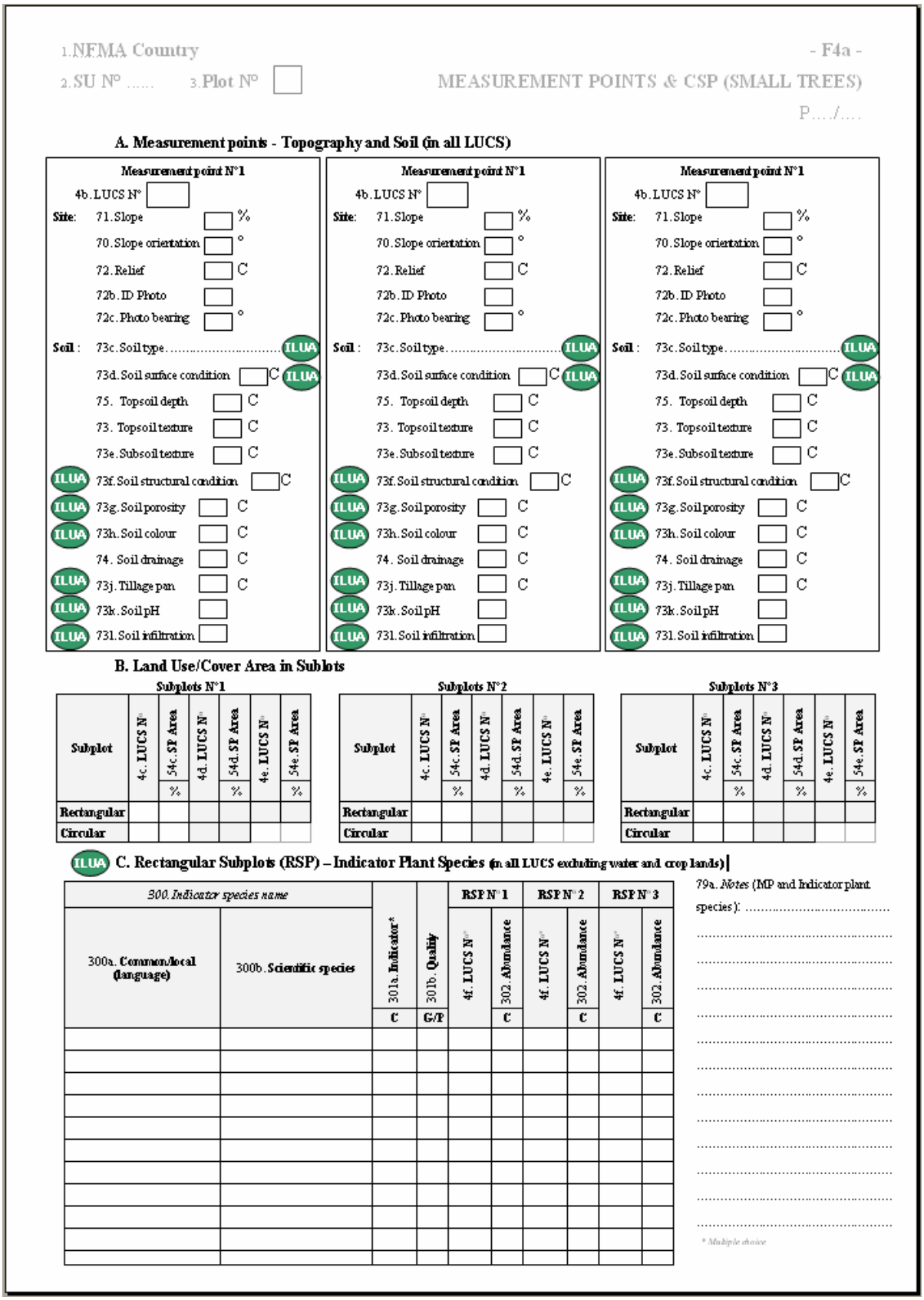


Figure 45. Field form F4 – Measurement Point and Circular Subplot (small trees)



1. NFMA Country — - F4a -

2. SU N° ..... 3. Plot N° ☐ — MEASUREMENT POINTS & CSP (SMALL TREES)

P..../....

A. Measurement points - Topography and Soil (in all LUCS)

Measurement point N°1	Measurement point N°1	Measurement point N°1
4b. LUCS N° ☐	4b. LUCS N° ☐	4b. LUCS N° ☐
Site: 71. Slope ☐ %	Site: 71. Slope ☐ %	Site: 71. Slope ☐ %
70. Slope orientation ☐ °	70. Slope orientation ☐ °	70. Slope orientation ☐ °
72. Relief ☐ C	72. Relief ☐ C	72. Relief ☐ C
72b. ID Photo ☐	72b. ID Photo ☐	72b. ID Photo ☐
72c. Photo bearing ☐ °	72c. Photo bearing ☐ °	72c. Photo bearing ☐ °
Soil: 73c. Soil type..... ILUA	Soil: 73c. Soil type..... ILUA	Soil: 73c. Soil type..... ILUA
73d. Soil surface condition ☐ C ILUA	73d. Soil surface condition ☐ C ILUA	73d. Soil surface condition ☐ C ILUA
75. Topsoil depth ☐ C	75. Topsoil depth ☐ C	75. Topsoil depth ☐ C
73. Topsoil texture ☐ C	73. Topsoil texture ☐ C	73. Topsoil texture ☐ C
73e. Subsoil texture ☐ C	73e. Subsoil texture ☐ C	73e. Subsoil texture ☐ C
ILUA 73f. Soil structural condition ☐ C	ILUA 73f. Soil structural condition ☐ C	ILUA 73f. Soil structural condition ☐ C
ILUA 73g. Soil porosity ☐ C	ILUA 73g. Soil porosity ☐ C	ILUA 73g. Soil porosity ☐ C
ILUA 73h. Soil colour ☐ C	ILUA 73h. Soil colour ☐ C	ILUA 73h. Soil colour ☐ C
74. Soil drainage ☐ C	74. Soil drainage ☐ C	74. Soil drainage ☐ C
ILUA 73j. Tillage pan ☐ C	ILUA 73j. Tillage pan ☐ C	ILUA 73j. Tillage pan ☐ C
ILUA 73k. Soil pH ☐	ILUA 73k. Soil pH ☐	ILUA 73k. Soil pH ☐
ILUA 73l. Soil infiltration ☐	ILUA 73l. Soil infiltration ☐	ILUA 73l. Soil infiltration ☐

B. Land Use/Cover Area in Sublots

Subplots N°1

Subplot	4c. LUCS N°	54c. SP Area %	4d. LUCS N°	54d. SP Area %	4e. LUCS N°	54e. SP Area %
Rectangular						
Circular						

Subplots N°2

Subplot	4c. LUCS N°	54c. SP Area %	4d. LUCS N°	54d. SP Area %	4e. LUCS N°	54e. SP Area %
Rectangular						
Circular						

Subplots N°3

Subplot	4c. LUCS N°	54c. SP Area %	4d. LUCS N°	54d. SP Area %	4e. LUCS N°	54e. SP Area %
Rectangular						
Circular						

ILUA C. Rectangular Subplots (RSP) – Indicator Plant Species (in all LUCS excluding water and crop lands)

300. Indicator species name				RSP N°1		RSP N°2		RSP N°3	
300a. Common/local (language)	300b. Scientific species	301a. Indicator* C	301b. Quality G/P	4f. LUCS N°	302. Abundance C	4f. LUCS N°	302. Abundance C	4f. LUCS N°	302. Abundance C

79a. *Notes* (IMP and Indicator plant species): .....

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* Multiple choice

Figure 46. Field form F4b –Subplots – Circular Subplots (indicator plants and small trees)

1. NFMA Country - F4b -

2. SU N° ..... 3. Plot N° SUBPLOTS–CSP (INDICATOR PLANTS & SMALL TREES)

P..../....

C. Rectangular Subplots (RSP) – Indicator plant species (in all LUCS excluding water and crop lands) (Ctd.)

300. Indicator species name				RSP N°1		RSP N°2		RSP N°3	
300a. **Common/local (language)**	300b. **Scientific species**	301a. **Indicator***	301b. **Quality**	4f. LUCS N°	302. Abundance	4f. LUCS N°	302. Abundance	4f. LUCS N°	302. Abundance
		C	G/P		C		C		C

79a. *Notes* (Indicator plant species): .....

* Multiple choice

D. Circular Subplots – Small trees measurements (0 cm < Dbh < 10 cm) (only in Forest and Woodlots LUCS)

77. *Species name*		CSP N°1			CSP N°2			CSP N°3		
77a. **Common/local** (language)	77b. **Scientific**	4g. LUCS N°	78a. **Counts**	78b. **Total**	4g. LUCS N°	78a. **Counts**	78b. **Total**	4g. LUCS N°	78a. **Counts**	78b. **Total**

79b. *Notes* (trees measurements in CSP): .....

.....

.....

Figure 47. Field form F4c –Subplots – Rectangular Subplots (Shrubs/Bushes)

1. NFMA Country - F4c -

2. SU N° ...... 3. Plot N° ☐ SUBPLOTS–RCP (SHRUBS/BUSHES)

P…./….

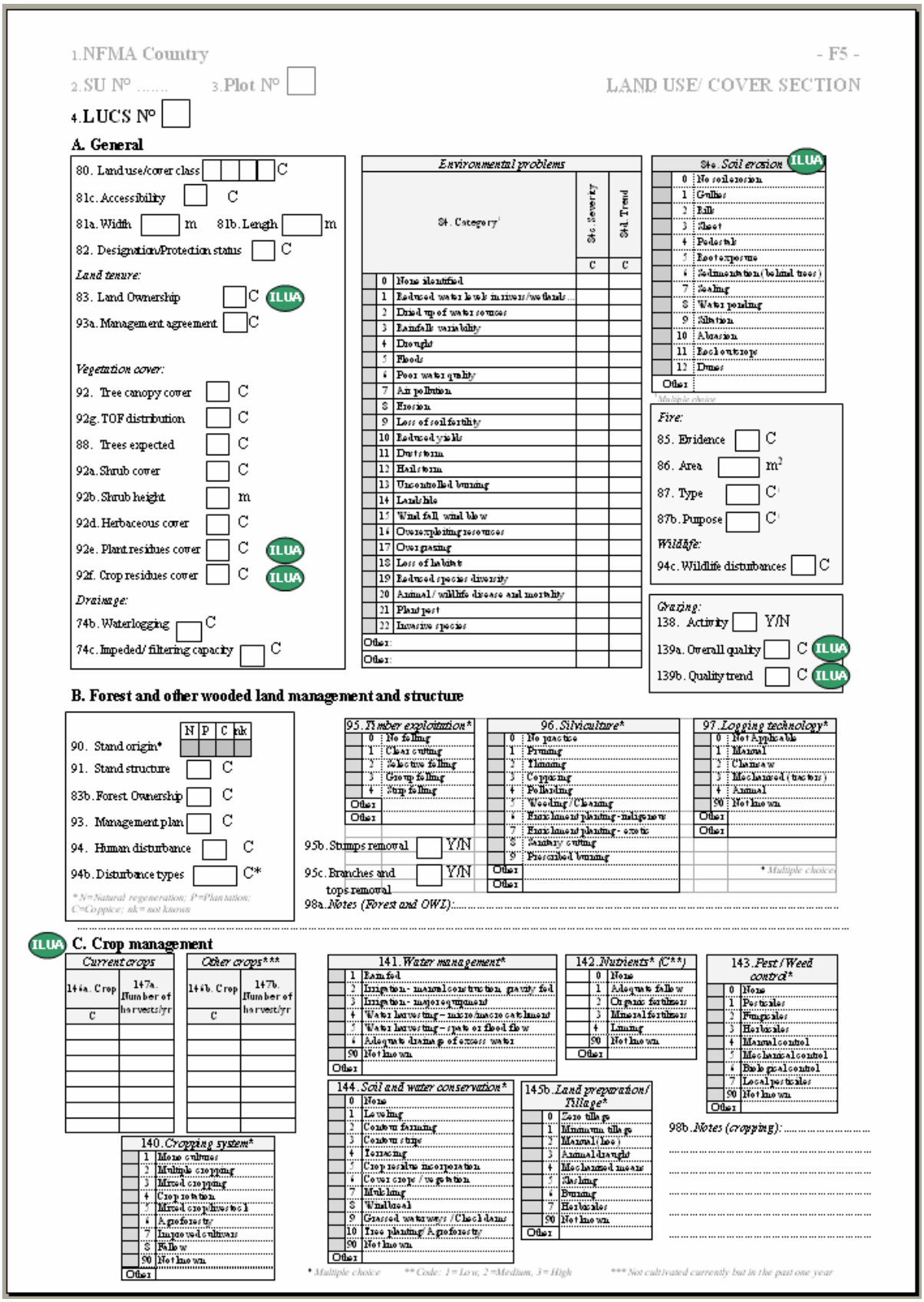
D. Rectangular Subplots (RSP) –Shrubs/bushes measurements (all LUCS)

6. RSP N°	4h. LUCS N°	56. *Species name* 56a. Common / local (language)	56. *Species name* 56b. Scientific	58b. No. of stems/unit	58. Average stem $D_{0.3}h$ (cm)	59. Diameter measurement height[1] (m)	61. Average height (m)

79c. *Notes* (shrubs/bushes): ....

[1] If different from 0.5m

Figure 48. Field form F5 –Land Use/Cover Section (LUCS)



1.NFMA Country — - F5 -

2.SU N° ..... 3.Plot N° — LAND USE/ COVER SECTION

4.LUCS N°

A. General

80. Land use/cover class C
81c. Accessibility C
81a. Width m 81b. Length m
82. Designation/Protection status C

Land tenure:
83. Land Ownership C ILUA
93a. Management agreement C

Vegetation cover:
92. Tree canopy cover C
92g. TOF distribution C
88. Trees expected C
92a. Shrub cover C
92b. Shrub height m
92d. Herbaceous cover C
92e. Plant residues cover C ILUA
92f. Crop residues cover C ILUA

Drainage:
74b. Waterlogging C
74c. Impeded/ filtering capacity C

Environmental problems

St. Category*	St. Severity C	St. Trend C
0 None identified		
1 Reduced water levels in rivers/wetlands...		
2 Dried up of water sources		
3 Rainfall variability		
4 Drought		
5 Floods		
6 Poor water quality		
7 Air pollution		
8 Erosion		
9 Loss of soil fertility		
10 Reduced yields		
11 Dust storm		
12 Hail storm		
13 Uncontrolled burning		
14 Landslide		
15 Wind fall, wind blow		
16 Overexploiting resources		
17 Overgrazing		
18 Loss of habitat		
19 Reduced species diversity		
20 Animal / wildlife disease and mortality		
21 Plant pest		
22 Invasive species		
Other:		
Other:		

St6. *Soil erosion* ILUA

0	No soil erosion
1	Gullies
2	Rills
3	Sheet
4	Pedestals
5	Root exposure
6	Sedimentation (behind trees)
7	Scaling
8	Water ponding
9	Siltation
10	Abrasion
11	Rock outcrops
12	Dunes
Other	

*Multiple choice

Fire:
85. Evidence C
86. Area m²
87. Type C*
87b. Purpose C*

Wildlife:
94c. Wildlife disturbances C

Grazing:
138. Activity Y/N
139a. Overall quality C ILUA
139b. Quality trend C ILUA

B. Forest and other wooded land management and structure

90. Stand origin* (N | P | C | nk)
91. Stand structure C
83b. Forest Ownership C
93. Management plan C
94. Human disturbance C
94b. Disturbance types C*

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

95. *Timber exploitation**

0	No felling
1	Clear cutting
2	Selective felling
3	Group felling
4	Strip felling
Other	
Other	

95b. Stumps removal Y/N
95c. Branches and tops removal Y/N

96. *Silviculture**

0	No practice
1	Pruning
2	Thinning
3	Coppicing
4	Pollarding
5	Weeding / Cleaning
6	Enrichment planting - indigenous
7	Enrichment planting - exotic
8	Sanitary cutting
9	Prescribed burning
Other	
Other	

97. *Logging technology**

0	Not Applicable
1	Manual
2	Chainsaw
3	Mechanised (tractor)
4	Animal
90	Not known
Other	
Other	

*Multiple choice

98a. *Notes (Forest and OWL)*:.....

ILUA **C. Crop management**

Current crops 144a. Crop C	147a. Number of harvests/yr

Other crops*** 146b. Crop C	147b. Number of harvests/yr

140. *Cropping system**

1	Mono cultures
2	Multiple cropping
3	Mixed cropping
4	Crop rotation
5	Mixed crop/livestock
6	Agroforestry
7	Improved cultivars
8	Fallow
90	Not known
Other	

141. *Water management**

1	Rainfed
2	Irrigation - manual/construction, gravity fed
3	Irrigation - motorised/pumped
4	Water harvesting - micro/macro catchment
5	Water harvesting - spate or flood flow
6	Adequate drainage of excess water
90	Not known
Other	

142. *Nutrients** (C**)*

0	None
1	Adequate fallow
2	Organic fertilizer
3	Mineral fertilizer
4	Liming
90	Not known
Other	

143. *Pest / Weed control**

0	None
1	Pesticides
2	Fungicides
3	Herbicides
4	Manual control
5	Mechanical control
6	Biological control
7	Local pesticides
90	Not known
Other	

144. *Soil and water conservation**

0	None
1	Levelling
2	Contour farming
3	Contour strips
4	Terracing
5	Crop residue incorporation
6	Cover crops / vegetation
7	Mulching
8	Wattle/soil
9	Grassed waterways / Check dams
10	Tree planting/ Agroforestry
90	Not known
Other	

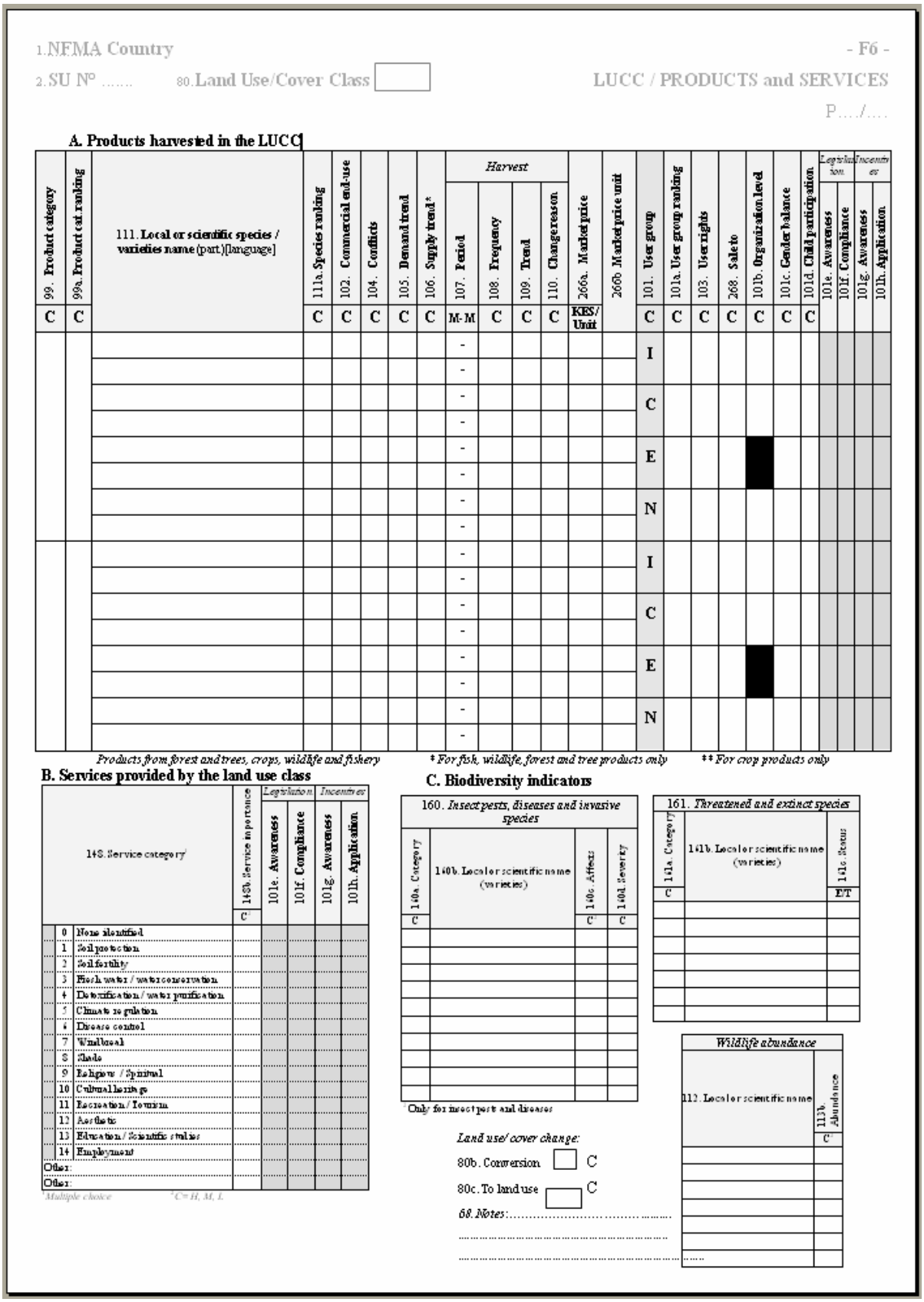
145b. *Land preparation / Tillage**

0	Zero tillage
1	Minimum tillage
2	Manual/hoe
3	Animal draught
4	Mechanised means
5	Ploughing
6	Harrowing
7	Herbicides
90	Not known
Other	

98b. *Notes (cropping)*:.....

* Multiple choice ** Code: 1 = Low, 2 = Medium, 3 = High *** Not cultivated currently but in the past one year

Figure 49. Field form F6 – Land Use/Cover Class - Products and Services



1. NFMA Country — - F6 -

2. SU N° ..... 80. Land Use/Cover Class [ ] — LUCC / PRODUCTS and SERVICES

P..../....

A. Products harvested in the LUCC

99. Product category	99a. Product cat. ranking	111. Local or scientific species / varieties name (part.)[language]	111a. Species ranking	102. Commercial end-use	104. Conflicts	105. Demand trend	106. Supply trend*	Harvest: 107. Period	Harvest: 108. Frequency	Harvest: 109. Trend	Harvest: 110. Change reason	266a. Market price	266b. Market price unit	101. User group	101a. User group ranking	103. User rights	268. Sale to	101b. Organization level	101c. Gender balance	101d. Child participation	Legislation: 101e. Awareness	Legislation: 101f. Compliance	Incentives: 101g. Awareness	Incentives: 101h. Application
C	C		C	C	C	C	C	M-M	C	C	C	KES/ Unit		C	C	C	C	C	C	C				
								-						I										
								-																
								-						C										
								-																
								-						E				[redacted]						
								-																
								-						N										
								-																
								-						I										
								-																
								-						C										
								-																
								-						E				[redacted]						
								-																
								-						N										
								-																

Products from forest and trees, crops, wildlife and fishery — * *For fish, wildlife, forest and tree products only* — ** *For crop products only*

B. Services provided by the land use class

148. Service category			148b. Service importance C*	Legislation: 101e. Awareness	Legislation: 101f. Compliance	Incentives: 101g. Awareness	Incentives: 101h. Application
	0	None identified					
	1	Soil protection					
	2	Soil fertility					
	3	Fresh water / water conservation					
	4	Detoxification / water purification					
	5	Climate regulation					
	6	Disease control					
	7	Wind/seal					
	8	Shade					
	9	Religious / Spiritual					
	10	Cultural heritage					
	11	Recreation / Tourism					
	12	Aesthetic					
	13	Education / Scientific studies					
	14	Employment					
Other:							
Other:							

*Multiple choice — *C = H, M, L

C. Biodiversity indicators

160. *Insect pests, diseases and invasive species*

140a. Category C*	140b. Local or scientific name (varieties)	140c. Affect C*	140d. Severity C

*Only for insect pest and disease

161. *Threatened and extinct species*

141a. Category C*	141b. Local or scientific name (varieties)	141c. Status ET

Wildlife abundance

112. Local or scientific name	113b. Abundance C*

Land use/ cover change:

80b. Conversion [ ] C

80c. To land use [ ] C

68. Notes: .....

.....

.....

Figure 50. Field form F6p – Land Use/Cover Class - Products and Services (Primary data sheet)

1. NFMA Country - F6b -

2. SU N° ……. 80. Land Use/Cover Class ☐ LUCC / PRODUCTS and SERVICES (Ctd)

P…./….

								Harvest													*Legislation*		*Incentives*	
99. **Product category**	99a. **Product cat. ranking**	111. **Local or scientific species / varieties name** (part)[language]	111a. **Species ranking**	102. **Commercial end-use**	104. **Conflicts**	105. **Demand trend**	106. **Supply trend***	107. **Period**	108. **Frequency**	109. **Trend**	110. **Change reason**	266a. **Market price**	266b. **Market price unit**	101. **User group**	101a. **User group ranking**	103. **User rights**	268. **Sale to**	101b. **Organization level**	101c. **Gender balance**	101d. **Child participation**	101e. **Awareness**	101f. **Compliance**	101g. **Awareness**	101h. **Application**
C	C		C	C	C	C	C	M-M	C	C	C	XXX/ Unit		C	C	C	C	C	C	C				
								-						I										
								-																
								-						C										
								-																
								-						E										
								-																
								-						N										
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								-																
								-						I										
								-																
								-						C										
								-																
								-						E										
								-																
								-						N										
								-																

68. Notes:……………………………………………………………………………………………………

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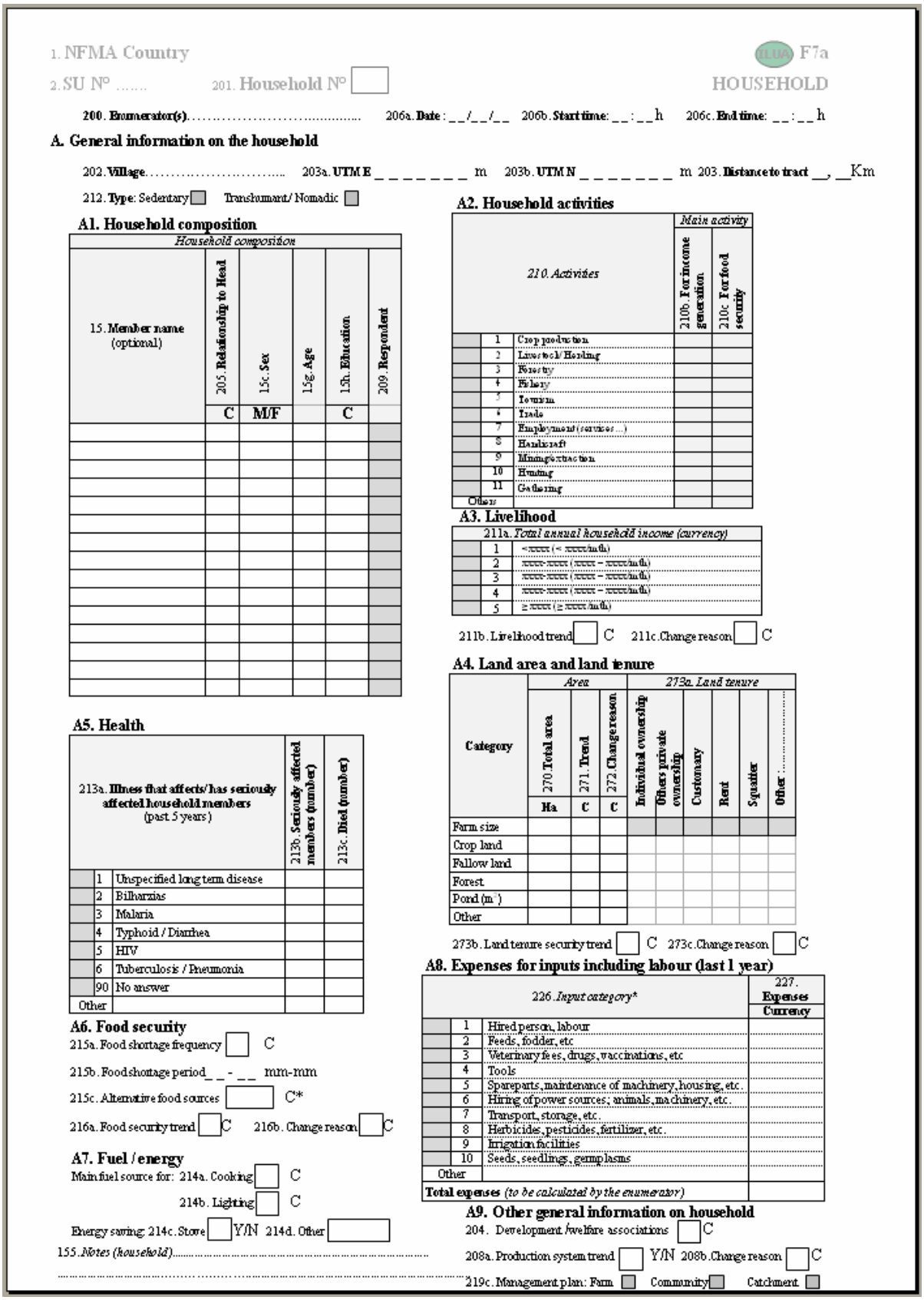
Figure 51. Field form F7a – Household (General information)



1. NFMA Country

2. SU N° ..... 201. Household N° ☐

ILUA F7a

HOUSEHOLD

200. Enumerator(s)..... 206a. Date : __/__/__ 206b. Start time: __:__h 206c. End time: __:__h

A. General information on the household

202. Village..... 203a. UTM E _ _ _ _ _ _ m 203b. UTM N _ _ _ _ _ _ m 203. Distance to tract __, __Km

212. Type: Sedentary ☐ Transhumant/ Nomadic ☐

A1. Household composition

Household composition					
15. Member name (optional)	205. Relationship to Head	15c. Sex	15g. Age	15h. Education	209. Respondent
	C	M/F		C	

A2. Household activities

210. Activities		Main activity: 210b. For income generation	Main activity: 210c For food security
	1 Crop production		
	2 Livestock/ Herding		
	3 Forestry		
	4 Fishery		
	5 Tourism		
	6 Trade		
	7 Employment (services ...)		
	8 Handicraft		
	9 Mining/extraction		
	10 Hunting		
	11 Gathering		
Others			

A3. Livelihood

211a. Total annual household income (currency)	
1	<xxxxx (< xxxxx/inh)
2	xxxxx-xxxxx (xxxxx – xxxxx/inh)
3	xxxxx-xxxxx (xxxxx – xxxxx/inh)
4	xxxxx-xxxxx (xxxxx – xxxxx/inh)
5	≥ xxxxx (≥ xxxxx/inh)

211b. Livelihood trend ☐ C 211c. Change reason ☐ C

A4. Land area and land tenure

Category	Area: 270. Total area	Area: 271. Trend	Area: 272. Change reason	273a. Land tenure: Individual ownership	Others private ownership	Customary	Rent	Squatter	Other : .....
	Ha	C	C						
Farm size									
Crop land									
Fallow land									
Forest									
Pond (m²)									
Other									

273b. Land tenure security trend ☐ C 273c. Change reason ☐ C

A5. Health

213a. Illness that affects/has seriously affected household members (past 5 years)		213b. Seriously affected members (number)	213c. Died (number)
1	Unspecified long term disease		
2	Bilharzias		
3	Malaria		
4	Typhoid / Diarrhea		
5	HIV		
6	Tuberculosis / Pneumonia		
90	No answer		
Other			

A6. Food security

215a. Food shortage frequency ☐ C

215b. Food shortage period _ _ - _ _ mm-mm

215c. Alternative food sources ☐ C*

216a. Food security trend ☐ C 216b. Change reason ☐ C

A7. Fuel / energy

Main fuel source for: 214a. Cooking ☐ C

214b. Lighting ☐ C

Energy saving: 214c. Stove ☐ Y/N 214d. Other ☐

155. Notes (household).....

A8. Expenses for inputs including labour (last 1 year)

226. Input category*		227. Expenses Currency
1	Hired person, labour	
2	Feeds, fodder, etc	
3	Veterinary fees, drugs, vaccinations, etc	
4	Tools	
5	Spareparts, maintenance of machinery, housing, etc.	
6	Hiring of power sources; animals, machinery, etc.	
7	Transport, storage, etc.	
8	Herbicides, pesticides, fertilizer, etc.	
9	Irrigation facilities	
10	Seeds, seedlings, germplasms	
Other		
Total expenses *(to be calculated by the enumerator)*		

A9. Other general information on household

204. Development /welfare associations ☐ C

208a. Production system trend ☐ Y/N 208b. Change reason ☐ C

219c. Management plan: Farm ☐ Community ☐ Catchment ☐

Figure 52. Field form F7b – Household (service access and crop management)

1. NMFA Country

2. SU N° .....

201. Household N°

F7b

HOUSEHOLD – CROP MANAGEMENT

A10. Access to services

	218. Service category	228. Use frequency	229. Service need	230. Accessibility	231. Distance to service	264. Service quality
		C	Y/N	C	Km	C
1	Credit services					
2	Saving services					
3	Extension services					
4	Veterinary services					
5	Veterinary drugs					
6	Cattle dips					
7	Local market place					
8	Regional market place					
9	Seed provision					
10	Health service					
11	Education - Primary					
12	Education - Secondary					
Other:						

A11. Access to water resources

	217. Water source type	Dry season							Wet season						
		232a. Access	233a. Distance	284a. Time	Uses			280a. Conflict	232b. Access	233b. Distance	284b. Time	Uses			280b. Conflict
			Km	min	281a. Livestock	282a. Crops	283a. Human			Km	min	281b. Livestock	282b. Crops	283b. Human	
1	Well														
2	Borehole														
3	Pond														
4	River/ Stream														
5	Lake														
6	Springs														
7	Rock catchment														
8	Dam														
9	Piped water														
Other:															

A12. Conflicts human/wildlife/livestock

	253a. Problem	253b. Conflict origin: Human	Livestock	Wildlife
0	No conflict			
1	Damage to crops			
2	Damage to trees			
3	Damage / destruction of property/ infrastructures			
4	Land degradation/ erosion			
5	Livestock death/ injury			
6	Livestock disease			
7	Human death/injury			
8	Competition for resources (space, forage, water)			
Other:				

A13. Benefits from wildlife and tourism

	254. Benefit from wildlife/tourism
0	No benefit
1	Infrastructure development (roads, schools...)
2	Sale of curios/ handicraft
3	Employment (hotels, KWS...)
4	Bursaries
Other:	

CROP MANAGEMENT

B1. Crop production system

140. *Cropping system* (C**)*	
1	Mono cultures
2	Multiple cropping
3	Mixed cropping
4	140b. Crop rotation C
5	Mixed crop/livestock
6	Agroforestry
7	Improved cultivars
7	Fallow
90	Not known
Other	

* Multiple choice

** Code: 1 = Low, 2 = Medium, 3 = High,

141. *Water management**	
1	Rain fed
2	Irrigation - manual construction gravity/ fed
3	Irrigation - major equipment
4	Water harvesting – micro/macro catchment
5	Water harvesting – /pots or flood flow
6	Adequate drainage of excess water
90	Not known
Other	

142. *Nutrients* (C**)*	
0	None
1	Adequate fallow
2	Organic fertilizers
3	Mineral fertilizers
4	Liming
90	Not known
Other	

143. *Pest / Weed control**	
0	None
1	Pesticides
2	Fungicides
3	Herbicides
4	Manual control
5	Mechanical control
6	Biological control
7	Local pesticides
90	Not known
Other	

144. *Soil and water conservation**	
0	None
1	Levelling
2	Contour farming
3	Contour strips
4	Terracing
5	Crop residue incorporation
6	Cover crops / vegetation
7	Mulching
8	Windbreak
9	Grassed waterways / Check dams
10	Tree planting/ Agroforestry
90	Not known
Other	

145b. *Land preparation/ Tillage**	
0	Zero tillage
1	Minimum tillage
2	Manual hoe
3	Animal draught
4	Mechanized means
5	Slashing
6	Burning
7	Herbicides
90	Not known
Other	

B2. Role distribution

158. Activity	155. Cash crops	156. Subsistence crops	157. Organisation level
	C	C	C
1. Management decision			
2. Land preparation			
3. Planting / Seeding			
4. Weeding			
5. Harvesting			
6. Marketing			
7. Watering			
8. Processing			
Other:			

155. *Notes (crop management)*.....

Figure 53. Field form F7b – Household – Livestock Management and Products

1. NFMA Country

2. SU N° ..... 201. Household N° ☐

F7c

HOUSEHOLD – LIVESTOCK MANAGEMENT AND PRODUCTS

LIVESTOCK MANAGEMENT

C1. Livestock production system

	219. Livestock category	220. Grazing*					221. Feeds*			222. Livestock housing at night	Local breeds				Management	
		1. Free ranging	2. Fenced unimproved pastures	3. Fenced improved pastures	4. Tethering	5. Zero grazing	1. Crop residues	2. Fallow land for grazing	3. Specific fodder		223. Proportion	223b. Trend	223c Change reason	223d. Maintain reason	224. Decisions	225. Working/Herder
											%	C	C	C	C	C
1	Cattle															
2	Sheep															
3	Goat															
4	Camel															
5	Donkey															
6	Pig															
7	Poultry															
Other:																
Other:																

220b. Access to grazing ☐ Y/N

Average distance to grazing area: 220c. Wet season _ _ _ Km

(common grazing only) 220d. Dry season _ _ _ Km

C2. Beekeeping

255. Feed ☐ Y/N 256. Beehive ☐ Y/N

257. Extraction technique: 1. Traditional ☐ 2. Modern ☐

258. Processing ☐ Y/N

C3. Total sales of livestock, poultry and beekeeping products (last one year)

	234. Product	234b. Unit of quantity	Dry season			Wet season		
			235a. Quantity sold	236a. Income from sale	237a. Ranking importance	235b. Quantity sold	236b. Income from sale	237b. Ranking importance
				Currency	C		Currency	C
1	Meat							
2	Milk							
3	Cheese/Dairy products							
4	Eggs							
5	Hides and skins							
6	Honey							
Other:								
Total income**								
Sum income (dry+wet)								

C4. Total sales of poultry and livestock during the last 1 year

	241. Livestock category	242. Unit of quantity	243. Current stock:	Inputs				Output						252. Opening stock:
				244a. Purchased quantity	244b. Expense of purchase	245. Born	246. Gifted in	247. Died	248. Stolen	249. Consumed	250. Given out	251a. Sold quantity	251b. Income from sale	
			Unit	Unit	Currency	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Currency	Unit
1	Cattle - Young stock													
2	Cattle - Weaner male													
3	Cattle - Weaner female													
4	Cattle - Adult male													
5	Cattle - Adult female													
6	Cattle - Oxen													
7	Sheep													
8	Goat													
9	Pig													
10	Chicken - Layer													
11	Chicken - Broiler													
12	Chicken - Free range													
13	Camel													
14	Donkey													
15	Rabbit													
Other:														
Other:														
Other:														
Other:														
Other:														
Total expenses **								Total income **						

* Multiple choice possible ** To be calculated by the enumerator

C5. Income received other than through sale of products (last one year)

	238. Income*	239. Value
		Currency
1	Hire of draft power	
2	Rental of bulls/donkeys	
3	Sport/recreation	
Other		
Other		
Total income**		

292. *Notes (livestock)*.....

.....

.....

.....

.....

AQUACULTURE

600. Aquaculture ☐ Y/N

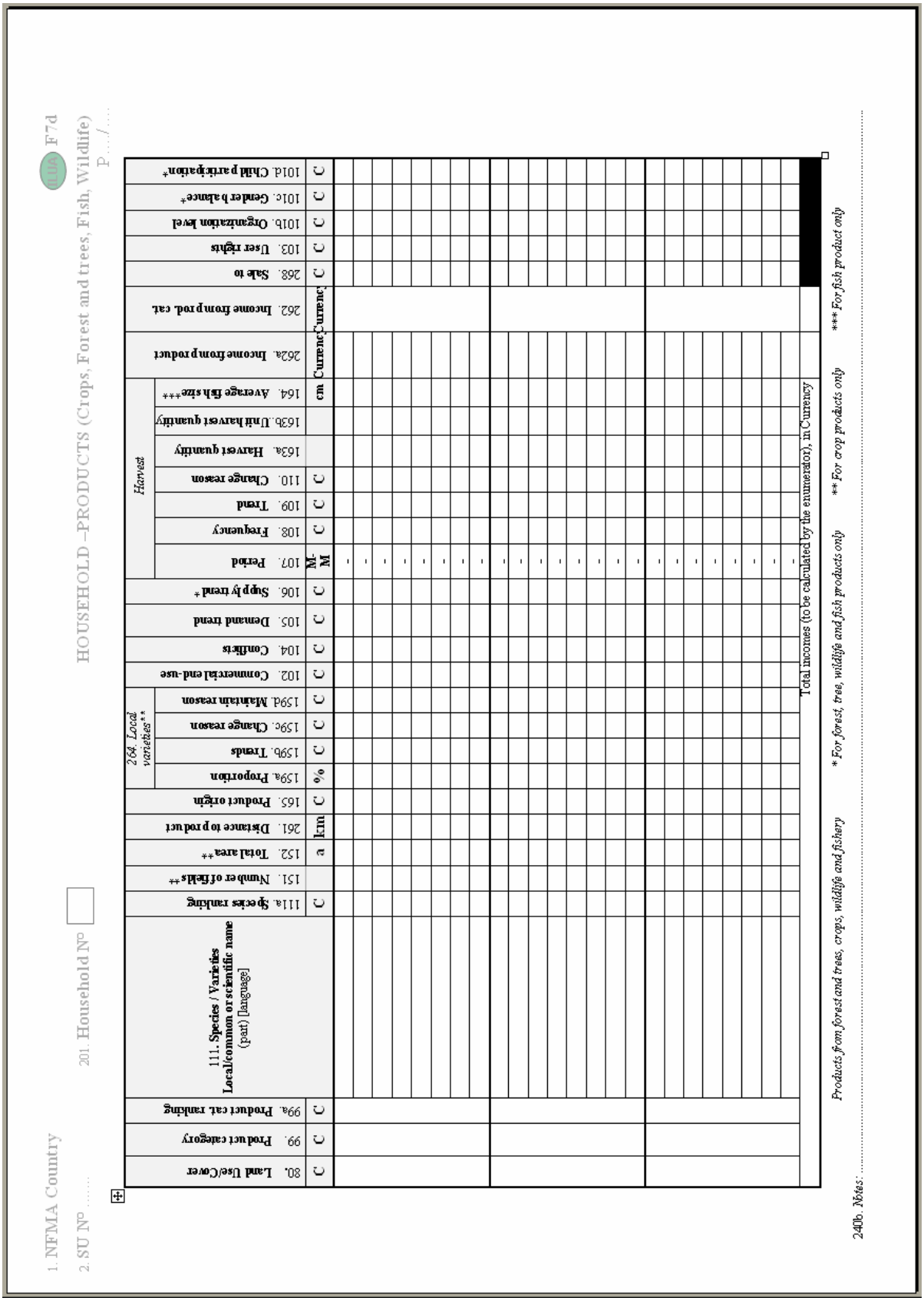
601. Culture type: 1. Monoculture ☐

2. Polyculture ☐

602. Production system ☐ C

603. Species cultured name (local or scientific)	604. Stocking density

Figure 54. Field form F7d – Household – Products (crops, forest and trees, fish, wildlife)



6.10 Sampling unit summary report layout

The NFMA is a long term process that will involve revisiting of the selected sampling sites (tracts) after a few years. Therefore it is important for the initial field teams to provide a detailed description about how the sampling units were accessed and what are the difficulties encountered during the work.

The following reporting layout is a guide for field team data collectors to facilitate repeated monitoring exercises.

1. - Cover Page: SU number

2. - Description of access to the SU

2.1. - **Description of access**: includes a brief description of the access taken to reach the SU by car, including the different places that are considered important as reference points, this will be supported with a sketch or a map. Also pictures have to be included in order to facilitate with illustrations the future access. Recommendations for future access can also be provided.

2.3. - **Sketch of access**: Sketch with detail description of the road that takes to SU, with picture to illustrate it, see figure bellow

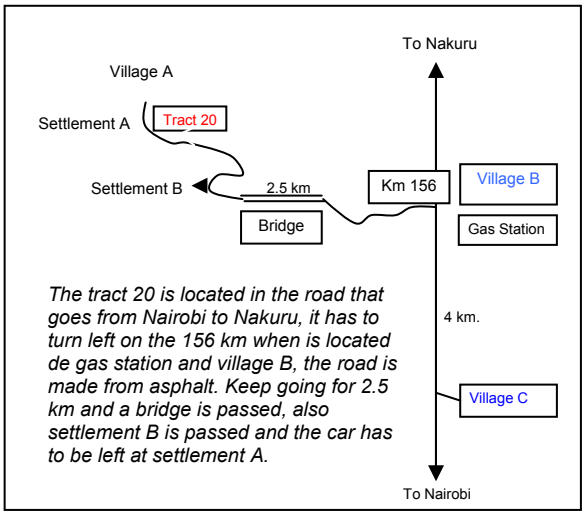


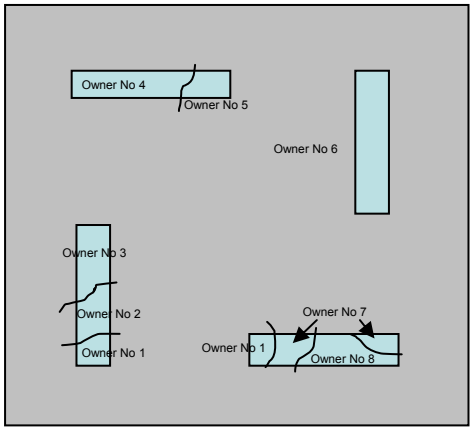
Photo No 013-0.1 and 013-0.2

(=First and second photo taken in accessing SU No 013 by car)

3.- Description of field data collection in the SU

3.1. - Overview of field data collection in the SU: Consists of a brief description of the strategy used, difficulties encountered during data collection in the SU as well as solutions for problems and recommendations.

3.2. - Owners per plot: Consists on registering the names of the owners per plot so for future measurements the teams can ask directly permission to the owners. Description on the procedure to contact owners can be put here if it's the same for all plots otherwise it has to be put in the corresponding plot. See example below.



***Plot 1**: from 0-75 mt the owner is No 1; 75-150 No 2 and 150-250 No 3.*

***Plot 2**: from 0-200 the owner is No 4 and 200-250 is No 5.*

***Plot 3**: just one owner, No 6*

***Plot 4**: from 0-75 owner 7; 0-175 No 8; 175-200 No 7 and 200-250 No 1.*

3.3. - Plot No. 1

3.3.1. - **Description on the procedure to contact owners**: Includes a brief description on the procedure to contact the owners and obtain the permission from them to enter their properties and measure the plots. This has to describe institutions visited, names of persons contacted, channel of communication used. See example below.

It was asked to the regional officer of the forest department offices in Nakuru, Mr. John Njeri to obtain information about the village, he told that we should look for the community leader, Mr. Ndambiri. We explained the objectives of the project to Mr. Ndambiri and he told us that there was no problem to go in, he accompanied us all time.

3.3.2. - **Problems found**: Includes access problems such as difficulties in getting permission to enter the plot, topography and other information considered useful e.g difficulties of gathering information and recommendations. See example below.

Slope was very high but there was no vegetation and the local guide helped in every moment.

3.3. - Plot No. 2

3.4. - Plot No. 3

3.5. - Plot No. 4

4. – Interviews

Description of issues concerning the interviews inside the SU e.g. how many interviews were done and with who, organisation of group interviews, difficulties (access, collaboration of people), refusals (main reason and solution of problems….) and recommendations.

4.1 Interviews with focus groups and key informants/ individual (F1 to F6)

4.2- Household survey interviews (F7)

5 - Photographs catalogue with its description

All photos taken in the SU, properly labelled and described if necessary. Includes photos that represent:

- access
- markes position
- vegetation/LUCC
- particular tree species (leaves/bark/shapes)
- population and resources uses

All Photo are labelled as explained in the manual e.g. No 013-2.5 =Fifth photo taken in plot No 2 of SU No 013.

Photos	Photo description	Photos code
	*Houses along the road just before turning to the right and taking the road that goes to settlement A.*	*No. 013-0.1:*
	*Coniferous plantation just after ending the first land use cover Natural grassland.*	*No. 013-2.2:*
	*Natural grassland There is natural growth of graminea and shrub herbaceous vegetation, with some scattered trees and crown cover of trees is less than 5%*	*No. 013-2.5*

6 – Field forms count

Check boxes and indicate the number of forms in the report

- ☐ SU: F1a (one field form)
- ☐ SU: F1b (one or more)
- ILUA ☐ SU: F1c (one field form)
- ILUA ☐ SU: F1d (one field form)

Plot 1:

- ☐ F2 (one field form)
- ☐ F3a/b (one or more)
- ☐ F4a (one field form)
- ☐ F4b (one or more)
- ☐ F4c (one or more)
- ☐ F5 (one or more)
- ☐ F6s (one or more)
- ☐ F6p (one or more)

Plot 2:

- ☐ F2 (one field form)
- ☐ F3a/b (1 or more)
- ☐ F4a (one field form)
- ☐ F4b (one or more)
- ☐ F4c (one or more)
- ☐ F5 (one or more)
- ☐ F6s (one or more)
- ☐ F6p (one or more)

Plot 3:

- ☐ F2 (one field form)
- ☐ F3a/b (1 or more)
- ☐ F4a (one field form)
- ☐ F4b (one or more)
- ☐ F4c (one or more)
- ☐ F5 (one or more)
- ☐ F6s (one or more)
- ☐ F6p (one or more)

Plot 4:

- ☐ F2 (one field form)
- ☐ F3a/b (1 or more)
- ☐ F4a (one field form)
- ☐ F4b (one or more)
- ☐ F4c (one or more)
- ☐ F5 (one or more)
- ☐ F6s (one or more)
- ☐ F6p (one or more)

ILUA ☐ Household survey: F7 (one or more)

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