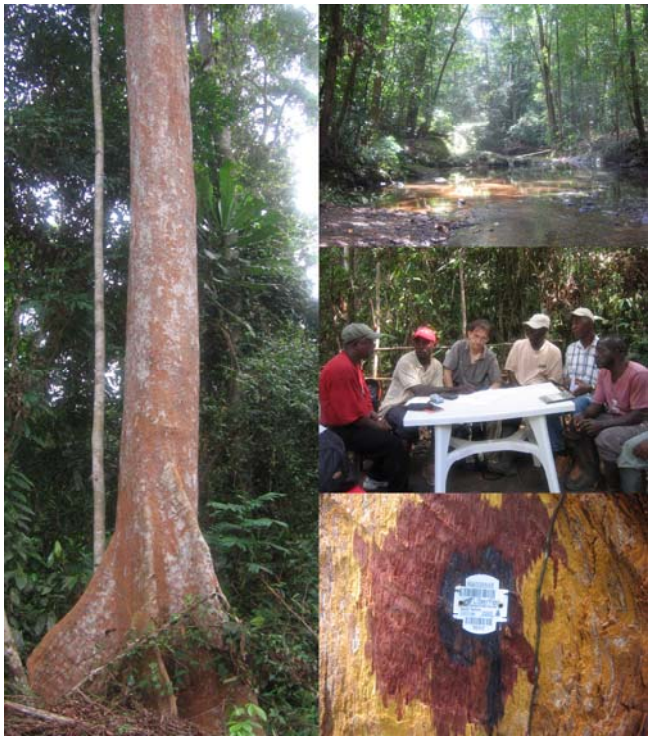
Republic of Liberia

FORESTRY DEVELOPMENT AUTHORITY

GUIDELINES FOR FOREST MANAGEMENT PLANNING IN LIBERIA



July 2009

With the technical assistance of

Republic of Liberia

FORESTRY DEVELOPMENT AUTHORITY

GUIDELINES FOR FOREST MANAGEMENT PLANNING IN LIBERIA

SECTION 1

INTRODUCTION

July 2009

With the technical assistance of

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The present Guidelines have been prepared by the FDA, with the assistance of the LIBERIA FOREST INITIATIVE (LFI). The project is implemented by the UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID), and with the technical assistance of FORET RESSOURCES MANAGEMENT (FRM), tropical forest management consulting firm based in France.

The Guidelines aim at providing practical and technical information on the methods to use to design and implement Forest Management Plans (FMPs). Technical assistance activities have been conducted over a 3 months period from April to June 2009.

The Guidelines for the preparation of Forest Management Plans concern the Forest Management Contracts (FMCs). Another set of Guidelines concerning Timber Sales Contracts (TSCs) forest management documents will be produced at a later date.

The elaboration of the Guidelines is based on FRM's expertise and experience acquired in tropical rainforests over more than 20 years in Western and Central Africa.

The present document has been prepared by Nicolas BAYOL, Senior Forest Management Specialist at FRM. This document is intended for concessionaires, the Forest Management Contract (FMC) holders in charge of managing their forest concessions, to help them prepare their FMPs. It will also provide the Forest Development Authority (FDA) with a set of consolidated procedures in compliance with international standards. These Guidelines were developed through a consultation process (meetings and workshop) involving all interested stakeholders (Forest Department Authority, LFI, private sector, NGOs, civil society…) leading to their validation.

GLOSSARY

Term	Acronym	Definition
Forest Management Contract	FMC	A long-term Forest Resource License issued by the Government that allows a person to manage a determined area of Forest Land and harvest or use the Forest Products
5-Year Forest Management Plan	5YFMP	Medium-term tactical document (5 years), setting management provisions for each Forest Compartment of the FMC
Agriculture unit		Area within the FMC dedicated to farming
Annual Coupe	AC	Portion of Forest Land subjected to a Forest Management Contract or Timber Sale Contract that can be sustainably harvested each year
Annual Operational Plan	AOP	Short-term operational document (1 year), setting the annual program and monitoring procedure of the management planning on each Annual Coupe
Block		1 km^2 area in the FMC
Bole valorisation rate		This rate determines the commercial volume of the harvested trees by taking into account the scraps (felling losses, wastage…) at each level of the logging process
Conservation unit		Area within the FMC where harvesting is forbidden due to high biodiversity level
DBH Cutting limit (DCL)		Minimum diameter at breast height, defined for each species, above which a tree can be harvested
Exclusion area		Small area excluded from harvesting inside the Timber Production Unit
Forest Compartment	FC	5-year forest management plan area comprised of 5 annual coupes
Gross standing volume	GSV	Total volume of the trunks, between buttress and first branch
Harvestable Area	HA	Area included in the Timber Production Unit
Harvestable Volume	HV	In this document, means gross standing volume of the trees of class A above the DCL
Logging rate		This rate determines the part of standing trees that can be harvested from the total available standing tree volume. It enables to assess the gross standing volume of harvested trees
Logging season		One year period from October to September
Management unit		Area with a specific management objective in the FMC: timber production, protection, agriculture, conservation or reforestation
Multi-ressource inventory		Statistical inventory implemented on the entire FMC for the SFMP preparation, including data on wildlife, NTFP, regeneration
Net standing Volume	NSV	Volume of the entire trunk of the harvestable tree

Term	Acronym	Definition
NTFP	NTFP	Non Timber Forest Products
Pre-harvest enumeration		100% inventory implemented on Annual Coupe for AOP preparation
Protection unit		Area within the FMC area where harvesting is restricted due to risks for the water, soil, or cultural activities
Quarters		Three months period inside the logging season
Reforestation unit		Area within the FMC dedicated to natural or manmade reforestation
Regrowth rate		Rate assessing the regrowth of the timber resource between the first and the second rotation
Strategic Forest Management Plan	SFMP	Long-term strategic document (25 years), setting all forest activities for the duration of the Forest Management Contract
Timber Production Unit		Area dedicated to timber production within the FMC area
Valorisation rate		Ratio established by the FMC holder to convert numbers of standing trees or gross standing volumes into numbers of harvestable trees or commercial volumes that can actually be harvested and/or marketed
Volume equation/table		Formula used to calculate gross standing volume from diameter data

1 GENERAL FRAMEWORK OF THE GUIDELINES

The modern concept of sustainable forest management is directly connected to the rising international awareness on biodiversity conservation issues, especially in the tropics. The Earth Summit, held in Rio in 1992 (United Nations Conference on Environment and Development), where the Convention on Biological Diversity was signed, is symbolically held in this respect as the starting point.

On forest management, Article 2b of the forest principles adopted in Rio in 1992 during the United Nations Conference on Environment and Development states: "*Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations"*.

Modern Sustainable Forest Management covers several dimensions, among which the social and the environmental dimensions hold a prominent place. New international demands aim at leading the forest sector towards Forest Management Planning and Certification.

Several definitions exist to explain the sustainable forest management concept. All focus on *"a balanced, constant and sustainable production of forest products especially in timber wood products."*

The modern forest management process is based on:

- Planned forest harvesting activities on forest areas used for wood production exclusively;
- Measures to guarantee the long-term social and environmental integrity of the forest.

The future of Forest Management in Liberia, as required by the National Forestry Reform Law, is to ensure that forests are managed in a sustainable manner while also integrating important biodiversity and social issues in the management. Forest Management process also includes social agreements with authorities and local populations in terms of local development (roads, health infrastructure, and redistribution of the timber income).

The objective of the new Liberian national forestry policy is: *"To conserve and sustainably manage all forest areas, so that they will continue to produce a complete range of goods and services for the benefit of all Liberians and contribute to poverty alleviation in the nation."* This goal is reflected throughout the revised forestry legislation (amended forestry law and FDA regulations), the Code of Forest Harvesting Practices and the present Guidelines for forest management planning.

The legal framework governing directly the Forest Management Planning aspects, concerned by FMCs, is defined in the following texts:

- National Forestry Reform Law of 2006, October 4, 2006;
- Public procurement and concessions commissions act, September 8, 2005;
- Environmental Protection and Management Law, November 26, 2002;
- FDA Ten core regulations, September 7, 2007;
- National Forestry Policy and implementation strategy, 2006;
- National Forest Management Strategy, 2007;
- Code of Forest Harvesting Practices, September 10, 2007;
- Standard Operating Procedures, developed for the Chain of Custody Information system;
- Guidelines for Forest Management Planning - Draft version, June 2007;
- Standard Operating Procedure 7: Block maps and stocks, Survey Registration.

For each FMC, specific rules are defined by the **Contract** signed between the Holder and the Government of Liberia.

The FMC Bidding documents (for 7 FMCs) also provide information on each FMC. The **Liberia ATO/ITTO principles, criteria, indicators and checklist for the sustainable management of Liberian natural forests** have also been used for the preparation of these Guidelines.

Key elements of the legal framework are provided in Appendix 1.

Different harvesting permit types are defined by the **National Forestry Reform Law**. Planning requirements for forest harvesting differ for both management plan type and forest contract type. The two main harvesting permit types for industrial logging and the associated management planning process are illustrated by the Figure 1.

These Guidelines are designed for the preparation of Forest Management Plans for FMCs exclusively. Figure 2 illustrates the global management process according to the Liberian legal framework for FMCs.

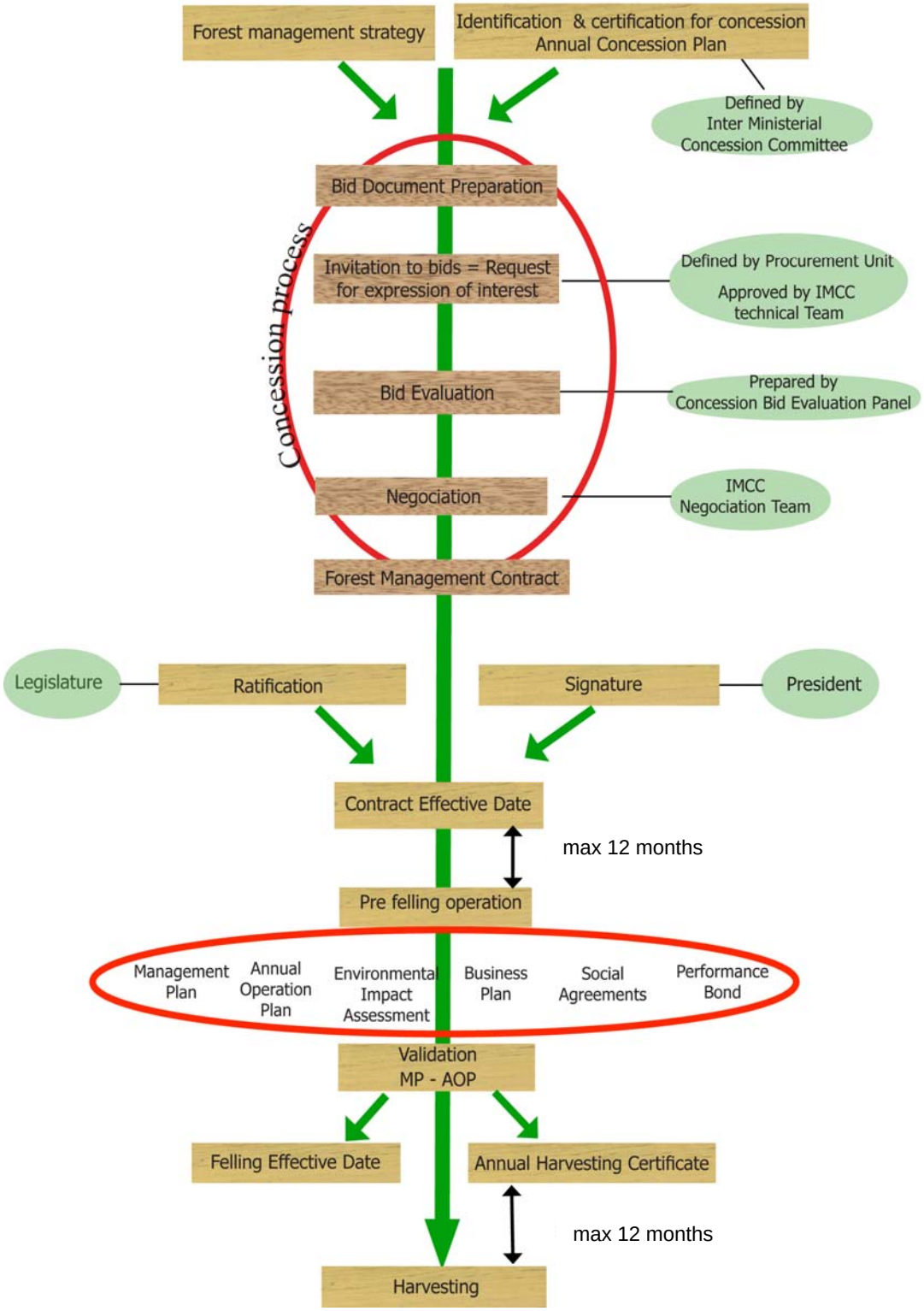


Figure 1: Global management process for Forest Management Contracts (FMCs)

2 MANAGEMENT PLANNING UNITS AND FOREST MANAGEMENT PLANS

The present Guidelines respond to the FDA's wish to provide a clear set of instructions to help forest managers and logging companies allocated FMCs to prepare the required Forest Management Plans and Annual Operational Plans. It should be read together with the FDA's "Code of Forest Harvesting practices" and the "Ten Core Regulations".

The Guidelines will be reviewed and improved on a regular basis by the FDA, through consultations with the forest industry, government agencies such as the EPA, civil society organizations, community groups and other interested parties.

On the FMC, different management unit will be defined including one (or several) Timber Production Unit. Each Timber Production Unit must be defined and divided into 5 Forest Compartments (FC), areas to be harvested within 5 years. Each Forest Compartment must be divided into 5 Annual Coupes, areas to be harvested within 1 year (with possibility to extent the opening period to 3 years, see section 3, chapter 6.2).

SFMP defines the boundaries of the Forest Compartments and their opening schedule. 5-year Forest Management Plans to be prepared before the opening of the Forest Compartment, defines final (for the initial 5YFMP) or provisional Annual Coupes boundaries and their opening schedule. Except for the initial 5YFMP, final Annual Coupe's boundaries will be defined by the Annual Operational Plan.

This land-use and management planning process is illustrated by Figure 3.

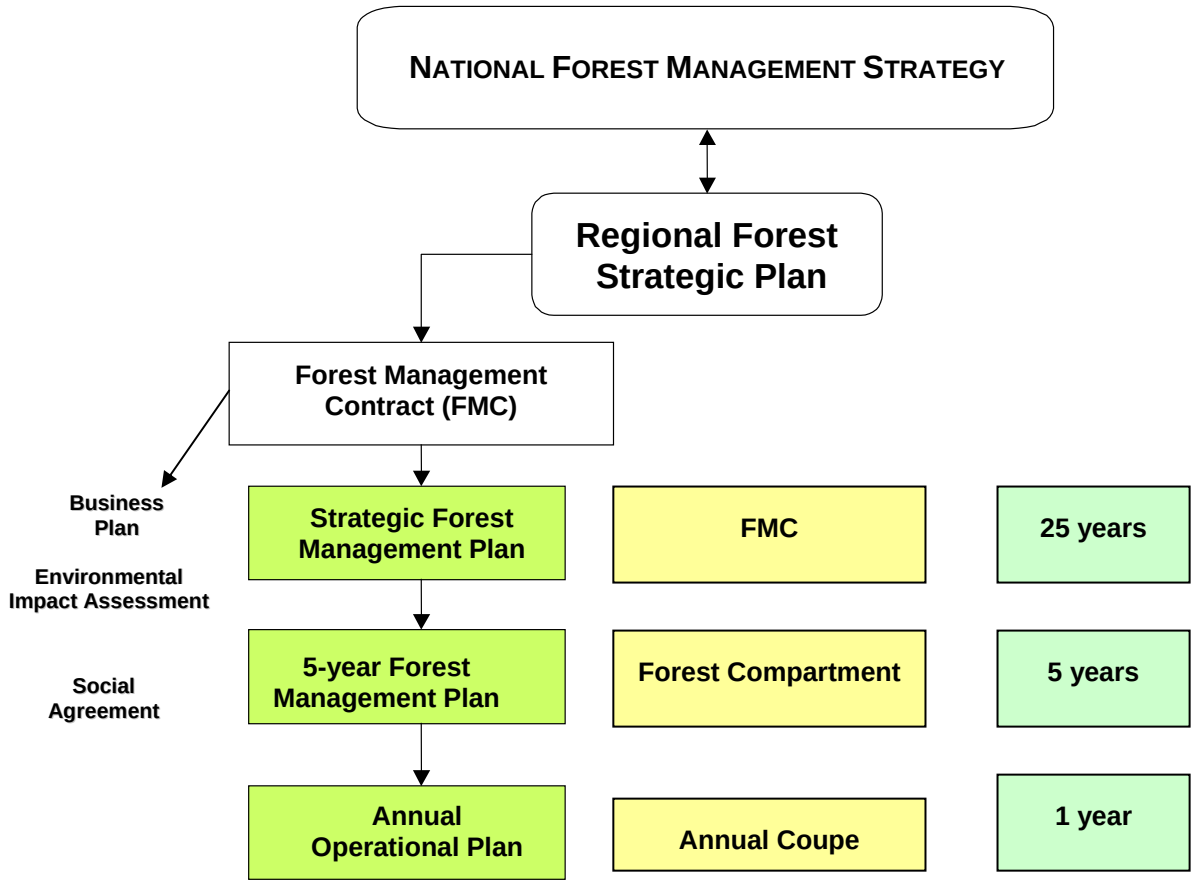


Figure 2: Forest management planning according to forest contract type

Sustainable forest management is based on a three-tiered process related to the planning duration or three spatiotemporal levels (Figure 4):

- **Strategic Forest Management Plan (SFMP)**, a long-term strategic document (25 years), setting all forest activities for the duration of the Forest Management Contract;
- **5-Year Forest Management Plan (5YFMP)**, a medium-term tactical document (5 years), setting management provisions for each Forest Compartment of the FMC;
- **Annual Operational Plan (AOP)**, a short-term operational document (1 year), setting the annual program and monitoring procedure of the management plan on each Annual Coupe.

FMC's Management Planning units and documents are summarized in the following table:

Table 1: Management Planning units and FMPs on a FMC

Units	Documents defining and mapping the area	Criteria for delineation
FMC	FMC Contract	
Management Unit	SFMP, version 1	Mapping study: swamps, slopes, farmlands
	SFMP, final version	To be refined with field data collected
Forest Compartment	SFMP, version 1	Forest Compartment n°1 based on area (20% of the harvestable area)
	SFMP, final version	All the Forest Compartments based on volume (20% of the harvestable volume for each compartment)
Annual Coupe	First 5YFMP, for Forest Compartment n°1	Annual coupes of Forest Compartment 1, based on area (4% of the harvestable area each)
	5YFMP, for Forest Compartment n°2	Annual coupes of Forest Compartment 2, based on volume (4% of the harvestable volume each) defined yearly with the pre-harvest enumeration results
Block	AOP (Blocks to be harvested during the logging season)	

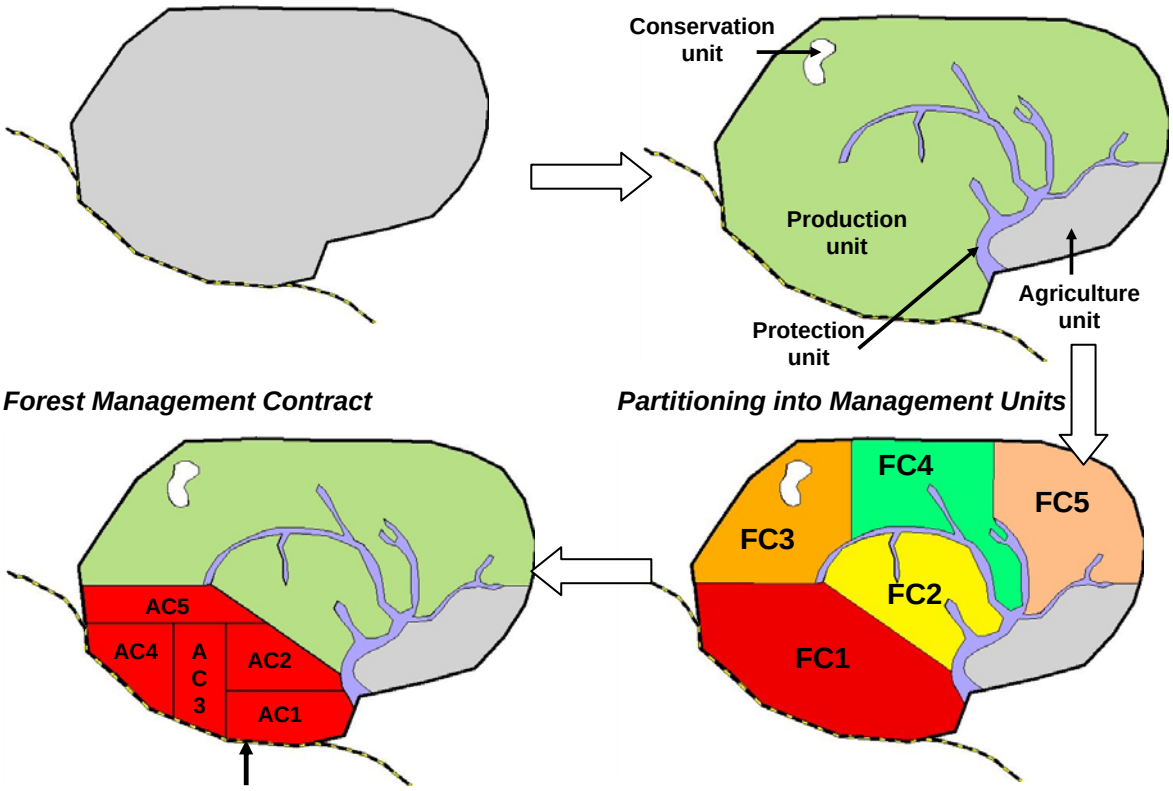


Figure 3 : Overview of the land-use and management planning on a FMC

3 FLEXIBILITY IN THE IMPLEMENTATION OF FOREST MANAGEMENT PLANNING

There is a need for flexibility in the implementation of the FMPs, especially in response to very specific conditions, such as an important decrease of the prices of some species.

Some rules have been defines by these Guidelines to ensure sufficient flexibility:

- Possibility to review the SFMP if new data is available on the forest dynamics or if the land-cover changes significantly (see section 2, chapter 11.3);
- Opening of the Annual Coupes (AC) during 3 years (see section 3, chapter 6.2).

However, the respect of the harvesting planning is crucial, for different reasons:

- Sustainable Forest Management requires planning all the activities on the entire AC area before its opening to insure an adequate planning of the infrastructure and the harvesting activities. Change in the area to be harvested would require to have completed the pre-harvest enumeration on the entire surface area of the AC.

- Even if market conditions change the main harvested species remain always marketable except during important economic crises. Furthermore, knowing several months in advance what will be the change how the market prices will vary and modifying the planning in time is not possible. Adapt efficiently the planning to the market is very difficult.
- If too much flexibility is allowed, a real risk exists that all the best forest areas, containing high volumes of the main species will be harvested during the first years of the rotation cycle, which would endanger the profitability of the harvesting for the following years. It is preferable to mix the production composition all along the rotation cycle, with high value species and low value species harvested all the time.
- The harvested blocks will be closed for the rest of the rotation cycle after their harvesting, to enable the recovery of the resource. It is important to respect as far as possible a time of rest for the forest, similar to the rotation cycle duration, for each block. In these conditions, the harvesting planning of the following rotation cycles will be closely linked with the one of the first rotation cycle. It his therefore important to have a logical and efficient planning during the first rotation cycle is therefore crucial.
- Bad harvesting planning will create higher environmental impacts on the forest because the forest on the same area of the FMC will be disturbed several times during the rotation cycle, with higher impacts on the soils, the watercourses and the wildlife.
- Bad planning would also increase the cost prices, especially because of an increase in the road length to be opened or maintained each year.

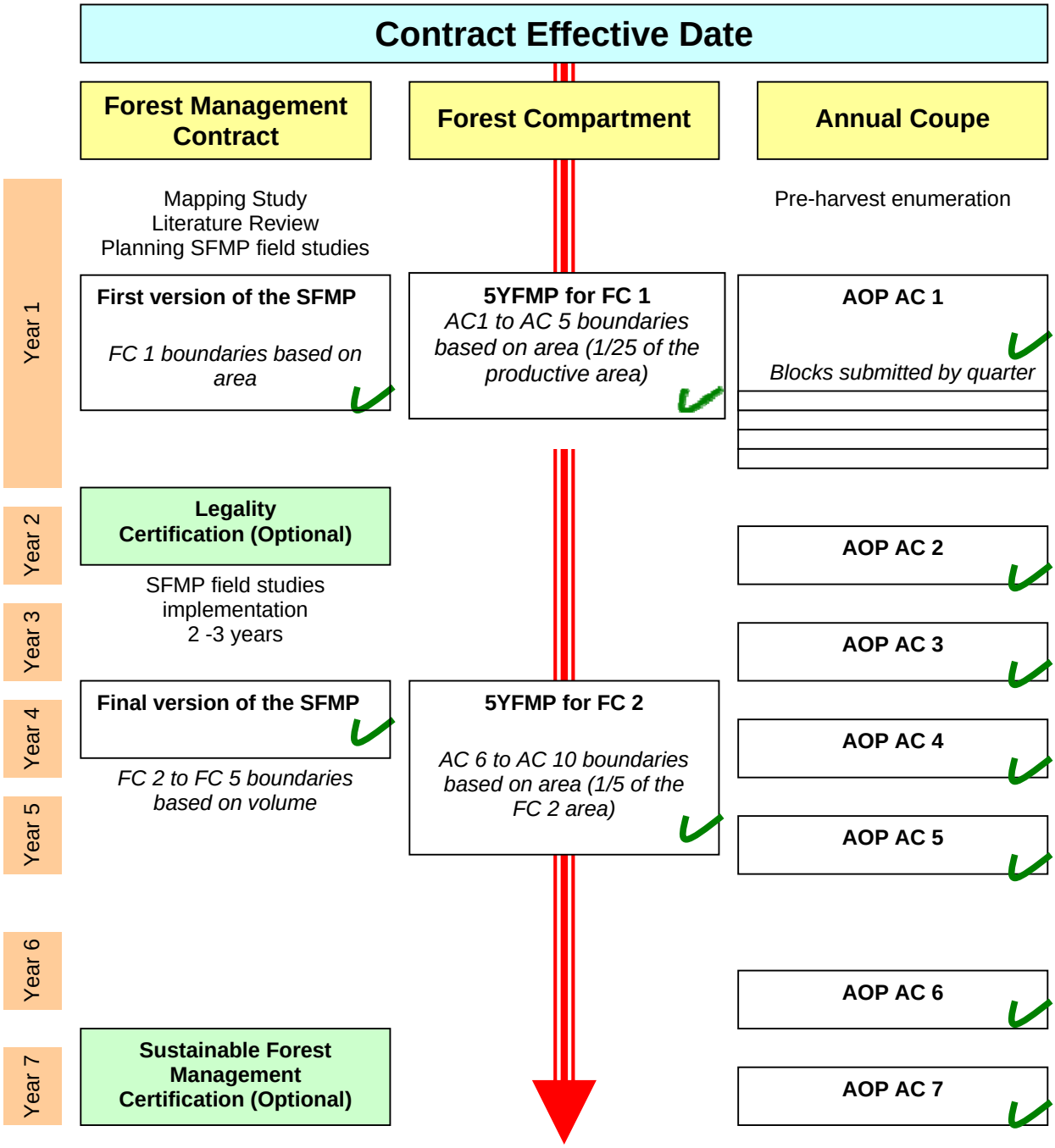


Figure 4: The forest management plan implementation process

The development of a SFMP is a long process (2 to 4 years) due to the necessity to acquire a deep knowledge of the area to be managed. The only way to make appropriate management decisions is to collect accurate and reliable field data. It is an expensive process and in order to help finance the preparation of the SFMPs, logging activities will be allowed during the preparation phase. The process will therefore be based on a two-step approach: a first version and a final version of the SFMP will be produced.

The **SFMP first version** will be submitted within 90 days before the first annual logging season following the contract effective date, according to the Forest Management Contract document. The **SFMP final version** must be submitted within 4 years from the contract effective date.

The **first 5YFMP** shall be submitted within 90 days before the first annual operating season following the contract effective date. For **the other 5YFMPs**, the submission must occur 90 days prior to the beginning of the first logging season concerned by the 5YFMP.

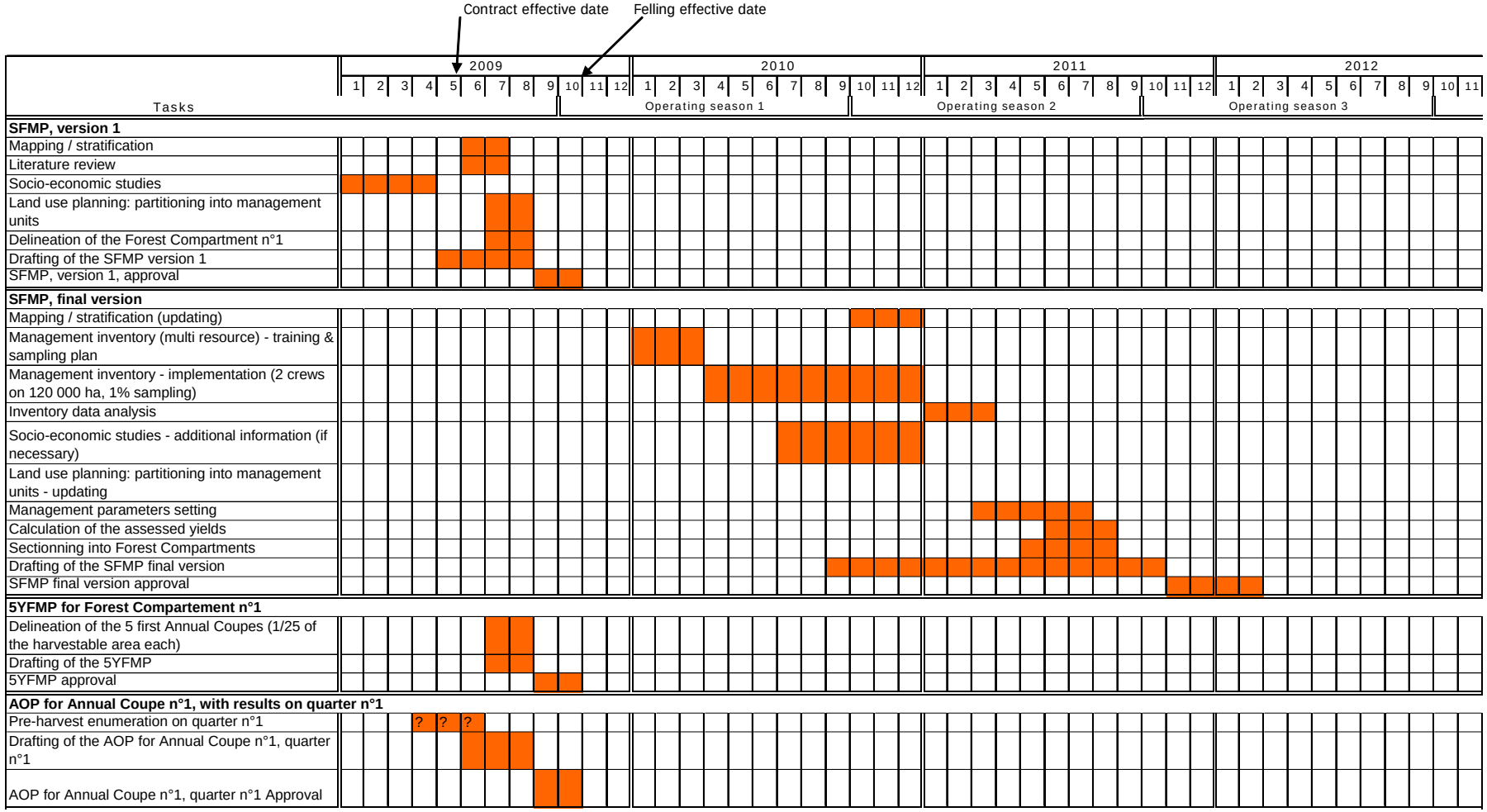
The timetable for the activities to be implemented for the drafting of the first version of the Forest Management Plans and for the beginning of logging activities is presented in Tables 2 and 3. According to this timetable, the Pre-harvest enumeration cannot be completed on the entire first Annual Coupe before the beginning of the first logging season.

The **first Annual Operational Plan (AOP)** will be prepared by **area quarters** (according to former rules in force before the approval of the New Forestry Law), as the pre-harvest enumeration cannot be finished on the entire Annual Coupe prior to the beginning of the logging season (not enough time). The **first AOP**, providing the results of the pre-harvest enumeration of the Km-square blocks concerned by the first quarter, shall be submitted within 90 days before the beginning of the logging season. Complements for the planning of the other quarters must be submitted at least 30 days before their harvest begins.

The **following AOPs** must be submitted 60 days before the beginning of the logging season.

The Guidelines provide a typical plan template for each management document to be produced by the FMC holder. For each chapter, the overall principles and contents are stated. Models of the tables to be included in FMPs are also provided.

Table 2: 5-year timetable for drafting a management plan



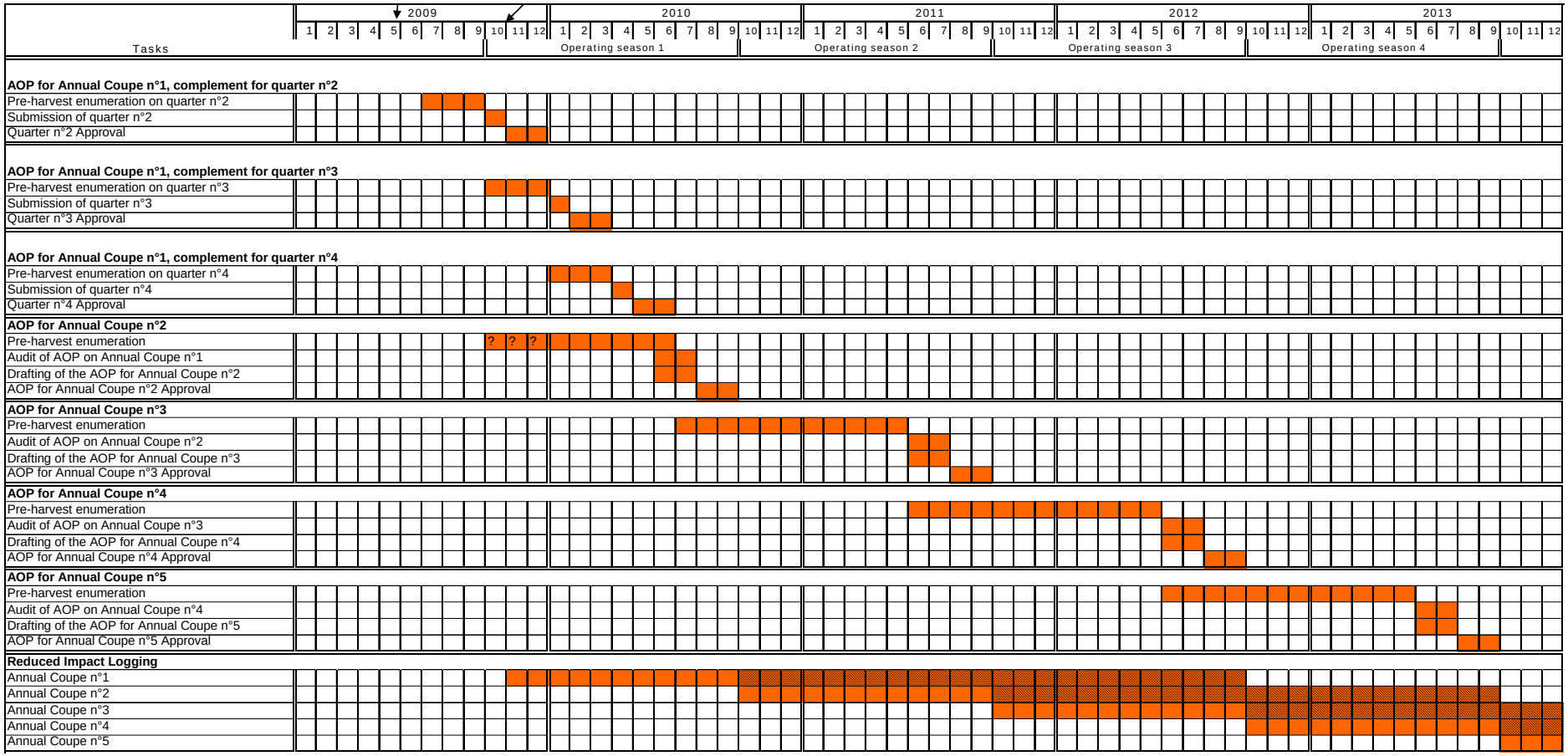

2009
2010
2011
2012
2013
1 2 3 4 5 6 7 8 9 10 11 12
Tasks
Operating season 1
Operating season 2
Operating season 3
Operating season 4
AOP for Annual Coupe n°1, complement for quarter n°2
Pre-harvest enumeration on quarter n°2
Submission of quarter n°2
Quarter n°2 Approval
AOP for Annual Coupe n°1, complement for quarter n°3
Pre-harvest enumeration on quarter n°3
Submission of quarter n°3
Quarter n°3 Approval
AOP for Annual Coupe n°1, complement for quarter n°4
Pre-harvest enumeration on quarter n°4
Submission of quarter n°4
Quarter n°4 Approval
AOP for Annual Coupe n°2
Pre-harvest enumeration
Audit of AOP on Annual Coupe n°1
Drafting of the AOP for Annual Coupe n°2
AOP for Annual Coupe n°2 Approval
AOP for Annual Coupe n°3
Pre-harvest enumeration
Audit of AOP on Annual Coupe n°2
Drafting of the AOP for Annual Coupe n°3
AOP for Annual Coupe n°3 Approval
AOP for Annual Coupe n°4
Pre-harvest enumeration
Audit of AOP on Annual Coupe n°3
Drafting of the AOP for Annual Coupe n°4
AOP for Annual Coupe n°4 Approval
AOP for Annual Coupe n°5
Pre-harvest enumeration
Audit of AOP on Annual Coupe n°4
Drafting of the AOP for Annual Coupe n°5
AOP for Annual Coupe n°5 Approval
Reduced Impact Logging
Annual Coupe n°1
Annual Coupe n°2
Annual Coupe n°3
Annual Coupe n°4
Annual Coupe n°5

Table 3: Timetable for drafting a management plan – extract for year 2009-2010

Tasks	2009							2010								
	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
SFMP, version 1																
Mapping / stratification																
Literature review																
Land use planning: partitioning into management units																
Delineation of the Forest Compartment n°1																
Drafting of the SFMP version 1																
SFMP, version 1, approval																
5YFMP for Forest Compartement n°1																
Delineation of the 5 first Annual Coupes (1/25 of the harvestable area each)																
Drafting of the 5YFMP																
5YFMP approval																
AOP for Annual Coupe n°1, with results on quarter n°1																
Pre-harvest enumeration on quarter n°1																
Drafting of the AOP for Annual Coupe n°1, quarter n°1																
AOP for Annual Coupe n°1, quarter n°1 Approval																
Quarter 1 logging																
AOP for Annual Coupe n°1, complement for quarter n°2																
Pre-harvest enumeration on quarter n°2																
Submission of quarter n°2																
Quarter n°2 Approval																
Quarter 2 logging																
AOP for Annual Coupe n°1, complement for quarter n°3																
Pre-harvest enumeration on quarter n°3																
Submission of quarter n°3																
Quarter n°3 Approval																
Quarter 3 logging																
AOP for Annual Coupe n°1, complement for quarter n°4 - if logging activities take place during this quarter																
Pre-harvest enumeration on quarter n°4																
Submission of quarter n°4																
Quarter n°4 Approval																
Quarter 4 logging																

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SECTION 2

STRATEGIC FOREST MANAGEMENT PLAN

July 2009

With the technical assistance of

SFMP
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STRATEGIC FOREST MANAGEMENT PLAN
TEMPLATE WITH COMMENTS

The Strategic Forest Management Plan (long-term management planning) will be prepared in two steps:

- Version 1 before the harvesting effective date and applicable in the first five years of the Forest Management Contract;
- Final version within 3 or 4 years from the Contract Effective Date.

The table of contents will be the same for Version 1 and the Final Version, but some sections will be not covered in Version 1 or differently covered in the two versions. The main differences between these 2 versions are indicated in boxes at the beginning of each concerned section. A summary of the sections to be covered by each version is provided below.

SFMP Sections		Version 1	Final version
1	Executive summary	To be covered	To be covered
2	Introduction	To be covered	To be covered
3	Document record sheet	To be covered	To be covered
4	General overview	To be covered	To be covered
5	Description of the managed forest and its environment	Based on available information	Updated with new data
6	Analysis of studies and work performed	See below	See below
6.1	Stratification and mapping	To be covered	Updated
6.2	Multi-resource inventory	Results of existing inventories only and planning of multi-resource inventory implementation	Based on multiresource inventory
6.3	Socioeconomic diagnosis	To be covered	Updated
7	Forest management proposition	See below	See below
7.1	Objectives	To be covered	To be covered
7.2	Applicable period of the forest management plan	To be covered	To be covered
7.3	Partitioning of the FMC into management units	To be covered	Updated
7.4	Management procedures for the Timber Production Unit	See below	See below

SFMP Sections		Version 1	Final version
	Management parameters	Refer to the Code of Forest Harvesting Practices	Review by the FDA
	Partitioning of the Forest compartments	Only FC 1, based on area	FC 2 to 5, based on volume
	Harvesting assessed yields	Not to be covered	To be covered
	Harvesting procedures	Provide Table 11 only	To be covered
7.5	Management procedures for the Conservation Unit		To be covered
7.6	Management procedures for the Protection Unit		To be covered
7.7	Management procedures for the Agriculture Unit		To be covered
7.8	Management procedures for the Reforestation Unit		To be covered
7.9	Research activities	Not to be covered	To be covered
7.10	Other environmental measures	Environmental Impact Assessment only	To be covered
8	Industrial planning	To be covered	Updated
9	Wildlife management	Not to be covered	To be covered
10	Social management	Timetable for socio-economic survey and public consultation only and reference to the social agreement	To be covered
11	Implementation, monitoring and evaluation of the forest management plan	Timetable for Final Version preparation only	To be covered
12	Economic and financial assessment	To be covered	To be covered
	Conclusion	To be covered	To be covered

1 EXECUTIVE SUMMARY

This section provides a 5 to 10 pages long summary of the SFMP document:

- Presentation of the managed area:
  - ✓ Location, surface area and boundaries - Administrative and legal status;
  - ✓ Forest stratification and land cover;
  - ✓ Wildlife and hunting;
  - ✓ Timber wood resources;
  - ✓ Local communities.

- Forest management decisions:
  - ✓ Management units;
  - ✓ Management parameters of the Timber Production Unit;
  - ✓ Environmental measures;
  - ✓ Social measures.

The summary must include the **management map**, showing the FMC boundaries, the Management Units, the Forest Compartments, the main roads and watercourses.

The summary must be distributed to representatives of all the affected communities during the public consultation for SFMP validation, according to regulation 105-07, section 51. More detail is provided in section 10.1.

2 INTRODUCTION

- Mission statement of the Forest Management Plan;
- Stated objectives;
- Partners for its preparation;
- Organization of its preparation.

3 DOCUMENT RECORD SHEET

- Name and contact address of Contract Holder;
- Contract reference number;
- SFMP reference number;
- Contract effective date;
- Dates of public consultation meetings;
- Date of submission to FDA for approval;
- Date of approval by FDA;
- Signatures.

4 GENERAL OVERVIEW

4.1 Institutional framework

This section provides a summary of the key elements stemming from the national and local institutional framework on the FMC area, listing the relevant national and local institutions and their responsibilities in the forest management of the FMC.

4.2 Legal framework

This section provides a summary of the forest management obligations stemming from the legal framework, including international treaties ratified by the Government of Liberia. This section should include the following topics:

- Forest management and use;
- Environment;
- Wildlife management;
- Protected species;
- Labour law and regulations;
- Forest Taxes.

4.3 Company Profile

- History;
- Number of employees by department;
- Past productions: volume per species and per year;
- Logging equipment and machinery;
- Processing capacities and industrial development projects: list of the mills, location, capacity (in volume) and past productions (volume per product and per year).

5 DESCRIPTION OF THE MANAGED FOREST AND ITS ENVIRONMENT

For Version 1 of the SFMP, this section is based on existing information only; no specific field study is required. In the case where no data is available, this part will not be covered.

This section will be updated for the Final Version of the SFMP with new data available.

5.1 Past history: activities and former management

Information required, if available:

- Description of the previous concession holders and of the extent of past logging activities (concerned areas, harvested volume per year and species, sylvicultural activities…). Special attention must be paid to pit-sawing activities;
- Description of the current FMC Holder and his past logging activities on the FMC Area (concerned areas, harvested volume, sylviculture…);
- Any other activities encroaching on the forest area: agricultural development, industrial plantation, mining.

Sources:

- FDA Annual Reports;
- Satellite images and GIS;
- FRM report, 2004.

This information will be used for the following tasks, detailed in the subsequent sections:

- Scheduling Forest Compartment and Annual Coupes openings;
- Updating harvestable volumes (optional);
- Identification of potential areas for the Reforestation unit.

5.2 Location, surface area and description of geographic boundaries

Information required, if available:

- Map at an appropriate scale at the FMC level (1/1.000.000 to 1/1.500.000) showing administrative boundaries, main road network, main towns, major rivers in and around the FMC;

Map 1: Location of the Forest Management Contract area

- Forest Management Contract boundaries: metes and bounds …;
- Identification of nearby land-use permits: FMCs and TSCs, communal or community forests, mining permits, protected areas and other land use affectation.

Sources:

- Bidding documents;
- Justification documents;
- FDA GIS data;
- FMC contracts.

This information will be used for the following tasks, detailed in subsequent sections:

- Identification of potential environmental constraints (natural parks, reserves…) that will be integrated in the management decisions.

5.3 Administrative and legal status

This section provides a summary on the FMC references, the bidding process and the Contract Effective Date.

5.4 Ecological factors

This section must not be only descriptive but must also underline the consequences on forest management and provide advice.

5.4.1 Climate

Information required, if available:

- Seasonal weather pattern in the Forest Management Contract area;
- Mean monthly rainfall and temperature levels (national meteorological network), illustrated by an ombrothermal diagram.

Sources:

- Ministry of Lands and Mines.

This information will be used for the following tasks, detailed in subsequent sections:

Planning of logging activities: road construction, maintenance and closure periods
logging season duration, extraction and transportation of the resource

5.4.2 Geology and pedology

Information required, if available:

- Geological history;
- Description of soil types: fertility, texture, hydromorphy, risks of erosion…;
- Existing maps (geological, pedological maps…).

Sources:

- Bureau of Geology / Ministry of Lands and Mines;
- Environmental Impact Assessment.

This information will be used for the following tasks, detailed in subsequent sections:

- Identification of suitability for other Land Uses, possible sources of road building material (laterite, rock…);
- Identification of forest management constraints, possible impacts on the natural environment so as to work out measures aimed at limiting these impacts;
- Identification and location of Protection Units and exclusion area;
- Planning for the resource accessibility and evacuation (road specifications, harvesting systems employed…).

5.4.3 Topography and Hydrography

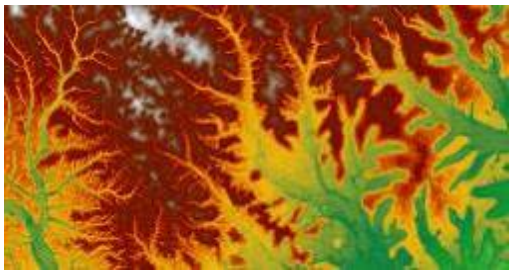
Information required, if available:

- Water courses;
- Relief: height and slopes;
- Map at an appropriate scale at the FMC level (scale between 1/400.000 and 1/600.000) showing the relief and the hydrographic network in and around the FMC.

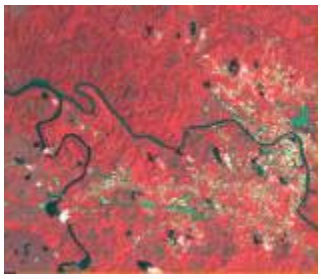
Map 2: Relief and hydrography

Sources:

- Existing topographic maps (scale 1/250 000);
- GIS Data: FDA GIS Department, UNHIC, FRM land cover 2004 study…;
- Digital Elevation Model (Shuttle Radar Topography Mission, 90 m resolution, downloaded from the web);
- Environmental Impact Assessment;
- Satellite imagery: Landsat, Aster…



Extract of Digital Elevation Model (SRTM)



Extract of a satellite scene

This information will be used for the following tasks, detailed in subsequent sections:

- Identification of critical watersheds, exclusion areas and Protection Units (sensitive areas: slopes > 30%, swampy areas, riverbanks, in accordance with Liberian Code of Forest Harvesting Practices …);
- Identification of forest management constraints, possible impacts on the natural environment so as to work out measures aimed at limiting these impacts;
- Planning for the resource accessibility and transportation (road network).

5.4.4 Vegetation (forest and non-forest formations)

Information required, if available:

- Description, location and surface area of forest and vegetation types on the FMC area: refer to Table 1 (§6.1) for SFMP final Version.

Sources:

- FRM Land cover study (2004);
- General report on National Forest Inventory in Liberia, German Forestry Mission to Liberia (1968);
- Other GIS data, maps and reports.

This information will be used for the following tasks, detailed in subsequent sections:

- Identification of the Timber Production Unit and sensitive vegetation types for protection, including buffer zone, and Conservation Units. This information will be used during the forest management land use process.

5.4.5 Wildlife

Information required, if available:

- Identification and location of important wildlife species in the FMC area, assessment of the population densities: refer to § 6.2;
- Assessment of the risks for wildlife species, especially due to hunting.

Sources:

- Existing data on wildlife (reports by NGOs/experts);
- Environmental Impact Assessment.

This information will be used for the following tasks, detailed in subsequent sections:

- Identification of Protection and Conservation Units included in the Forest Management land use;
- Wildlife management: rules for hunting, alternative protein supply, monitoring;
- Rules for harvesting practices.

5.5 Communication network and infrastructure

Information required, if available:

- Human settlements and demography;
- Road network location and state;
- Education infrastructure and services: location, staff and skills, equipment;
- Healthcare infrastructure and services: location, staff and skills, equipment.

Sources:

- GIS data;
- Justification document;
- Social agreement.

This information will be used for the following tasks, detailed in subsequent sections:

- Access to the concerned FMC area;
- Planning of log transport and road network;

- Location of base camp.

5.6 Economic activities

Describe the activities of the populations:

- Forest-related activities;
- Farming;
- Fishing;
- Hunting;
- Livestock breeding;
- Small scale craft activities;
- Gathering and/or use of non-timber forest products (NTFP).

Describe the activities of the private companies:

- Logging and forest industry;
- Mining;
- Agro-industry;
- Industrial fishing;
- Tourism and ecotourism;
- Trade and other industries.

6 ANALYSIS OF STUDIES AND WORK PERFORMED

6.1 Stratification and mapping

The methodology and the results of this study will be provided by Version 1 of the SFMP, and refined in the Final Version of the SFMP, to be prepared within 4 years from the Contract Effective Date.

These activities require GIS skills. This study can be performed by FDA.

Information required, if available:

- Watercourse location and types;
- Road network and other infrastructure;
- Relief: height and slopes;
- Land cover and vegetation types location and description;
- Human settlements;
- FMC boundaries;
- Administrative boundaries.

Source:

- Existing thematic maps: Topographic maps (scale 1/250.000), pedology, geology…;
- GPS field records: road network, villages, settlements, hydrographic network, forest and vegetation types…;
- GIS data: FDA, UNHIC, FRM land cover study;
- Digital Elevation Model (Shuttle Radar Topography Mission, 90 m resolution, internet downloadable);
- Current and old satellite images to detect changes in the land cover: Landsat, Aster…;
- Dedicated remote sensing studies based on satellite imagery;
- Multi-resource inventory.

This information will be used for the following tasks, detailed in subsequent sections

Mapping is used at every step of the forest management planning process and various maps are produced:

- Location of the FMC Area;
- Topography and hydrography;
- Social infrastructure, demography and location of the local communities;
- Land cover: forest stratification – vegetation map;
- Sampling plan of the multi-resource inventory;
- Spatial analysis of field data: tree species and fauna populations density maps;
- Management maps: Forest Compartments location, road network proposal, social map, inventory map, pre-harvest map…

Methodology

In this part, the FMC Holder must summarize the applied methodology leading to the forest stratification and map of land cover types:

- Data is centralized in a cartographic data base which is constantly updated with data produced from field activities (multi-resource inventory, socioeconomic diagnosis…);
- Digitization work at a scale of 1/50.000.

Land cover mapping requirements:

- Forest stratification based on analysis of current satellite imagery;
- Diachronic satellite image analysis to detect changes in the forest cover, especially deforestation;
- Digitization on computer of the different land cover types:

  Forest types with forest density characterisation: dense forest / open forest, forest on permanent or seasonal swamp, mountainous forest, secondary forest, regrowth…
  Non-forest formations: savannas, low bush, industrial plantations, water, crop clearing and farmlands, village areas…
- Minimum surface for the mapping entity: surface area 25 to 50 ha;
- Minimum size for the mapping of swampy areas: width 100 meters;
- Ground truthing and validation of the digitization (multi-resource inventory, socioeconomic diagnosis…), to be carried out only for SFMP final Version;
- Map production (scale between 1/50.000 and 1/150.000) including map instructions detailing the methodology and describing the land cover types at the FMC level.

INSERT IN THIS CHAPTER

Map 3: Forest stratification and land cover types on the Forest Management Contract area

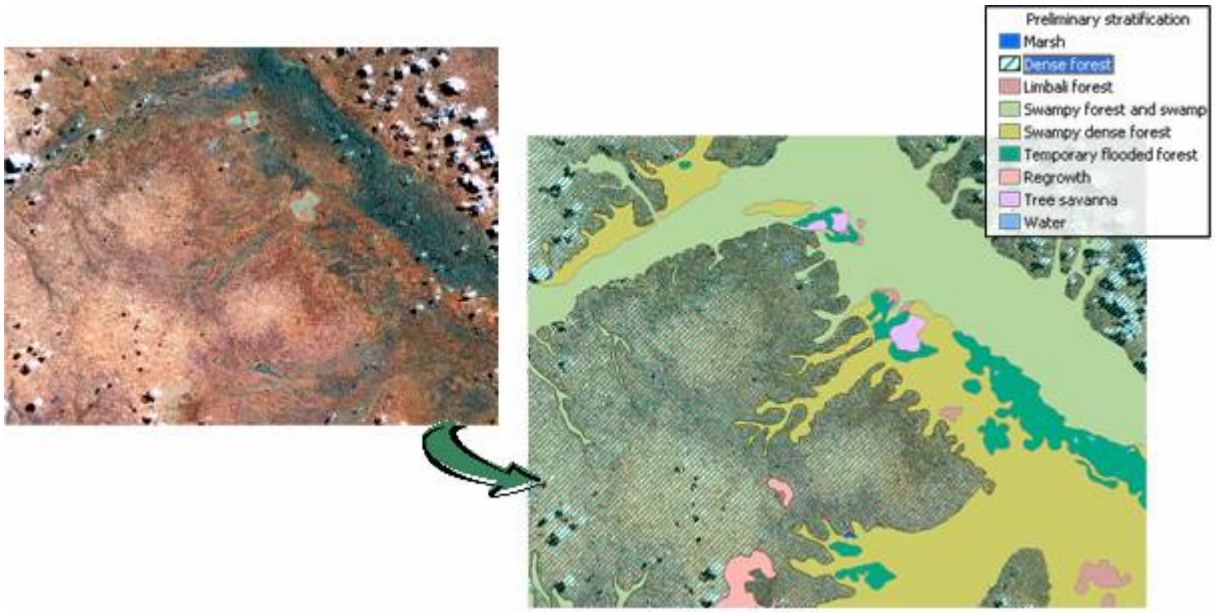


Figure 1: Example of digitization and forest stratification

- Non harvestable and harvestable area, to be calculated from the land cover map: provide a synthetic table according to following model:

Table 1: Summary of surface areas by land cover type on the FMC area, calculated by GIS

Land cover type	**Surface area (ha)**	**% of total area**
Land cover type 1		
…..		
Total of harvestable areas (forest land cover)		
Total of non-harvestable areas		
TOTAL		

6.2 Multi-resource inventory

This section will be detailed only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date, according to the following requirements.

Version 1 of the Strategic Forest Management Plan will provide and comment on the results of inventories previously conducted on the FMC (including inventory data provided by justification documents). Version 1 of the SFMP must provide a precise timetable (cf. model provided in Table 2 section 1) for the implementation of the multi-resource inventory; this inventory will be implemented according to the requirements of the Guidelines for Forest Management Planning.

The following elements in this section 6.2 are not required for Version 1 of the SFMP.

6.2.1 Objectives

The multi-resource inventory is the key study for the long-term management planning of the Forest Management Contract, to achieve several objectives:

- Assessment of the current timber resource (commercial volume for the first cutting cycle) in order to plan the harvesting activities on Forest Compartments;
- Assessment of the future timber resource (inventory of trees under the DBH Cutting Limit);
- Assessment of the natural regeneration of the major marketable tree species;
- Guide for the forest company concerning industrial choices, market development and production diversification;
- Assessment of the local diversity (biodiversity spot): fauna, flora (inventory of all tree species), forest ecosystems, non-timber forest products…

6.2.2 Methodology

In this section, the FMC Holder provides a summary of the methodology used for the multi-resource inventory.

We provide here the principles of the multi-resource inventory methodology.

The **multi-resource inventory** is a statistic inventory focussing on tree stands samples. This inventory covers all the forest area (survey on a large area) with a different sampling intensity according to the diameter class records. The following principles apply:

- to ensure reliability and accuracy for data processing, a minimum sampling rate on the harvestable forest surface must be applied (for trees above 40 cm):
  - ✓ 1% minimum for a FMC < 200 000 ha
  - ✓ 0,8% minimum for a FMC > 200 000 ha

- the sampling intensity can be defined according to the forest variability (analysis of pre-inventory data or existing inventory data), the implementation of a pre-inventory is optional;
- the inventory is based on a sampling plan: equidistant parallel transects, and as far as possible placed perpendicularly to the hydrographic network. To facilitate the design of the sampling plan, the forest area will be divided into different forest sampling units. The sampling plan must be illustrated by maps (scale between 1/250.000 and 1/350.000) and by tables describing transects (start and finish point characteristics, length of transects…). The sampling plan must be submitted to the FDA prior to the beginning of the field work.

INSERT IN THIS CHAPTER

Map 4: Sampling plan of the multi-resource inventory on the FMC area (to be included only in Final Version of the SFMP)

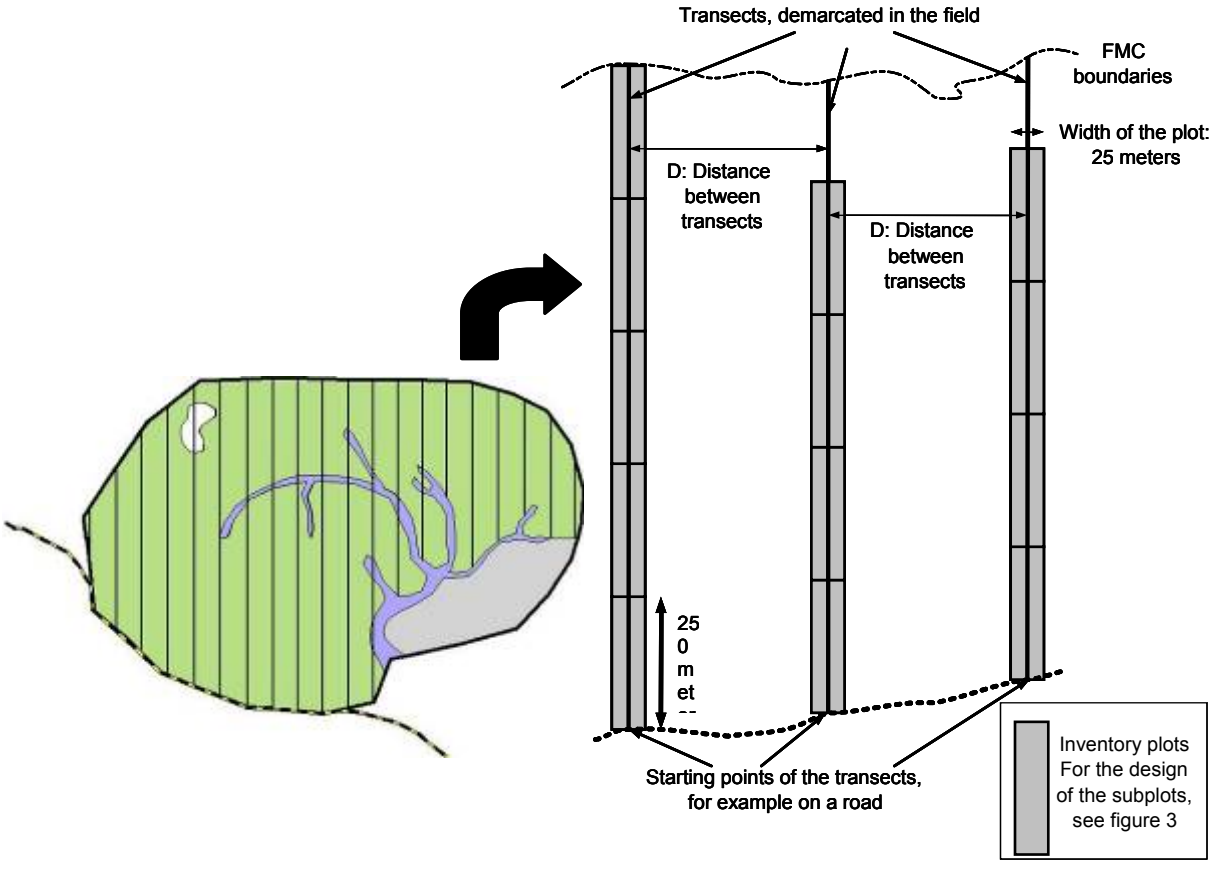


Figure 2: Inventory design: sampling plan

- each transect is divided into 0,5 ha plots: 200m length x 25m width;
- each plot is centred on the transect and divided into different sampling subplots according to the tree diameter class:

Plot	Area	Diameter class
200 x 25 meters	0,5 ha	40 cm and more
100 x 25 meters	0,25 ha	20 cm and more
40 x 25 meters (optional)	0,1 ha	10 cm and more

- DBH is measured according to fixed conventions. Trees are recorded per diameter classes of 10 cm range and all tree species are considered;
- Identification of all recorded trees;
- Assessment of tree stems quality;
- Records of direct/indirect signs of fauna, non-timber forest products, marketable tree regeneration and other biodiversity signs.

The multi-resource inventory protocol is summarized in the following diagram:

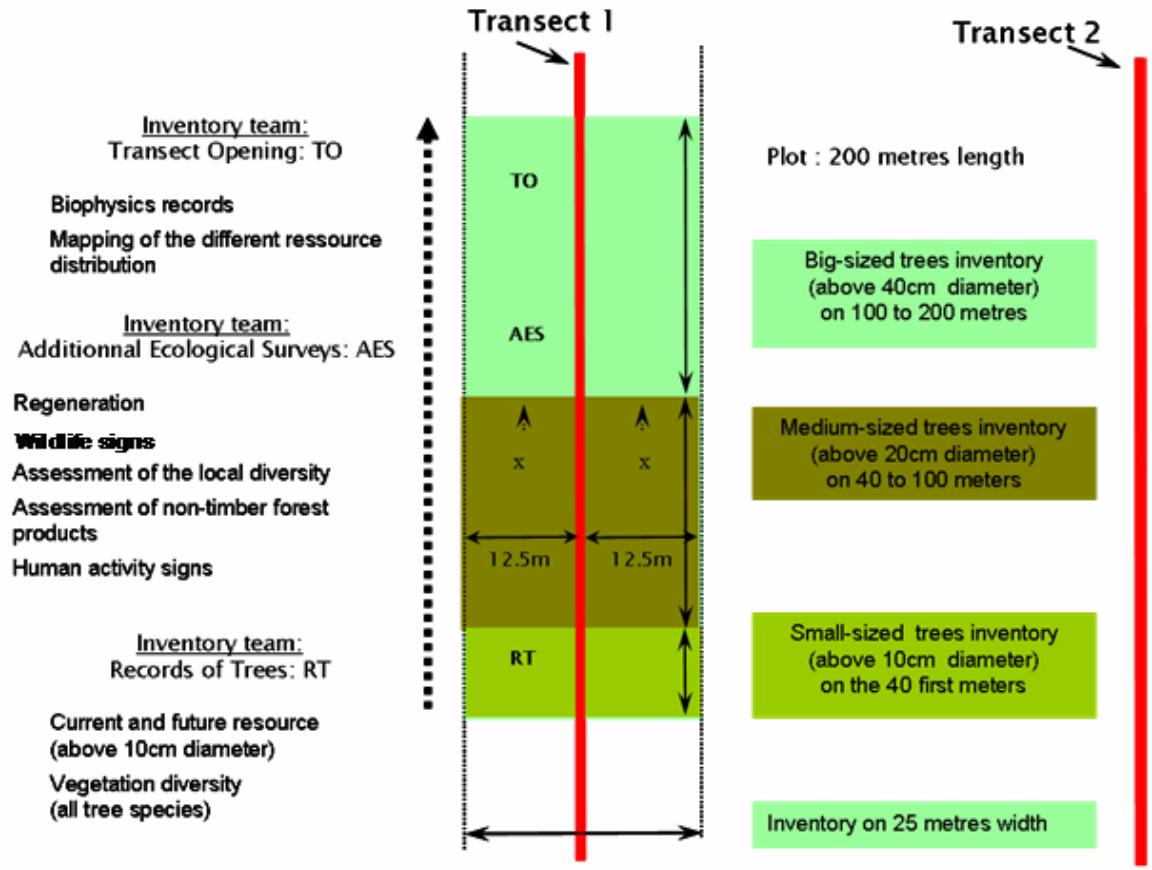


Figure 3: The inventory protocol: data collected and plot design

6.2.3 Data processing and analysis parameters

Data processing leads to the drafting of an inventory report and requires specific software, associated with a GIS, to enter and analyse the data, and evaluate the reliability of the obtained results before their interpretation.

The parameters required for volume calculation are provided by the following figure:

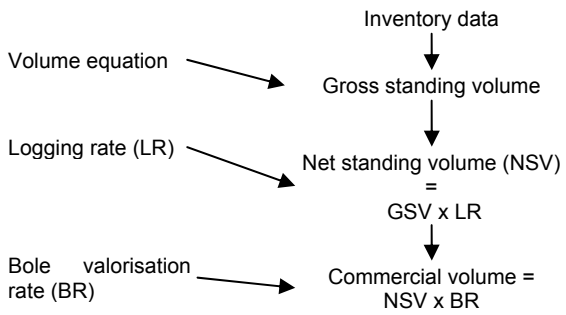


Figure 4: Principle for calculating the commercial volume

- **Volume equations**: The volume equations will be provided and established **by the FDA** for each tree species, or group of tree species, according to the result of dendrometric studies at the forest region level (for the South East and the North West forest regions). At the beginning of the process, existing volume equations from the neighbouring countries (especially Ivory Coast) can be used, and new volume equations will be built by the FDA, based on specific Liberian field studies.

The principles are based on:

- Priority to marketable tree species and potentially marketable tree species;
- Use data from field studies: the Bitterlich relascope method (measure of standing trees) and measures of felled trees;
- For species which have not been recorded with the Bitterlich relascope, use existing equations.

- **Valorisation rates**: established **by the FMC Holder** to convert numbers of standing trees or gross standing volumes into numbers of harvestable trees or commercial volumes that can actually be harvested and/or marketed.
- **Logging rate:** some trees with diameter above Diameter Cutting Limit are not harvested, mainly due to their bad quality. This rate determines the true harvestable part of standing trees compared

to the total available standing tree volume and enables to assess the gross standing volume of harvested trees:

- Established for a given species in a given context;
- Takes into account the selection criteria of harvestable trees: timber and stem quality, species, market and company criteria.

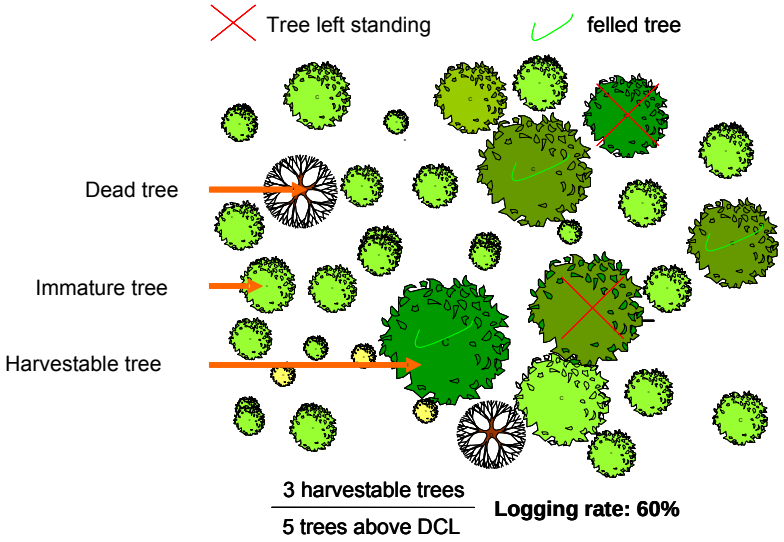


Figure 5: Logging rate illustration

Bole valorisation rate: part of the felled trees will not be actually sold because of defects (see below). This rate determines the commercial volume of harvested trees by taking into account the scraps (felling losses, wastage…) at each stage of the logging process.

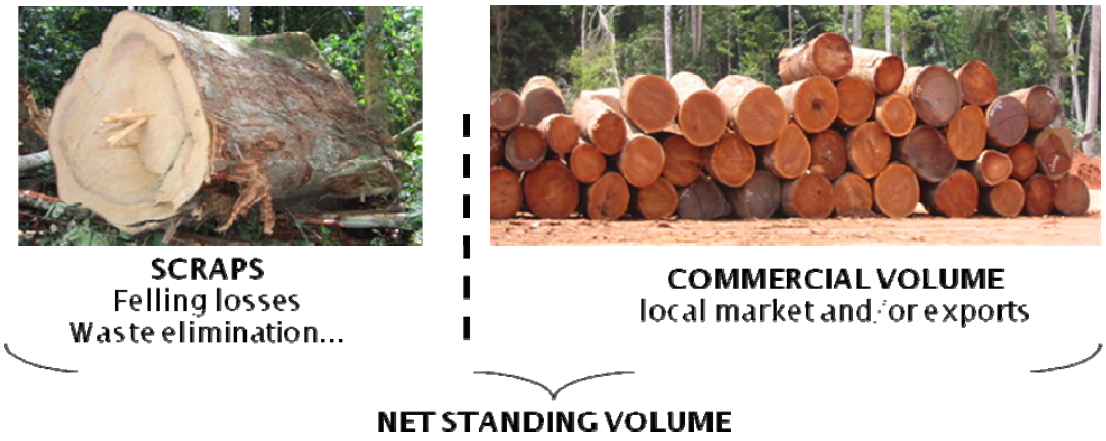


Figure 6: Bole valorisation rate illustration

The Holder must provide a table listing by species the volume equation, the logging rate and the bole valorisation rate, according to the model below.

Table 2: Volume equations and valorisation rates used for the inventory analysis (to be included only in Final Version of the SFMP)

Species	Volume equation	Logging rate	Bole valorisation rate
Class A			
Species 1			
Species 2			
…..			
Class B			
…..			

- **species groups**: these groups are provided by the FDA for the species Classes A, B and C (Appendix 2). Class D will contain the other tree species identified during the multi-resource inventory.

In already harvested areas, the inventory data can be updated (it is not mandatory), to take into account the natural growth between the inventory and the harvesting date. For this update, a matrix model must be used. The parameters to be used are the following:

- **annual diameter growth rates**: use data derived from:
  - ✓ literature review (neighbouring countries…);
  - ✓ annual ring analysis;
  - ✓ permanent sample plot studies.

A synthesis of existing data for Class A species is provided in Appendix 3.

- **natural mortality**: the natural tree death rate is generally estimated at 1% in tropical moist forests (1% of the trees die each year naturally).

- **harvesting damage**: the harvesting damage rate is generally estimated 10% (10% of the trees die because of the harvesting).

6.2.4 Results

The inventory report must provide the following tables, charts and maps, giving:

- number of standing and harvestable trees per species and diameter class;
- basal-area per species;
- gross standing and commercial volumes per species and diameter class;
- location of the harvestable volumes per species on the FMC;
- standard error on volumes, per species and diameter class.

These tables and charts must be prepared according to the following models:

Table 3: Synthesis per species and class of species of the multi-resource inventory: density and basal-area per hectare (to be included only in Final Version of the SFMP)

			Density (stems/ha)				Total basal-area (m^2/ha)
Species	**Botanical name**	**DCL (cm)**	**Stems >= DCL[1]**	**Harvest-able stems**	**Stems > 40 cm**	**Total stems > 10 cm**	
Class A							
Total class A							
Class B							
Total class B							
…							
Great total							

[1] *DCL: DBH Cutting Limit*

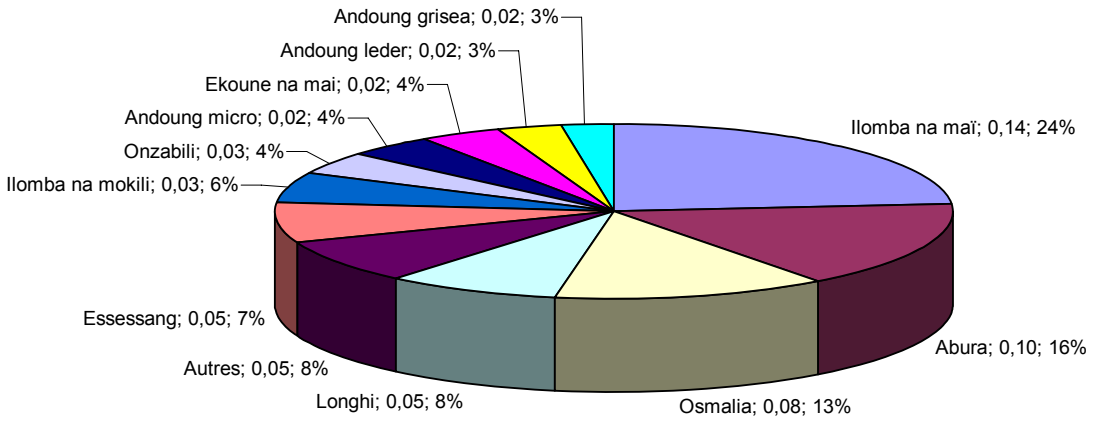


Figure 7: Repartition of the total commercial volume per tree species ≥ DCL, for each Class of species (example)

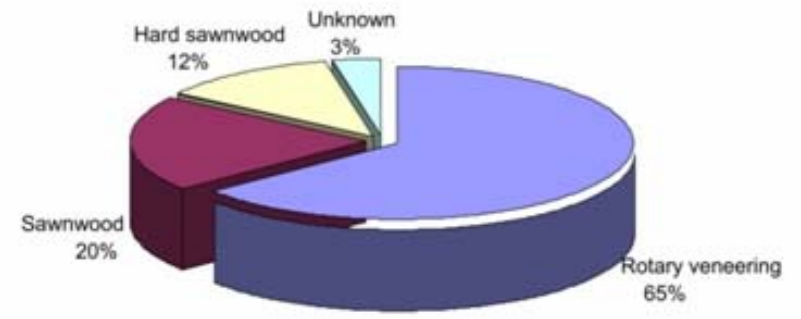


Figure 8: Repartition of the total commercial volume per Class of species ≥ DCL (example)

Table 4: Volumes per tree species, and class of species, per hectare (to be included only in Final Version of the SFMP)

		Gross standing volume			Commercial volume		
		(m^3/ha)			(m^3/ha)		
Species	**DCL(cm)**	**≥DCL**	**≥50 cm**	**≥70 cm**	**≥DCL**	**≥50 cm**	**≥70 cm**
Class A							
Total class A							
Class B							
Total class B							
…							
Great total							

- Resource location maps: provide resource location maps per tree species for class A and B, except for rare species (scale at between 1/400.000 and 1/600.000):

INSERT IN THIS CHAPTER

Map 5: Timber resource location maps (for each species of the Class A and B tree species) (to be included only in Final Version of the SFMP)

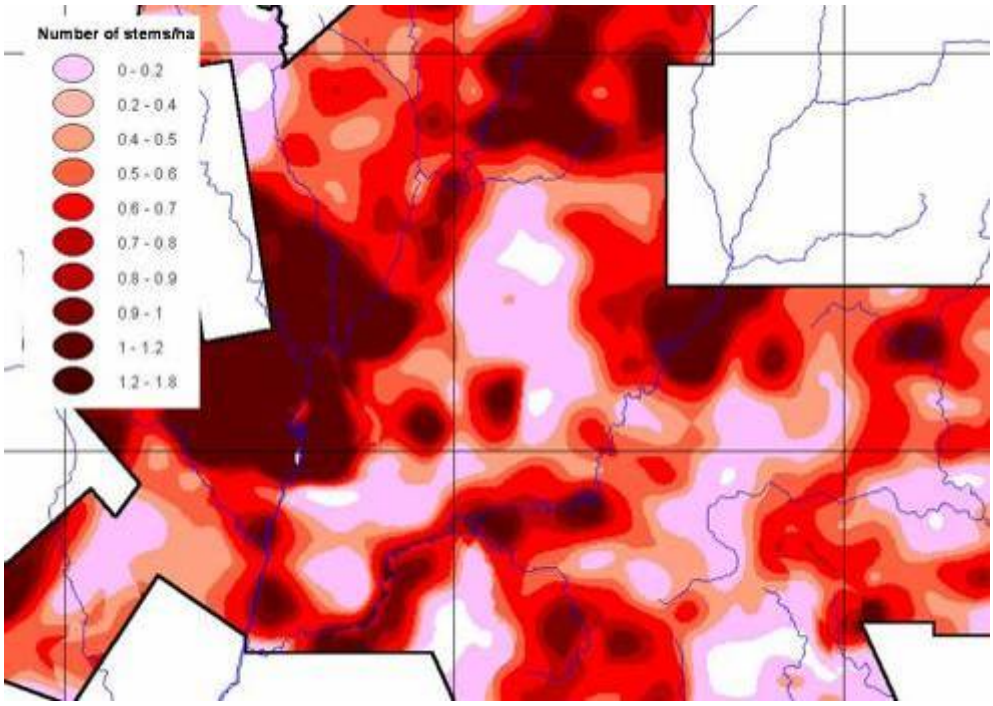


Figure 9: Extract of a resource location map (to be included only in Final Version of the SFMP)

- **Stand structure and comments regarding the species ecology:** provide stand structures (histograms) of tree species, and group of species, to show regeneration deficit and provide an overview of the renewal capacities and growth behaviour. This stand structure charts will be provided for class A and B species, except for the rare species.

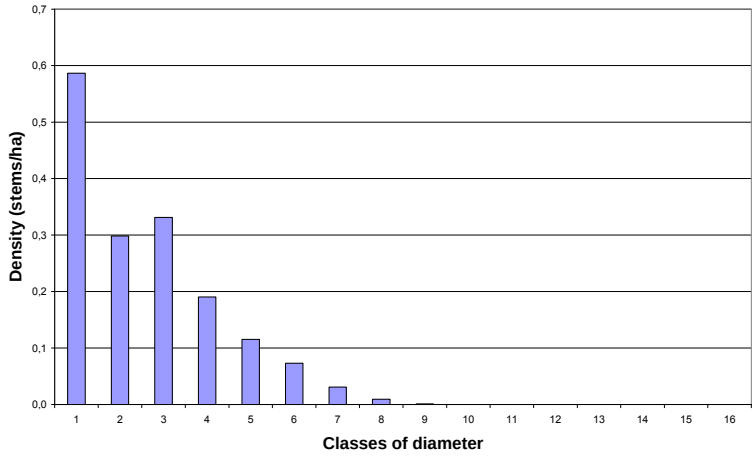


Figure 10: Example of an histogram of standing tree species (to be included only in Final Version of the SFMP)

- **Results on wildlife:** provide synthetic tables of indicators and abundance, and location maps:

INSERT IN THIS CHAPTER

Map 6: Mammal population density maps (for the main species identified during the multi-resource inventory) (to be included only in Final Version of the SFMP)

- **Results on NTFP**: provide a table giving abundance, and location maps, according to the following model:

Table 5: Synthesis on NTFP records (to be included only in Final Version of the SFMP)

Products	Observation number[2]	Frequency[3]

INSERT IN THIS CHAPTER

Map 7: NTFP abundance location maps (for the main NTFP identified during the multi-resource inventory) (to be included only in Final Version of the SFMP)

[2] *Number of inventory plots containing the concerned NTFP.*
[3] *Percentage of inventory plots containing the concerned NTFP.*

6.3 Socioeconomic diagnosis

This section will be detailed in Version 1 of the SFMP and will be updated in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date.

This section will be based on data provided by the justification document, this data should be updated or completed for the Final Version of the SFMP.

The analysis of the socioeconomic environment is twofold:

- **at base camps**, the objectives are to:
  - ✓ Identify all concerned parties via a fully inclusive census;
  - ✓ Review the current situation concerning living conditions and the needs to be covered for each type of management measures (healthcare, basic education, access to drinking water, food safety, habitat and hygiene and socio-cultural development). Identify measures to improve the living conditions of the employees and their families, if necessary;
  - ✓ Review of the current situation on the working conditions (working safety, training programmes…). Identify measures to improve the working conditions of the employees, if necessary.

- **in local villages**, the field data to collect and the expected results of the socioeconomic diagnosis concern:
  - ✓ **population background history:** identification and location of all the villages inside the FMC boundaries, analysis of the population origins and the reasons for any migratory flows;
  - ✓ **demographic features**: population census and description (per origin, sex, age class, job activities…) and description of demographic trends;
  - ✓ **local communities organization**: designated representatives persons (village leaders…), the standard decision-making, land ownership status, the local management of natural resources and the traditional mechanisms of conflict resolutions, Common Initiative Groups;
  - ✓ **infrastructure and living conditions**: healthcare, education, hygiene, drinking water… to identify the main means of local development that can be included in social agreements;
  - ✓ **production systems and local economies**: identify the village territory boundaries, the exploitation process of natural resource (agriculture, livestock, hunting, fishing, collect of NTFP) and their importance in term of generating incomes;
  - ✓ **local population's uses of the forest**: analysis of the various uses made of the forest (economic, cultural, medical…) to prevent and avoid existing and potential conflicts, develop sustainable use of the natural resources (hunting regulation…).

A model of the form that can be used for the socio-economic survey is provided in Appendix 4. This form is extracted from the ATIBT handbook "the requirements of a practical forest management plan for natural tropical African production forest".

This section will be illustrated by maps at the FMC level (scale between 1/400.000 and 1/600.000):

INSERT IN THIS CHAPTER

Map 8: Demography on the FMC area

Map 9: Social infrastructure on the FMC area

7 FOREST MANAGEMENT FINAL PROPOSAL

7.1 Objectives

The sustainable forest management implies a triple durability through a constant timber production (economic objective) while protecting the social and environmental functions of the forest (social and ecological objectives). These objectives aim at guarantying company, forest and local community activities sustainability. To answer these objectives, the forest management is based on a land use planning of the FMC, partitioned into different management units (timber production, conservation, protection, reforestation and agriculture).

This section will state a list of objectives for the FMC, based on the following:

The **main objective** is:

1. to ensure a sustainable timber production, economically acceptable by the company, intended for log export or for the industrial processing in Liberia.

The **associated objectives**, to be adapted for each FMC specific context are:

2. to guarantee that the harvesting on the FMC of Non Timber Forest Products, including busmeat, endangers neither the resources (vegetable and animal), nor the ecosystems.
3. to make sure that the forest ecosystem keeps after logging activities a maximum of its ecological functions and its biodiversity.
4. to protect effectively the particularly sensitive areas and those containing an exceptional ecological potential.
5. to provide forest company employees good living and working conditions, and to arrange necessary means for that purpose.
6. to contribute to the national economy and the local development in the villages of the FMC by a better local redistribution of logging activities benefits (sustainable benefits for all the stakeholders).

7. to implement study and research programs on the FMC to improve the logging practices, the forest management and to estimate the logging impacts and the performance of the measures fixed by the SFMP.

7.2 Applicable period of the Strategic Forest Management Plan

Version 1 of the SFMP: 5 years; Final version of the SFMP, to be prepared within 4 years from the Contract Effective Date: 20 years

The SFMP can be reviewed before the end of the applicable period, under the conditions defined by chapter 11.3.

7.3 Partitioning of the FMC into management units

Version 1 of the SFMP: partitioning based only on the results of the land cover study (see 6.1). Final version of the SFMP: partitioning refined and completed. The harvestable area will be the area of the Timber Production Unit.

Land use planning is based on:

- results of the forest stratification mapping;
- results of the multi-resource inventory;
- socio-economic surveys.

Objectives of the land-use planning:

- Identify the productive and the non-productive areas (using the forest stratification mapping);
- Define the different management units within the FMC Area:

  Timber Production Unit – harvesting allowed: only for logging activities;
  Protection Unit –harvesting restricted;
  Conservation unit – no harvesting allowed;
  Reforestation unit;
  Agriculture unit – community uses.

The creation of Conservation, Agriculture and Reforestation Units in the SFMP is not compulsory in Liberia but recommended. In that case, the recommended criteria must be observed. A Conservation Unit may be requested by some holders interested by forest certification.

THE TIMBER PRODUCTION UNIT

Identification criteria:

Areas with forest cover only;
Areas with slope less than 30%;
Areas not included in other management units.

Data used:

Multi-resource Inventory data;
Satellite images and GIS;
Digital Elevation Model.

THE PROTECTION UNIT

According to the Code of Forest Harvesting Practices, the Protection Unit must include sensitive areas:

Identification criteria:

Swampy areas;
Areas with slope above 30%;
Areas of cultural importance (such as historical, archaeological and spiritual sites);
Watercourses and buffer strip protection.

Data used:

Multi-resource Inventory data;
Satellite images and GIS;
Socio-economic study;
Digital Elevation Model.

THE CONSERVATION UNIT

This unit is not mandatory but may be requested by some holders, especially those interested by forest certification. The location of the Conservation Unit must be justified in the SFMP:

Identification criteria:

Areas that contain special importance for flora and fauna: protect Wildlife habitats, endemic species habitats …;
Areas with biological diversity: high altitude forests, mangrove forests…;

Data used:

Multi-resource Inventory data;
Location maps.

THE REFORESTATION UNIT

Areas dedicated to reforestation by using natural or artificial forest regeneration:

Selection criteria:

degraded forest areas;
abandoned agriculture areas.

Data used:

Multi-resource Inventory data;
Socioeconomic diagnosis data;
Satellite images and GIS.

THE AGRICULTURE UNIT

Extension of farmland surface area on the territory of the Timber Production Unit, during the 25 years of the contract, will be granted after consultation of the concerned local communities and the FMC Holder.

Selection criteria:

Areas reserved for local community uses: needs for farmlands, forest uses, small scale and local-craftmaking…;
Potentially deforested areas in agreement and cooperation with local communities.

Data used:

Satellite images, diachronic satellite image analysis and GIS;
Socioeconomic diagnosis data: farming practices, population growth.

The location and size of the Agriculture Unit created for each affected community must be validated by the community and included in the social agreement between the FMC Holder and the community.

Considering the existence of forest local right uses, all the Management Units could be considered as forest territories with several purposes where these rights must be respected. In parallel, the local communities must be encouraged towards a sustainable use of the natural resources.

- Rules used for partitioning: The partitioning principles aim at facilitating the field marking of Management Units boundaries and must be based on:
  - ✓ Natural boundaries (rivers, swamp, topographic limits…) if possible;

- ✓ Human limits (administrative/official limits, roads…) if possible;
- ✓ Otherwise straight transects, in order to be easier to demarcate.

For the Agriculture Unit other principles come in addition:

- ✓ Agriculture dynamism: location of farmland expansion (diachronic satellite imagery analysis);
- ✓ Allocated space proportional to the population size of villages;
- ✓ Inclusion of existing crop clearing.

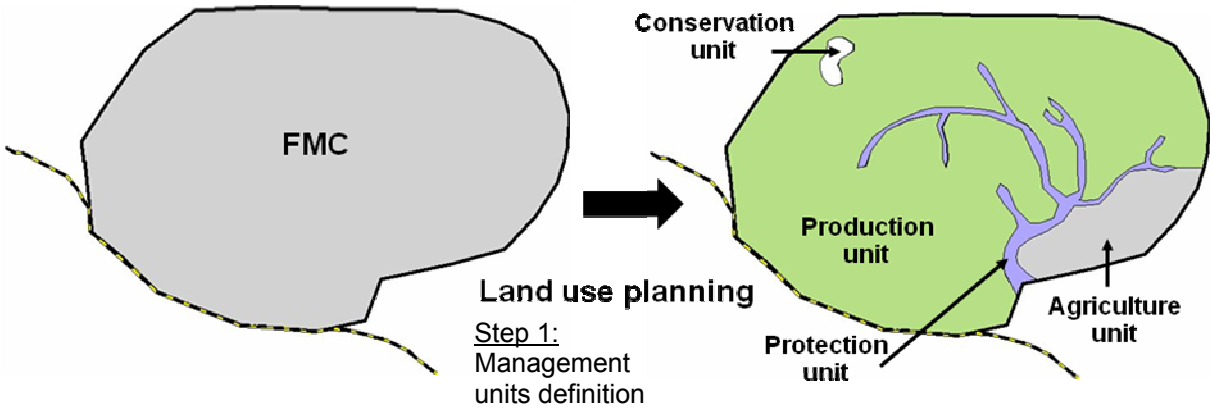


Figure 11: Management process: step 1: Break FMC down into management units

- Maps: This section must be illustrated by a map at an appropriate scale (scale between 1/250.000 and 1/350.000);

INSERT IN THIS CHAPTER

Map 10: Forest management units within the FMC area

- Area for each management unit: provide a synthetic table, according to the following model:

Table 6: Management units created on the Forest Management Contract[4]

Units number	Management units	Description	Surface area (ha)	%
1.1	Protection			
1.X				
2.1	Conservation			
2.X				
3.1	Reforestation			
3.X				
4	Agriculture			
Total non timber productive management units				
5.1	Timber Production			
5.2				
5 Total				
		Total		

Several Timber Production Units can be defined, for example if the resource is very heterogeneous on the FMC, in order to insure a constant production by species.

For Protection, Conservation, and Reforestation Units, several units may be defined, because of different objectives or characteristics.

7.4 Management procedures for the Timber Production Unit

- Management parameters: in compliance with Liberian regulations, the Code of Forest Harvesting Practices:
  - ✓ **managed tree species:** the selection of species to be managed are provided by the FDA tree species list: Class A, Class B and Class C;
    protected tree species: according to the Code of Forest Harvesting Practices, these are mostly the CITES, IUCN and National red list species including rare, endangered and mother/seed species.

Version 1 of the SFMP: refer to the Code of Forest Harvesting Practices;

Final version of the SFMP: the list of the protected tree species should be refined during the preparation of the SFMP (see Appendix 5).

[4] *For some unit types, several unit may be created on the FMC*

According to the results of multi-resource inventories at the forest stand or national level, the FDA will provide a list of protected species that do not reach a total density of 0,02 stems/ha (for trees above 10 cm DBH), see Appendix 5 for the rules regarding rare species.

- ✓ **rotation duration**: the rotation duration is set at 25 years, but can be extended if justified by the holder, the rotation must be always a multiple of 5 years;

- ✓ **DBH cutting limit**:

Version 1 of the SFMP: refer to the Code of Forest Harvesting Practices about the existing DBH cutting limit;

Final version of the SFMP: these DBH Cutting Limits should be updated by the FDA during the preparation of the SFMP see Appendix 5 for the rules regarding the DBH cutting limit definition. This update will be decided by the FDA after a consultation process.

Species list and Diameter Cutting limits by species must be listed in this section in a table as follows:

Table 7: Species and Diameter Cutting Limits

Species	Diameter Cutting Limit (cm)
Class A	
Species 1	
Species 2	
……	
Class B	
……..	

- Division of the Forest compartments:

Version 1 of the SFMP: create boundaries for Forest Compartment n°1 based on area: Forest Compartment n°1 contains 20% (+/-5%) of the harvestable area (1/25 of the harvestable area for each Annual Coupe).

Final version of the SFMP (prepared within 4 years from the Contract Effective Date): create boundaries for the remaining four Forest Compartments, defined by volume, each of them containing the same volume (+/-5%).

Procedure to define the Forest Compartment:

Version 1 of the SFMP:

1. calculation of the harvestable area of the FMC, based on GIS study: HA FMC
2. calculation of the theoretical harvestable area of Forest Compartment n°1: HA FC1 = HA FMC / 5
3. delineation of Forest Compartment n°1 containing HA FC1 +/- 5%

The maximum deviation to the average of +/-5% must be calculated as explained below

Deviation (+/- 5%) = ((HA FC1 – (HA FMC / 5) / HA FMC / 5) x 100

With: HA FC1: Harvestable Area of the Forest Compartment n°1

HA FMC Harvestable Area of the Forest Management Contract

For example, if HA FMC = 100 000 ha, harvestable area of FC n°1 must be lower than 21 000 ha and bigger than 19 000 ha.

The deviation to the average is always calculated with this same methodology in the SFMP.

Table 8: Forest Compartment n°1: surface areas (to be included only in version 1 of the SFMP)

HA FC1	
HA FMC	
Deviation to the average	

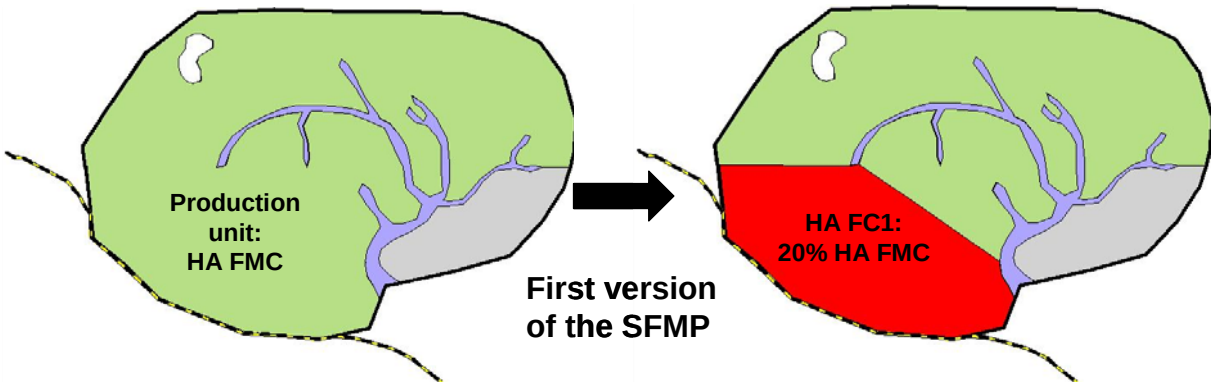


Figure 12: Example of the first Forest Compartment delineation[5]

[5] *HA FMC: Harvestable Area of the FMC*
HA FC 1: Harvestable Area of Forest Compartment 1

Final version of the SFMP:

1. calculation of the Harvestable Volume (gross standing volume of trees of class A above DCL) on the residual area (excluding FC 1), based on multi-resource inventory: HV FC 2-5;
2. calculation of the theoretical harvestable volume (gross standing volume of trees of class A above DCL) to be contained by each remaining Forest Compartment: HV FC = HV FC 2-5 / 4;
3. delineation of Forest Compartment n°2 to 5 containing HV FC +/- 5% by using the results of the multi-resource inventory (analysis of the inventory plots located inside each Forest Compartment):

   Deviation to the average (+/- 5%) = $((V_{fc} – V_a) / V_{fc}) \times 100$

   With: V_{fc}: total gross standing volume for Class A species on the Concerned Forest Compartment

   V_a: average of gross standing volume for Class A species on Forest Compartments 2 to 5.

In areas already harvested, the inventory can be updated (it is not mandatory), to take into account the natural growth between the inventory and the harvesting date.

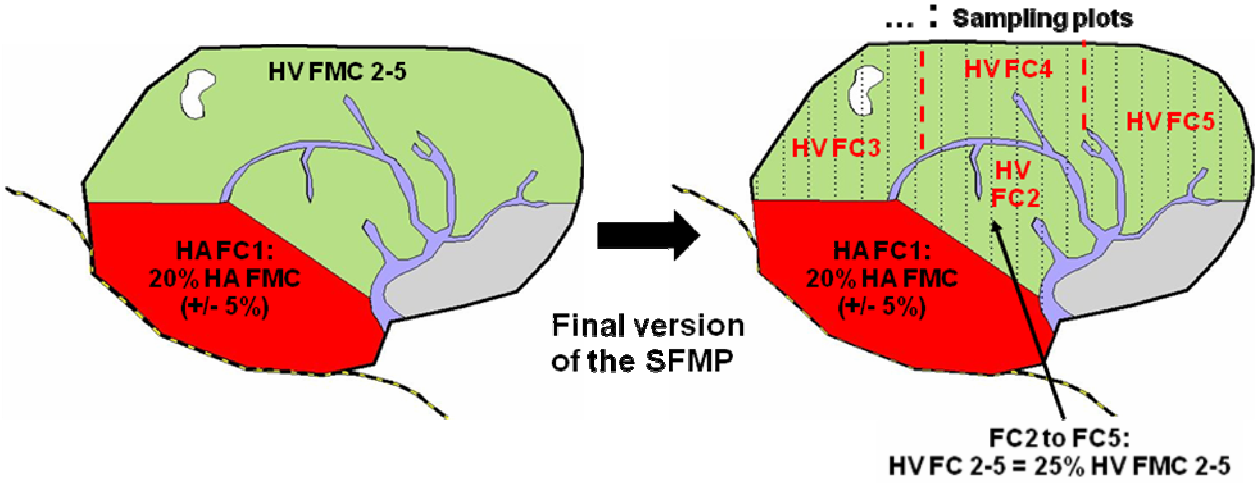


Figure 13: Example of the Forest Compartments 2-5 delineation[6]

Rules used for partitioning: the partitioning principles must facilitate the field demarcation of managed area boundaries and must be based on:

- natural boundaries (rivers, swamp, topographic limits…) or human limits (administrative/official limits, roads…) if possible, otherwise encourage a delineation by straight transects;

[6] [6] *HA FMC: Harvestable Area of the FMC*
HA FC 1: Harvestable Area of Forest Compartment 1
HV FMC 2-5: Harvestable Volume of the FC 2, 3, 4 and 5
HV FC: Harvestable Volume of the FC 2, 3, 4 and 5

- one continuous area for each Forest Compartment, otherwise provide justification (for example: harvesting history);
- scheduling according to accessibility - for a logical harvest order of the Forest Compartments (considering roads, rivers…). Previously harvested forests must be included in the last forest compartments in order to be harvested as late as possible.

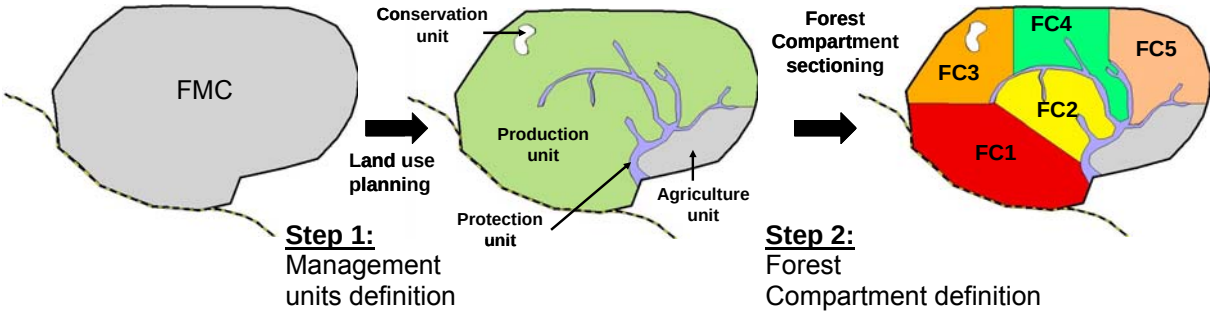


Figure 14: Summary of management process: step 2: Partitioning units into Forest Compartments

- Harvesting assessed yields by species: provide synthetic tables and histograms, according to the models provided below:

These yields will be assessed only in the Final Version of the SFMP, to be prepared within 4 years from the Contract Effective Date. This section will not be covered in Version 1 of the SFMP.

Table 9: Forest Compartments: surface areas and gross standing volumes for the Class A tree species (to be included only in Final Version of the SFMP)[7]

	FC opening years	Surface area (ha)	Gross standing volume (m^3/ha)	Total Gross standing volume on the FC (m^3)	Deviation from average (%)
Forest Compartment 1					
Forest Compartment 2					
Forest Compartment 3					
Forest Compartment 4					
Forest Compartment 5					
Average					

[7] *Forest Compartment n°1 , already defined by the first version of SFMP will not necessary contain the same volume*

Table 10: Forest compartments: Gross standing volumes per tree species for the Classes A, B and C tree species (to be included only in Final Version of the SFMP)

Species	DCL (cm)	Gross standing volumes (m^3)					
		FC 1	FC 2	FC 3	FC 4	FC 5	Total on the Timber Production Unit
Class A							
Total Class A							
Class B							
Total Class B							
…							
General total							

Table 11: Forest compartments: Commercial volumes per tree species, for the Class A tree species, and per year (m^3/year) (to be included only in SFMP Final Version)

Species	Coefficients		Commercial volumes (m^3)				
	Logging	Bole valorisation	FC 1	FC 2	FC 3	FC 4	FC 5
Total							

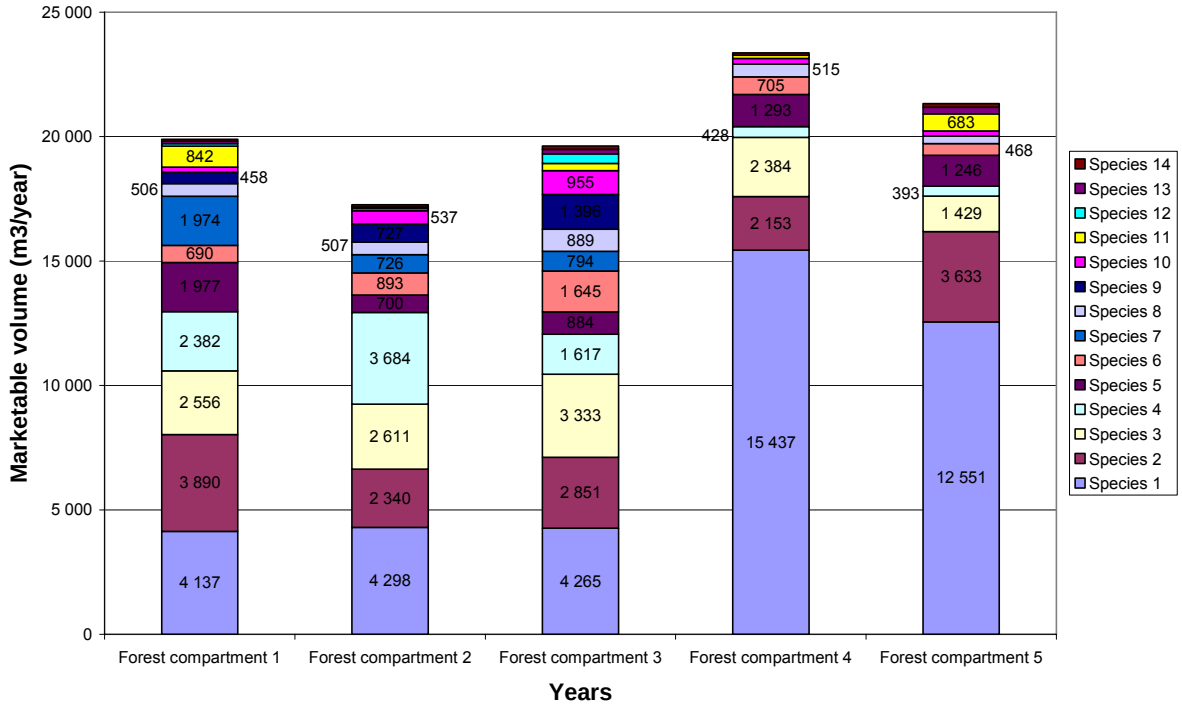


Figure 15: Example of annual production forecast per Forest Compartment (Commercial volume in m^3/year)

Harvesting procedures:

The SFMP must describe the implementation of the following harvesting procedures

- ✓ **drafting of management plans**: provide a timetable for 5-year Forest Management Plans and Annual Operational Plans preparation (according to the model provided in table 2 of section 1;
- ✓ **Reduced Impact Logging (RIL) practices** according to the measures included in the Code of Forest Harvesting Practices. The holder must be precise on how he will plan and monitor the logging activities: roads, landings and skid trail planning and demarcation, post-harvesting monitoring. Indicative planning of the main roads network will be provided in the management map. Other roads and landings will be planned in 5YFMPs and AOPs;
- ✓ **sylvicultural measures**: maximum level of harvesting, protect mother trees, protect future tree stems and tree species, develop artificial enrichment…

A specific rule is added to those included in the Code of Forest Harvesting Practices: **maximum harvesting level of 30 m^3/ha**. This rule will be applied by square-km blocks, with a maximum gross standing volume of 3 000 m^3 harvested by entire block (rule to be adapted for smaller blocks). In the management plan, the holder must commit to this rule.

- **Rights of use**: provide measures, according to the social agreements, to maintain local right use on forest territories with several other purposes (NTFP, hunting, fishing, agriculture, pit-sawing…).

  The Table 13 (§10.5) details the regulations to be applied by activity on the management unit.

- **management map**: forest management planning requires the establishment of a management map (scale between 1/50.000 and 1/150.000) which includes:

  ✓ Forest Compartments boundaries;

Version 1 of the SFMP: provide only the boundaries of the first Forest Compartment; Final version of the SFMP: provide the definitive delineation of the 5 Forest Compartments.

  ✓ management units boundaries;
  ✓ existing road network and the main roads to be built during the SFMP rotation period;
  ✓ human settlements;
  ✓ watercourses.

7.5 Management procedures for the Conservation unit

This section will not be completed in Version 1 of the SFMP, but only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date. This section will be covered only if Conservation Unit are created on the FMC.

- Activities authorized or forbidden: refer to (§10.5), which details the regulations to be applied by activity on each management unit;
- Research activities and monitoring: develop scientific studies, within partnerships.

7.6 Management procedures for the Protection Unit

This section will not be completed in Version 1 of the SFMP, but only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date.

- Activities authorized or forbidden: refer to (§10.5), which details the regulations to be applied by activity on each management unit;
- Research and monitoring activities: develop scientific studies, within partnerships.

7.7 Management procedures for the Agriculture Unit

This section will not be completed in Version 1 of the SFMP, but only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date. This section will be covered only if Conservation Unit are created on the FMC.

The overall objective of the Agriculture Unit area management is to ensure a monitoring of the shifting cultivation development:

- Management rules:
  - ✓ Means to limit and monitor the crops clearing to preserve the forest cover: ensure a permanent timber production area;
  - ✓ This area can be harvested under an agreement and cooperation of the local communities.
- Agricultural support:
  - ✓ Develop alternative cultivation methods and improve farming production systems;
  - ✓ Enhance knowledge and skills among local communities.
- Monitoring:
  - ✓ Develop compensation mechanisms in case of logging damage in this area: prevent conflicts;
  - ✓ Encourage local communities towards the sustainable use of natural resources;
  - ✓ Develop a permanent consultation process with the local communities and other stakeholders;
  - ✓ Develop partnerships with environmental NGOs for a best efficiency in the monitoring.
- Research activities and monitoring: proceed to trials and encourage the use of new cultivation methods, especially in areas subjected to flooding.

7.8 Management procedures for the Reforestation Unit

This section will not be completed in Version 1 of the SFMP, but only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date. This section will be covered only if Conservation Unit are created on the FMC.

- Activities authorized or forbidden: refer to (§10.5), which details the regulations to be applied by activity on each management unit;
- Description of the natural or artificial reforestation program, and of the responsibilities for its implementation.

The following table must be provided both in Version 1 and final Version of the SFMP.

Table 12: Regulated activity for forest management unit

Units / Activity	Timber production	Conservation	Protection	Reforestation	Agriculture
Logging activities	Towards SFMP agreement	Forbidden	Regulated by the Code of Forest Harvesting Practices	Forbidden	Authorized with regulations
Extraction of sand, gravel and laterite	Authorized	Forbidden	Forbidden	Forbidden	Authorized with regulations
Road network and log landings	Authorized and according to the Code of Forest Harvesting Practices	Forbidden	Regulated by the Code of Forest Harvesting Practices	Authorized with regulations	Authorized with regulations
Eco-tourism	Authorized	Authorized	Authorized	Authorized	Authorized
Pit-sawing	Forbidden	Forbidden	Forbidden	Forbidden	Authorized
Collection of firewood and craft products	Authorized and according to the current legislation	Authorized and according to the current legislation	Authorized and according to the current legislation	Authorized and according to the current legislation	Authorized and according to the current legislation
Hunting	Authorized and according to the current legislation	Forbidden	Authorized and according to the current legislation	Authorized and according to the current legislation	Authorized and according to the current legislation
Fishing	Authorized	Forbidden	Authorized	Authorized	Authorized
Collect of NTFP	Authorized	Authorized	Authorized	Authorized	Authorized
Agriculture	Forbidden	Forbidden	Forbidden	Forbidden	Authorized
Mining	Authorized with regulations	Forbidden	Authorized with regulations	Forbidden	Authorized with regulations

7.9 Research activities

This section will not be completed in Version 1 of the SFMP, but only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date.

- Permanent sample plots: this study will be carried out by the FDA at the national level.

An additional research program on forest dynamics and ecological studies may be carried out by the FMC Holder under the forest management plan mainly with permanent sample plots.

- Other studies on forest ecology: regeneration conditions, phenology tracks …;

- Sylvicultural research;

- Partnerships for research program: national and international universities, research organizations, NGOs...

7.10 Other environmental measures

This section will not be completed in version 1 of the SFMP, but only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date.

Version 1 will only make reference to the Environmental Impact Assessment.

- Environmental Impact Assessment.
  - ✓ Reference to the Environmental Impact Assessment approved by the Environmental Protection Agency.

  Main purpose of the Environmental Impact Assessment:
  - ✓ Evaluate positive and negative environmental effects related to logging activities, timber processing and logs transportation;
  - ✓ Propose mitigation measures for the negative effects.

The main topics of this study focus on: pollution, soil compaction and erosion, damage to the forest stands, habitat division, watercourse system disturbance and social impact.

- Environmental measures applied to the Timber Production Unit:
  - ✓ Reduced Impact Logging, refer to the §7.5;
  - ✓ Sylvicultural measures, refer to the §7.5;
  - ✓ Setting of management parameters guaranteeing the sustainability of the resource (DCL, protected tree species…), refer to the §7.5;
  - ✓ Measures against pollution in the forest camps and forest area according to the measures included in the Code of Forest Harvesting Practices: management of toxic, polluting products and hydrocarbons (collect, store and process, and limit the sources of ground spillage), management of waste.

8 INDUSTRIAL PLANNING

This section will be completed in Version 1 of the Strategic Forest Management Plan. It will be reviewed in the Final Version of the Strategic Forest Management Plan to be prepared within 4 years from the Contract Effective Date.

- Analysis of the resource (inventory data processing):
  - ✓ Provide the main justification for the industrial choices made: timber resource and its valorisation (nature, abundance and timber uses);
  - ✓ Promote new tree species or new products for the market: a tool towards diversification (better visibility).

- Industrial objectives:
  - ✓ Enhance the valorisation of the resource;
  - ✓ Open new markets towards a better public profile (company's image);
  - ✓ Reduce transportation costs through a stronger industrialization.

- Planning of industry settlements:
  - ✓ Plan the industrial development of the company, consistent with the actual assessed timber resources;
  - ✓ Schedule industrial projects over the five following years.

9 WILDLIFE MANAGEMENT

This section will not be completed in version 1 of the SFMP, but only in the Final Version of the Strategic Forest Management Plan, to be prepared within 4 years from the Contract Effective Date.

9.1 Objectives

- Set up a permanent process on the managed area to develop hunting monitoring and control, awareness raising and regulation planning intended for local communities and employees of the company;
- Support alternative solutions to compensate the immediate benefits brought by hunting (food, financial gain) and to encourage livestock and fish farming, enhance the agricultural production…;
- Control bush meat transportation in the managed area;
- Develop internal company rules (game transport, workers hunting regulations…);

- Ensure appropriate food supply on base camps.

9.2 Review of hunting legislation and regulations

- Information campaign (respect of laws and regulations).

9.3 Fauna and hunting management program

- Hunting: monitoring and awareness rising. Information campaign for local communities and workers about the respect of National hunting Laws or Regulations and the respect of International Conventions;
- Development of internal regulations and mechanisms.

The success of wildlife management relies on a permanent consultation process established with the local communities and the company staff. The participation of other stakeholders (environmental NGOs for example) would be a plus for improved monitoring efficiency.

10 SOCIAL MANAGEMENT

This section will be detailed only in the Final Version of the Strategic Forest Management Plan to be prepared within 4 years from the Contract Effective Date. Version 1 of the SFMP will only provide a timetable for additional socio-economic survey and public consultation, and a reference to the social agreement (10.4).

10.1 Permanent consultation process

According to the regulation 105-07 on major pre-felling operations, section 51, the SFMP must be submitted to a public consultation process. This consultation will be held before the approval of the Final Version of the SFMP, within 90 days of the technical approval of the SFMP by the FDA. The Holder will be responsible for the organization of this public consultation.

For the purpose of this public consultation, representatives of the affected communities (inside the FMC and within 3 kilometres) must be informed and invited to two meetings. For their information, the executive summary of the SFMP will be distributed; the main decision of the SFMP will be presented and discussed during a first public meeting.

During the second meeting, the Holder and the FDA will explain how the expectations of the participants have been taken into account.

The SFMP Final version must include (but not for the first submission to the Technical Review):
- The list of the stakeholders consulted;
- Short reports of the 2 public meetings held.

The FMC Holder will require new skills to implement and ensure the monitoring of the permanent consultation process and to set up of a social department: 2 or 3 persons covering all the skills required by the social aspects of the SFMP.

This permanent consultation is based on fundamental principles of intervention:

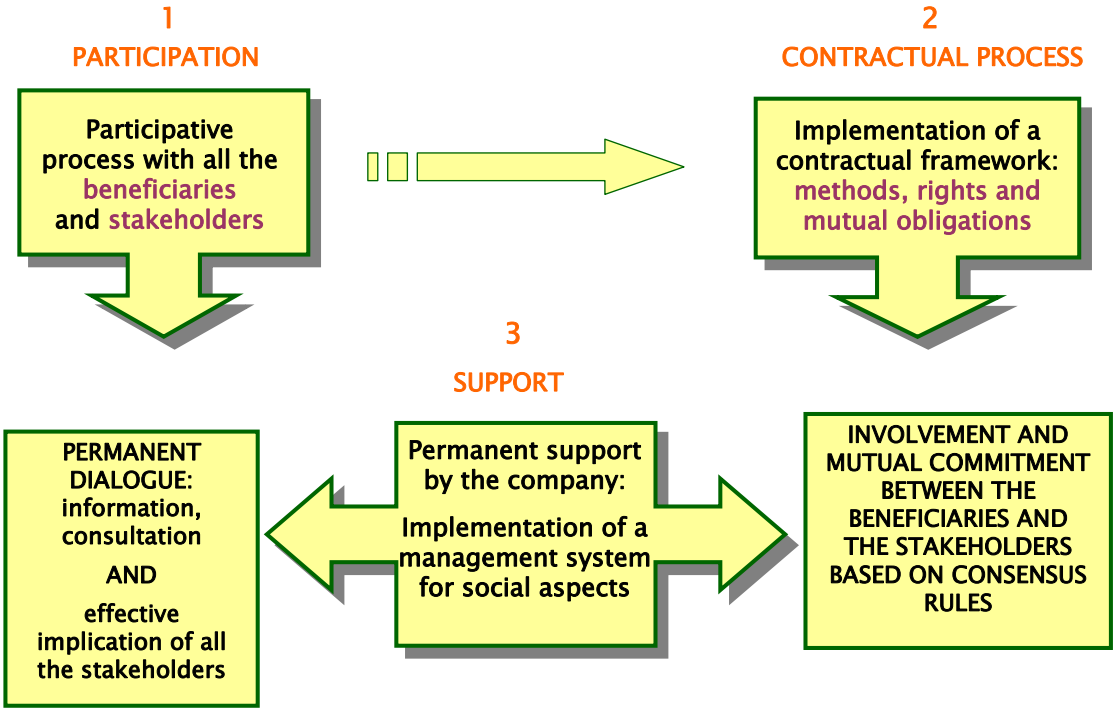


Figure 16: Three fundamental principles of permanent consultation (from ATIBT Handbook, volume 2 "Social Aspects")

10.2 Measures taken for the workers and their families' well being in the camps

Provide a synthetic table, according to the Table 13 model (§10.5), listing topics and actions/measures to be undertaken:

- Healthcare: measures concerning the supply of medical care and basic healthcare services by a professional team, in equipped and adapted premises;

- Basic education: measures concerning the schooling of children at base camps, with qualified teachers teaching in equipped and adapted premises;
- Access to drinking water: measures concerning the supply of drinking water to base camps and of a suitable distribution network;
- Food safety: measures concerning the supply of food products to base camps, providing a healthy, balanced and suitable diet; in connexion with the sustainable forest management (hunting, fishing and farming);
- Habitat and hygiene: measures concerning the quality of the habitat, hygiene, preventive health services and safety at base camps.

10.3 Measures taken for the workers' working conditions

Provide a synthetic table, according to the Table 13 model (§10.5), which lists the concerned topic and the actions or the measures to be lead inside:

- Further training: measures concerning training and further development of employees' careers;
- Working safety: measures concerning the employees' work (operating instructions, procedures, training, equipment, preventive measures, means of intervention);
- Social and cultural development: measures promoting social and cultural development and access to information (sports equipment…).

10.4 Measures taken for the contribution to local development

For this section, the FMC Holder must refer to Social agreement.

10.5 Measures aiming at reducing, avoiding or compensating the negative impacts of the logging activities on local communities' well-being

Provide a synthetic table, according to the Table 13 model, listing the concerned topic and the actions or the measures to be lead inside:

- Limitation of negative logging impacts on the living condition of local communities: protection of sensitive resources (competitive resources, sacred sites, areas or trees with a cultural or religious value) and decrease in logging activity disturbances (road opening, log transportation …);
- Efforts to encourage local population to sustainable use of natural resources (crops clearing stabilization, support for alternative solutions…);
- Compensation measures in case of damages.

Table 13: Social measures of the SFMP (a table must be provided for each of the following sections: 10.2, 10.3, 10.4 and 10.5) (to be included only in Final Version of the SFMP)

Topic of the social aspect	Place	Reports made: summary (source: socioeconomic diagnosis and diagnosis of the project's social impact)	N° Social action	Actions or measures registered on the social program of the SFMP	Person in charge	Comments on actions or measures	Lead time

11 IMPLEMENTATION, MONITORING AND EVALUATION OF THE FOREST MANAGEMENT PLAN

Version 1 of the SFMP must provide only a precise timetable for the preparation of the Final Version of the SFMP, according to the model provided in table 2 of Section 1. The other elements listed below will be provided only by the Final Version of the SFMP.

Table 14: Timetable for the preparation of the Final Version of the SFMP (to be included in SFMP Version 1 only, see model in section 1, table 2)

11.1 Functional organization

The implementation and the monitoring of the forest management imply a new internal organization of the company:

- New skills acquisition in various sectors: training programs for the company's employees;
- Implementation of new company departments: forest management department, social department…;
- Improved logging practices (better planning, chain of custody, monitoring…);
- Implementation of partnerships to guarantee the management success.

This new organization must be explained in this section.

11.2 Audits

Implementation of annual audits to analyse:

- the harvesting schedule according to the initial planning;
- the harvesting yields;
- the implanted infrastructure;
- the encountered difficulties and the modifications compare to the initial planning;
- the implementation of environmental, social and research programs.

Audit planning and implementation must be explained in this section.

11.3 Forest Management Plan review

Planning is an ongoing process requiring a constant monitoring and review of all management activities. The FMC Holder will provide information in this section on when formal reviews of the SFMP are planned and what circumstances will require an early review of SFMP.

The review of the SFMP could be planned as following:

- At each period of 5-years implementation, since the SFMP approval, and at the end of the rotation period;
- Provision for early review if circumstances change (economic situation, market demands…) or if it is necessary for the sustainable management of the FMC Area.

A new SFMP will be submitted to the FDA and will be implemented after approval.

12 ECONOMIC AND FINANCIAL ASSESSMENT

12.1 Cost of the Strategic Forest Management Plan preparation

Planned costs for the final SFMP preparation will be provided in Version 1 of the SFMP.

This section presents, for each tasks implemented for the SFMP preparation (in synthetic tables for example), the total expenses and the expenses per hectare of the SFMP's preparation.

12.2 Cost of the implementation the forest Management Plan

This cost will be provided for the 5 following years.

12.3 State revenues

This section lists all State's taxes and fees in order to assess the economic return.

12.4 Corporate Business plan

The business plan will be updated on the basis of all the elements provided by the SFMP, more particularly on the assessed timber yields.

13 SUMMARY OF THE TABLES AND MAPS TO INCLUDE IN THE SFMP

The following list of tables must appear in the SFMP document:

The following list of maps must be produced in the SFMP document:

GUIDELINES ILLUSTRATIONS

FIGURES

TABLES

Republic of Liberia

FORESTRY DEVELOPMENT AUTHORITY

GUIDELINES FOR FOREST MANAGEMENT PLANNING IN LIBERIA

SECTION 3

5 YEAR FOREST MANAGEMENT PLAN

July 2009

With the technical assistance of

5YFMP
TABLE OF CONTENTS

5-YEAR FOREST MANAGEMENT PLAN

TEMPLATE WITH COMMENTS

In order to enable to start the logging activities during the preparation, validation and implementation steps of the SFMP, a Version 1 of the SFMP (covering the first 5 years of the FMC) will be produced along with the preparation of the initial 5YFMP for Forest Compartment n°1. This initial 5YFMP document will differ from the 4 following 5YFMPs, especially with regards to the AC's delineation:

Initial 5YFMP	Year 1	Partitioning in AC based on surface area (1/25 of the harvestable area for each AC)
Subsequent 5YFMPs	Year 2,3,4 and 5	Partitioning in AC based on volume

The 5YFMP will require an analysis and an update of the data collected during the SFMP preparation on the concerned Forest Compartment, but no specific studies.

All 5YFMPs will have the same table of contents, the main difference between the first and the 4 subsequent 5YFMP is indicated in a box at the beginning of the concerned section.

1 EXECUTIVE SUMMARY

This section provides a summary, between 2 to 5 pages, of the 5YFMP's document:

- Description of Forest Compartment area;
- Forest management decisions;
- Forest management planning.

2 DOCUMENT RECORD SHEET

- Name and contact address of Contract holder;
- Contract reference number;
- Strategic Forest Management Plan reference number;
- Contract effective date;
- Strategic Forest Management Plan date of approval;
- Five-Year Management Plan reference number;
- Date of submission to FDA for approval;
- Date of approval by FDA;
- Signatures.

3 GENERAL FRAMEWORK

3.1 Company Profile

First and second 5YFMP: this Section will not be covered; Others 5YFMP: Brief update of the data provided in SFMP

- History;
- Number of employees;
- Past productions (volume by species and by year for the 5 previous years);
- Logging materials and machines;
- Transformation capacities: list of the mills, location, capacity (in volume) and past productions (volume by product and by year).

If necessary, this presentation includes updated data compare to the SFMP.

3.2 Description of the FMC area

First and second: 5YFMP: this Section will not be covered;

Others 5YFMP: the data provided in SFMP will be updated

- Provide a summary of the general background which includes updated information compare to Version 1 and Final Version of the SFMP:
  - ✓ Location, surface area and description of geographic boundaries;
  - ✓ Administrative and legal status;
  - ✓ History: activities and former management;
  - ✓ Environmental factors (climate, hydrography, vegetation, wildlife…);
  - ✓ Communication network and Infrastructure;
  - ✓ Socioeconomic background.
- Provide a map to locate the Forest Management Contract area (scale between 1/1.000.000 and 1/1.500.000).

INSERT IN THIS CHAPTER

Map 1: Location of the Forest Management Contract area

3.3 Description of the Forest Compartment

Forest Compartment boundaries and date of harvesting must be the same compare to the ones defined by the SFMP.

- Order of passage within the planning schedule;
- Location within the FMC area;
- Surface area;
- Map locating the Forest Compartment within the FMC area (between 1/250.000 and 1/350.000 scale) at the FMC level.

INSERT IN THIS CHAPTER

Map 2: Location of the Forest Compartment within the Forest Management Contract area

4 ASSESSMENT OF THE PREVIOUS 5-YEAR FOREST MANAGEMENT PLAN

First 5YFMP: This section will not be covered.

This section will be elaborated according to the annual audit reports and will aim at clarifying the results and the experiences of the previous Forest Compartment harvesting. The main topics to be addressed will be:

- respect of the land-use planning and harvesting planning;
- compliance with the management parameters: DBH Cutting Limits, protected species;
- volumes and number of trees harvested (consistency with the planning);
- respect of the harvesting rules;
- unexpected environmental impacts, on soils, stands, linked to chemical pollution…;
- illegal harvesting inside the Forest Compartment;
- wildlife management;
- respect of the social planning;
- evolution of shifting cultivation.

5 DESCRIPTION AND LOCATION OF THE FOREST COMPARTMENT

5.1 Boundaries and surface area

- Provide a map (between 1/150.000 and 1/250.000 scale), at the Forest Compartment level, and a synthesic table, according to the following template, to describe the Forest Compartment boundaries (metes and bounds);

INSERT IN THIS CHAPTER

Map 3: Forest Compartment delineation

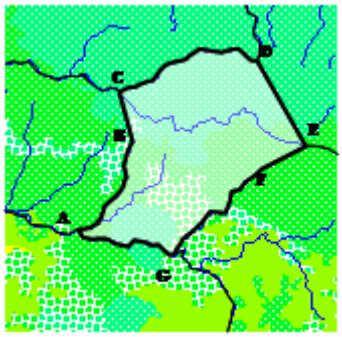


Figure 1: Forest Compartment boundaries

Table 1: Definition of the Forest Compartment's boundaries

Point reference	Coordinates		Point description[1]	Path[2]	Length to be opened
	X	Y			
A					
B					
…					
Total					

5.2 Description of the Forest Compartment

Provide a diagnosis of the forest state, including updated data for each approached topic:

- biophysical background (soils, topography…);
- forest stratification updated with recent satellite images: provide a synthetic table according to the following template and a map.

[1] *Point defined by the coordinates or by its location (on a water-course, a confluent, a road…) an by the physical features*

[2] *Path from point to point a straight line, a natural feature or a road*

Table 2: Summary of surfaces per land cover type on the Forest Compartment, calculated by GIS

Land cover type	Surface area (ha)	% of the total area
Total of harvestable areas (forest land cover)		
Total of non-harvestable areas		
TOTAL		

INSERT IN THIS CHAPTER

Map 4: Forest stratification and land cover types on the Forest Compartment

- fauna;
- socioeconomic background:
  - ✓ demography;
  - ✓ human locations (villages and settlements);
  - ✓ Infrastructure;
  - ✓ local community activities.

5.3 Management units within the Forest Compartment

- provide a synthetic table based on Management Units mapped in the SFMP according to the following template:

Table 3: Summary of forest management units on the Forest Compartment

Units number	Land use affectation	Description	Surface area (ha)	%
Total Protection Units				
Total Conservation Units				
Total Reforestation Units				
Total Agriculture Units				
Total Timber Production Units				
TOTAL				

- provide an illustrative map (between 1/150.000 and 1/250.000 scale) at the Forest Compartment level.

INSERT IN THIS CHAPTER — Map 5: Forest management units on the Forest Compartment

5.4 Synthesis of results of the multi-resource inventory conducted in the Forest Compartment

First 5YFMP: This section will not be covered.

This section aims at analysing the Forest Compartment timber resource according to the data collected during the preparation of the SFMP: provide synthetic tables. The data can be updated if new data is available (annual growth, harvestable area, new inventory…).

Synthetic tables, according to the following templates, summarising the results of the multi-resource inventory on the concerned Forest Compartment will be provided:

Table 4: Synthesis by species, and class of species, on the Forest Compartment: density and basal-area per hectare

			Density (stem/ha)				Total basal-area (m^2/ha)
Species	**Botanical name**	**DCL (cm)**	**Stems ≥ DCL (cm)**	**Harvestable stems**	**Stems > 40 cm**	**Total stems > 10 cm**	
Class A							
Total class A							
Class B							
Total class B							
…							
Great total							

Table 5: Volumes per tree species and per hectare on the Forest Compartment

		Gross standing volumes (m^3/ha)			Commercial volumes (m^3/ha)		
Species	**DCL (cm)**	**≥DCL**	**≥50 cm**	**≥70 cm**	**≥DCL**	**≥50 cm**	**≥70 cm**
Class A							
Total class A							
Class B							
Total class B							
…							
Great total							

6 PLANNING OF LOGGING ACTIVITIES ON THE FOREST COMPARTMENT

6.1 Average yields on the Forest Compartment

First 5YFMP: This section will not be covered.

Provide a synthetic table according to the following template:

Table 6: Gross standing and commercial volumes per tree species, for Class A tree species, and per year (m^3/year) on the Forest Compartment

Species	Valorisation Rates		Gross standing volume		Commercial volume	
	Logging	Bole valorisation	m^3/ha	Total (m^3)	m^3/ha	Total (m^3)
Class A						
Total class A						
Class B						
Total class B						
Great Total						

At this stage, an update of the harvestable area and the available volumes figures is expected in the case of important crop clearings and of new information on the available resource on already logged areas (annual growth, natural mortality…).

6.2 Partitioning into Annual Coupes, rotation order and opening schedule

Partitioning into Annual Coupes

First 5YFMP: provide boundaries of Annual Coupes n°1 to 5 based on surface area.

Other 5YFMP: provide provisional boundaries of the 5 Annual Coupes of the Forest Compartment based on surface area (same methodology as for the first 5YFMP).

These provisional boundaries will be refined every year according to the results of the Pre-harvest enumeration, delineation based on volume. The final Annual Coupes will contain the same volumes (+/-5%).

Criteria for partitioning into Annual Coupes:

- First 5YFMP for Forest Compartment 1:
  - ✓ Final AC contains 20% (1/5) of the Forest Compartment Harvestable Area.

- Following 5YFMP, for Forest Compartments 2 to 5:
  - ✓ Provisional AC boundaries are defined, each one containing 20% (1/5) of the Forest Compartment Harvestable Area.

- AOP for Forest Compartments 2 to 5:
  - ✓ Final boundaries of the concerned Annual Coupe are defined containing 20% (1/5) of the Forest Compartment Harvestable Volume (gross standing volume of Class A species trees above DCL).
  - ✓ For each Forest Compartment, an Indicative Annual Harvestable Area will be calculated by divided the Forest Compartment Harvestable Area by 5, and the Annual Coupe Harvestable Area can not cover more than 115% of this Indicative Annual Harvestable Area, even if the first rule is not fulfilled. This second rule is not applicable for the last Annual Coupe of each Forest Compartment.

- First 5YFMP:
  - ✓ Procedure to define the Annual Coupes:
    1. calculation of the harvestable area of the FC 1, provided by Version 1 of the SFMP: HA FC 1
    2. calculation of the theoretical harvestable area of Annual Coupes n°1 to 5: HA AC = HA FC 1 / 5
    3. delineation of Annual Coupes n°1 to 5 containing HA AC +/- 5%

The maximum deviation to the average of +/-5% must be calculated as explained below, for each Annual Coupe

Deviation (+/- 5%) = ((HA AC – (HA FC1 / 5) / HA FC1 / 5) x 100

With: HA AC: Harvestable Area of the concerned Annual Coupe

HA FC1 Harvestable Area of the Forest Compartment n°1

  - ✓ Provide a table describing the Annual Coupes on the Forest Compartment 1 according to the following template:

Table 7: Annual Coupes on the first Forest Compartment (to be included only in the first 5YFMP)

AC	Harvestable area (ha)	Deviation to the average[3]	Harvesting date
1			
2			
3			
4			
5			
Total			

✓ Provide a map (scale between 1/100.000 and 1/200.000).

INSERT IN THIS CHAPTER — Map 6: Location of the Annual Coupes on the first Forest Compartment

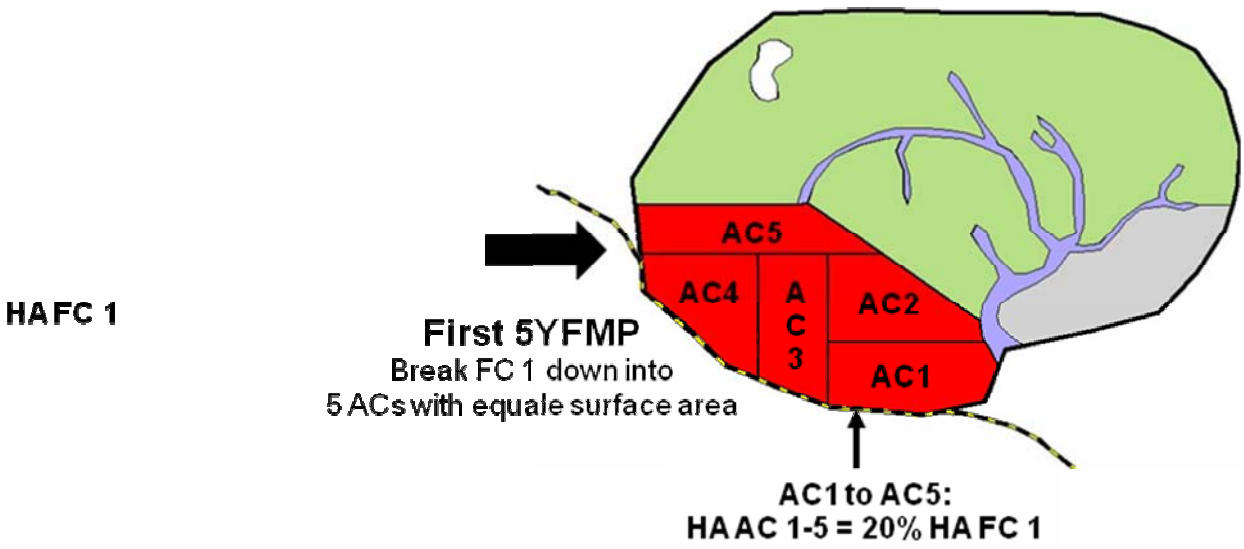


Figure 2: Partitioning the first Forest Compartment into Annual Coupes (Example)

[3] *Must be between -5% and +5% for each AC*

- Other 5YFMPs:

The partitioning into Annual Coupes is based on volume according to the results of pre-harvest enumeration. The time required to conduct these inventories on the whole Forest Compartment makes it impossible for the delineation of all the Annual Coupes to be provided at this stage. Provisional boundaries will be provided in the 5YFMP number 2, 3, 4 and 5, based on area, with the same rules compare to the initial 5YFMP. The definitive boundaries will be adjusted according to the volumes found as the pre-harvest enumeration progresses.

An additional rule on maximum harvestable area is furthermore defined for each Annual Coupe. It must be smaller than 115% of the Indicative Annual Harvestable Area (annual average harvestable area), except for the last Annual Coupe of each Forest Compartment.

The definitive AC boundaries will be supplied every year in the Annual Operational Plans.

✓ Summary of the rules governing the Annual Coupe delineation:

1. HV AC = (HV FC / 5) +/- 5%
2. HA AC < 115% x (HA FC / 5), even if rule 1 is not fulfilled. This second rule is not applicable for the last Annual Coupe of each Forest Compartment

Where:
HV AC: Harvestable Volume on Annual Coupe
HV FC: Harvestable Volume on Forest Compartment
HA AC: Harvestable Area of Annual Coupe
HA FC: Harvestable Area of Forest Compartment

✓ Procedure to define the Annual Coupes:

1. calculation of the harvestable volume of the concerned FC (gross standing volume for Class A species), provided by the 5YFMP: HV AC
2. calculation of the Indicative Annual Harvestable Area: IA AA = HA FC / 5, where HA FC = Forest Compartment Harvestable Area.
3. on the AC concerned by the 5YFMP (FC 2-5), the theoretical harvestable volume of each AC is calculated:

HV AC = HV FC / 4

4. each year: delineation of the following Annual Coupe, containing HV AC +/- 5% by using the results of the Pre-harvest enumeration lead on the concerned FC (based on the gross standing volume for the Class A species).

The maximum deviation to the average of +/-5% must be calculated as explained below :

Deviation (+/- 5%) = ((HV AC – (HV FC / 5) / HV FC / 5) x 100

With: HV AC: Harvestable Volume of the concerned Annual Coupe
HV FC Harvestable Volume of the concerndForest Compartment

5. control of the respect of the maximum harvested area : each Annual Coupe can not exceed 115 % of the Indicative Annual Harvestable Area, even if the harvestable volume contained is lower than HV FC 2-5 - 5%. This rule is not applicable for the last Annual Coupe of the Forest Compartment.

The 5YFMP must provide the following table, except the first 5YFMP.

Table 8: Annual Coupe delineation criteria (not to be provided for the first 5YFMP)

	Unit	Value
Harvestable Volume[4] on Forest Compartment (HV FC)	m^3	
Harvestable Area on Forest Compartment (HA FC)	ha	

✓ Provide a table which presents the indicative ACs on the FC 2-5 according to the following template:

Table 9: Indicative Annual Coupes on Forest Compartments 2-5 (not to be included in the first 5YFMP)

Indicative AC	Harvestable area (ha)	Distance to the Annual Average Harvestable Area	Harvesting date
1			
2			
3			
4			
5			
Total			

✓ Provide a map (scale between 1/100.000 and 1/200.000).

Map 7: Location of the indicative Annual Coupes on the Forest Compartments 2-5

[4] *In this document, harvestable volume means the gross standing volume of the trees of class A above the DCL*

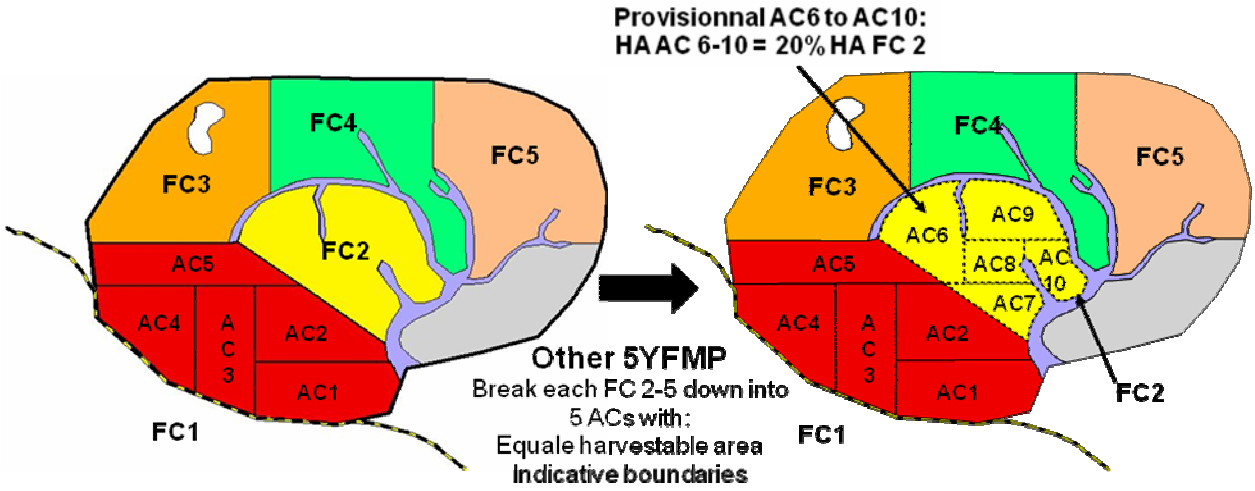


Figure 3: Example of partitioning the Forest Compartment 2 into Annual Coupes

- Rules used for the Annual Coupe partitioning: the partitioning principles aims at facilitating the field demarcation of boundaries and should be based on:
  - ✓ natural boundaries (rivers, swamp, topographic limits…) or human limits (administrative/official limits, roads…) if possible, otherwise encourage a delineation by straight transects;
  - ✓ one continuous area for each Annual Coupe, otherwise provide justification (for example: harvesting history).

1. Cutting cycle order of the ACs

It takes into account the accessibility for a logical logging order (that considers roads, rivers…). Previously harvested forests must be included in the last annual coupes so as to be harvested last.

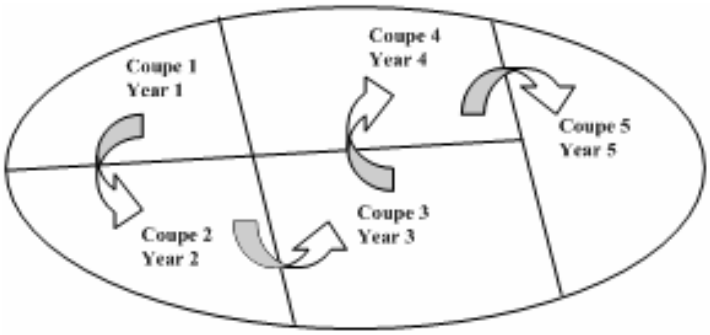


Figure 4: Order of coupes

Opening schedule

Each Annual Coupe will be normally put in harvesting at the beginning of the logging season, according to the opening dates planned by the 5YFMP. The permanent closure of the Annual Coupe will be effective only 3 years after its opening date.

This option gives more flexibility in the harvesting by allowing:

- to achieve logging operations on certain Annual Coupes;
- to adapt the harvesting schedule to the fluctuations of the tropical timber world market: valuation of tree species which had not been harvested at the time of the Annual Coupe logging.

This section provides a schedule for Annual Coupes opening on the Forest Compartment according to the following template:

Table 10: Annual Coupes opening schedule on the Forest Compartment

	Logging season 1	**Logging season 2**	**Logging season 3**	**Logging season 4**	**Logging season 5**
AC 1					
AC 2					
AC 3					
AC 4					
AC 5					

However, each Km-square blocks inside an Annual Coupe may be opened only during one logging season according to the Liberia Code of Forest Harvesting Practices – section 7. Only the Km-square blocks not opened during the logging season may be harvested during the 2 following logging seasons (see section 4 on Annual Operational Plan).

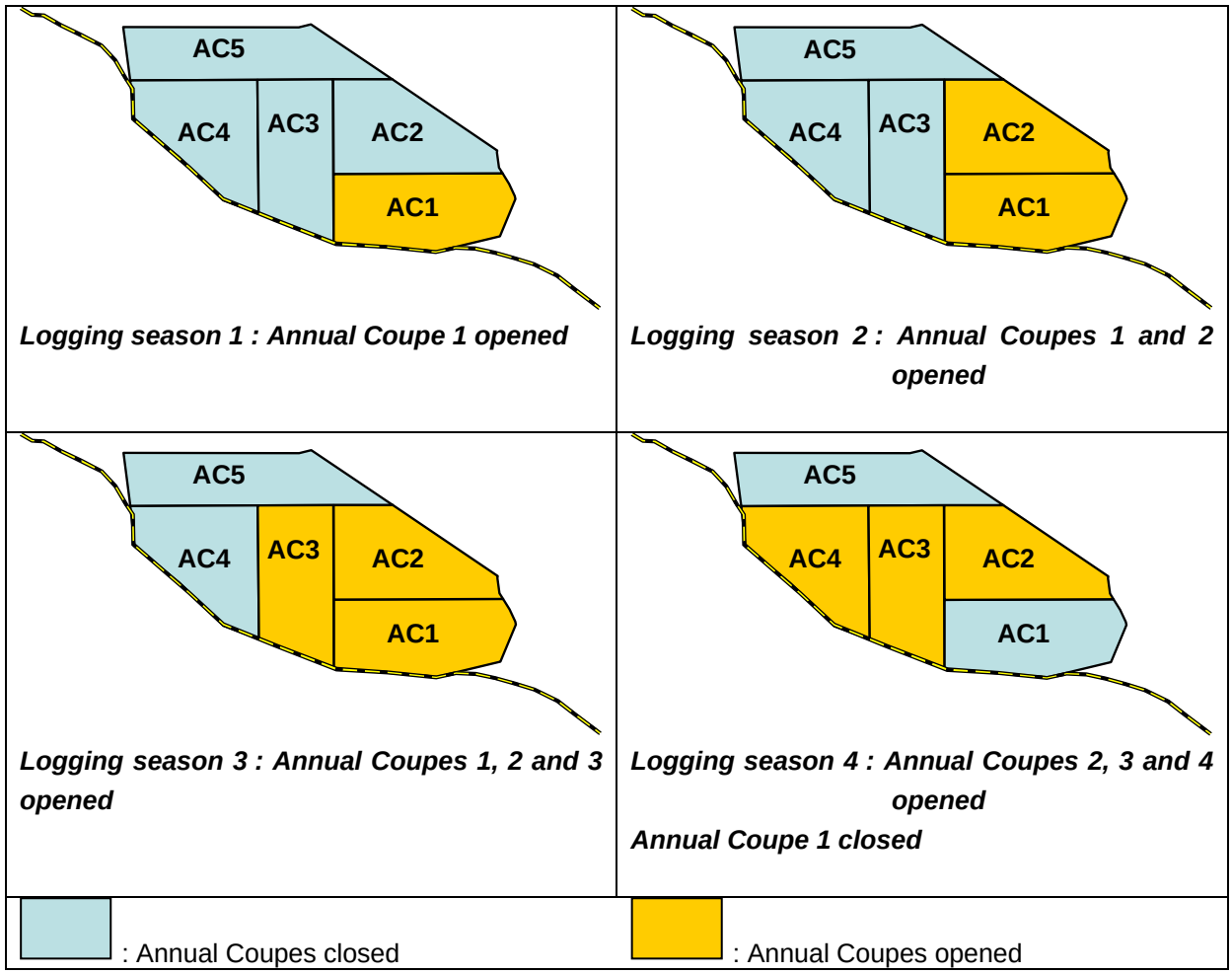


Figure 5 : Annual Coupe opening schedule on the Forest Compartment

6.3 Logging management rules

- Physical demarcation of the Forest Compartment and the Annual Coupes boundaries:
  - ✓ provide a schedule which plans the field demarcation of the Forest Compartment boundaries;
  - ✓ provide a schedule which plans the field demarcation of the Annual Coupes boundaries.

- Pre-harvest enumeration: the methodology and the implementation is detailed in the Standard Operating Procedure n°7 for the Chain of Custody system.

- Rules governing logging operations: refer to the Liberia Code of Forest Harvesting Practices and to the other prescriptions provided in the SFMP;

- Planning the road network: provide a map (scale between 1/100.000 and 1/200.000), at the Forest Compartment level, to illustrate the principal road network of the Forest Compartment;

INSERT IN THIS CHAPTER Map 8: Management map of the Forest Compartment

- ✓ the planning of main Infrastructure to realize during the 5YFMP period: bridges, swamp ridges… illustrates by a table according to the following template;
- ✓ the planning of the secondary road network will be done after pre-harvest enumeration and provided in the Annual Coupe Plans.

Table 11: Program of the road openings and the other Infrastructure on the Forest Compartment

Type of network/Infrastructure	Length	Location	Id. (map)	Programmation

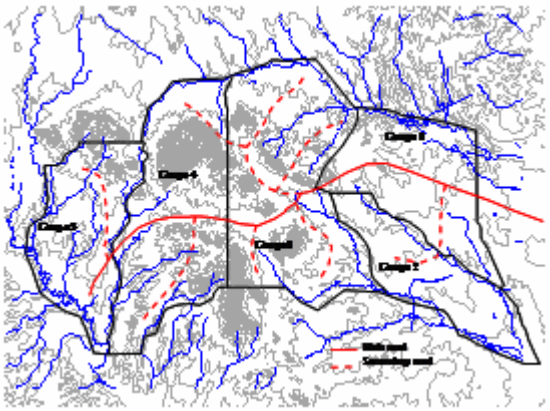


Figure 6: Example of a road network

6.4 Other management rules

First 5YFMP: This section will not be covered.

This section describes only, for each of the following subjects, the main lines of the actions to be implemented during the period of the 5YFMP. These rules are based on those defined for the FMC in the SFMP. The details of these actions will be supplied at the AOP level (planning of the concrete realizations):

- Staff management program;
- Social program;
- Training and awareness-raising program;
- Wildlife management program;
- Environmental program;
- Research and Development program.

7 ACTIVITY FORECAST / IMPLEMENTATION CHART

The programmed activities, during the concerned 5YFMP period, must be provided in schedule tables according to the following templates:

Table 12: Planning schedule of logging activities

Activity	Quarters of Year 1				Quarters of Year 2				Quarters of Year 3				Quarters of Year 4				Quarters of Year 5			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Demarcation of the Forest Compartment boundaries																				
Demarcation of the Annual Coupes boundaries																				
Main road network building																				
Per-harvesting enumeration																				
Submission of the AOPs																				
Logging activities																				

Table 13: Planning schedule of the other activities during the Forest compartment period

Activity	Quarters of Year 1				Quarters of Year 2				Quarters of Year 3				Quarters of Year 4				Quarters of Year 5			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Staff management program																				
Nature of the action																				
…																				
Training and awareness program																				
Nature of the action																				
…																				
Environmental program																				
Nature of the action																				
…																				
Wildlife management program																				
Nature of the action																				
…																				
Research and Development program																				
Nature of the action																				
…																				
Social program: (refer to Social agreement)																				
N° of Social action																				
…																				

TABLES TO BE INCLUDED IN THE 5YFMP

MAPS TO BE INCLUDED IN THE 5YFMP

FIGURES

Republic of Liberia

FORESTRY DEVELOPMENT AUTHORITY

GUIDELINES FOR FOREST MANAGEMENT PLANNING IN LIBERIA

SECTION 4

ANNUAL OPERATIONAL PLAN

July 2009

With the technical assistance of

TABLE OF CONTENTS OF AOP

ANNUAL OPERATIONAL PLAN
TEMPLATE WITH COMMENTS

According to the timetable, presented by the table 3 of document 1, the Pre-harvest enumeration can not be finished on the entire first Annual Coupe before the beginning of the logging season. For this reason, a submission by quarters for the blocks of the first AOP is planned (according to former rules in force before approval of the New Forestry Law).

The preparation of the SFMP in 2 versions brings a differentiation between the first 5YFMP and the fourth following ones which imply differences between the 5 first AOP and the 20 following ones. All the AOPs have the same table of contents, the main differences between the 5 first ones and the other will be indicated in boxes at the beginning of the concerned parts.

1 EXECUTIVE SUMMARY

This section provides a summary, between 2 to 5 pages, of the AOP document:

- Presentation of the Annual Coupe area;
- Forest management decisions;
- Forest management planning.

2 DOCUMENT RECORD SHEET

- Name and contact address of Contract holder;
- Contract reference number;
- Strategic Forest Management Plan reference number;
- Contract effective date;
- Strategic Forest Management Plan date of approval;
- Five-Year Management Plan reference number;
- Five-Year Management Plan reference and date of approval;
- Annual Operational Plan reference number;
- Period covered by Annual Operational plan;
- Date of submission to FDA for approval;
- Date of AOP submission to FDA for approval;
- Date of AOP approval by FDA;
- Signatures.

3 REFERENCES

3.1 Location of the Annual Coupe on the FMC area

The boundaries and date of opening of the Annual Coupe must be consistent with those defined by the 5 YFMP. For the FC 2 to 5, the boundaries can be changed in order to respect the criteria defined in chapter 3.2.

- Order of passage within the planning schedule;
- Location within the FMC area;
- Surface area;
- Map to locate the Forest Compartment within the FMC area (scale between 1/250.000 and 1/350.000).

INSERT IN THIS CHAPTER

Map 1: Location of the Annual Coupe on the concerned Forest Compartment within the Forest Management Contract area

3.2 Description of the Annual Coupe

- Boundaries and surface area:

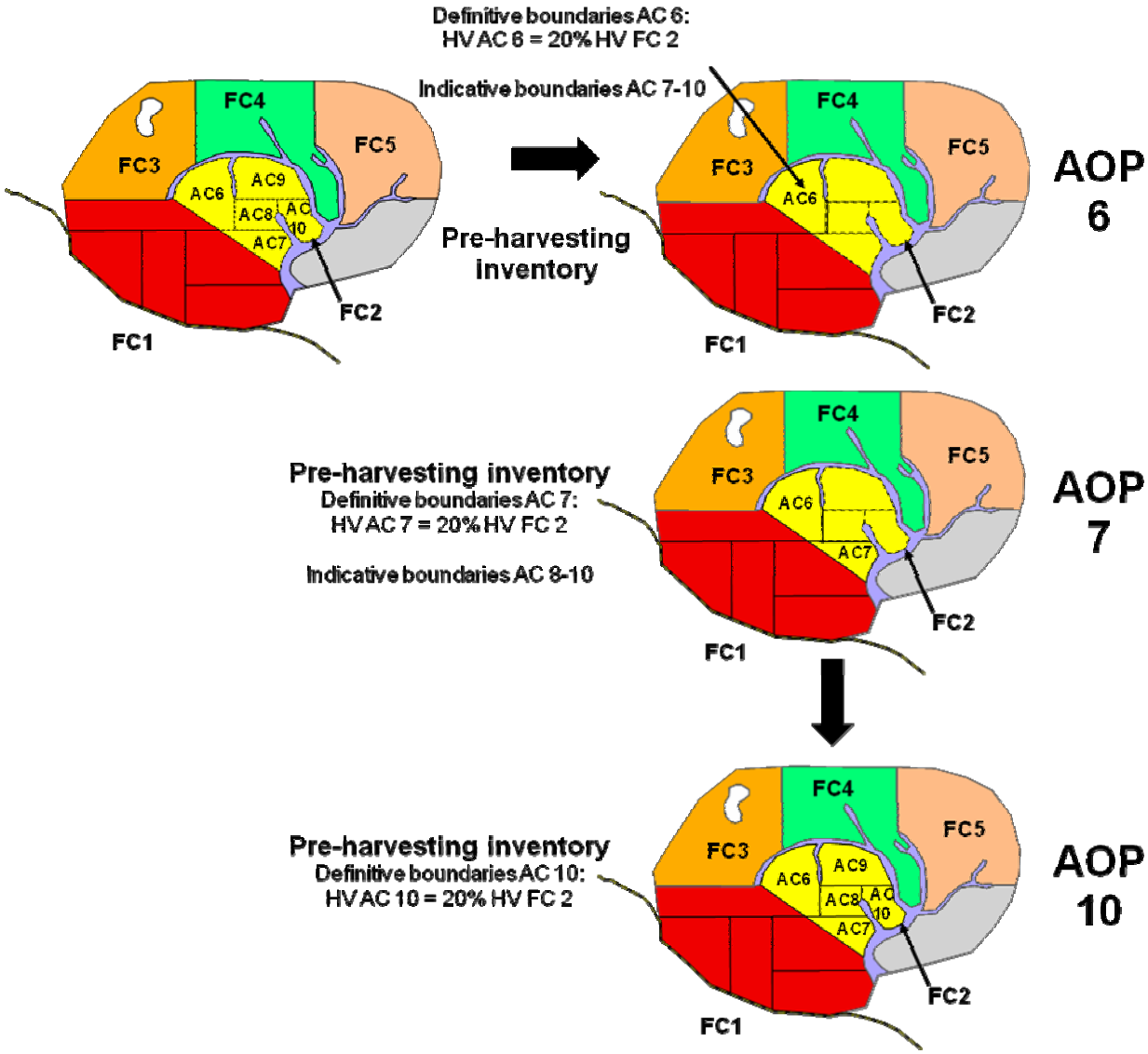
AC 1-5: the AC's definitive boundaries and the surface are provided by the first 5YFMP; AC 6-25: AC provisional boundaries are provided by the other 5YFMPs. The AOP describes the definitive boundaries of the concerned AC according to harvestable volume found during the pre-harvest enumeration.

Criteria for sectioning into Annual Coupes:

- First 5YFMP for Forest Compartment 1:
  - ✓ Final AC contains 20% (1/5) of the Forest Compartment Harvestable Area.

- Following 5YFMP, for Forest Compartments 2 to 5:
  - ✓ Provisionnal AC are designed, each one containing 20% (1/5) of the Forest Compartment Harvestable Area.

- AOP for Forest Compartments 2 to 5:
  - ✓ Final AC of the concerned Annual Coupe is designed containing 20% (1/5) of the Forest Compartment Harvestable Volume (gross standing volume of trees of Class A species above DCL);
  - ✓ For each Forest Compartment, an Indicative Annual Harvestable Area will be calculated by divided the Forest Compartment Harvestable Area by 5, and the Annual Coupe Harvestable Area can not cover more than 115% of this Indicative Annual Harvestable Area, even if the first rule is not fulfilled. This second rule is not applicable for the last Annual Coupe of each Forest Compartment.



HV AC: Harvestable Volume (Gross standing volume of class A species) on Annual Coupe
HV FC: Harvestable Volume (Gross standing volume of class A species))on Forest Compartment
HA AC: Harvestable Area of Annual Coupe
HA FC: Harvestable Area of Forest Compartment

Figure 1: Example for the delineation of Annual Coupes of the Forest Compartment 2

The Annual Coupe boundaries are defined by points (with description and coordinates) and by path from point to point:

- ✓ provide a table to describe the Annual Coupe boundaries according to the following model:

Table 1: Description of the Annual Coupe boundaries

Point reference	Coordinates		Point description[1]	Path [2]	Length to be demarcated
	X	Y			
A					
B					
…					
Total					

- ✓ provide a map at the Annual Coupe level to illustrate (scale between 1/50.000 and 1/150.000) the Annual Coupe boundaries.

INSERT IN THIS CHAPTER

Map 2: Annual Coupe delineation

- Specificities (biophysics, socioeconomics…): provide a brief diagnosis of the forest state, including updated data for each approached topic:
  - ✓ biophysics background (soils, topography…): provide indications on the main characteristics of the area which can have an impact on the forest management;
  - ✓ forest stratification: provide a synthesis table (according to the following model) and a map (scale between 1/50.000 and 1/150.000) at the Annual Coupe level:

INSERT IN THIS CHAPTER

Map 3: Forest stratification and land cover types on the Annual Coupe

Map 4: Annual Coupe delineation

[1] *Point defined by the coordinates or by its location (on a water-course, a confluence, a road…)*

[2] *Path from point to point a straight line, a natural feature or a road*

Table 2: Summary of surface areas per land cover type on the Annual Coupe, calculated by GIS

Land cover type	Surface area (ha)	% of the total area
Total of harvestable areas (forest land cover)		
Total of non-harvestable areas		
TOTAL		

- fauna;
- socioeconomic background: demography, human settlements, infrastructures and local community activities.

- Management units within the Annual Coupe: provide a synthesis table including updated data (according to the following model); and a map (scale between 1/50.000 and 1/150.000).

INSERT IN THIS CHAPTER

Map 5: Forest management units on the Annual Coupe

Map 6: Forest management units on the Annual Coupe

Table 3: Management units on the Annual Coupe

Management units	Surface area (ha)	%
Agriculture		
Protection		
Conservation		
Reforestation		
Production		
Total		

- Past logging activities: as far as information is available, former harvesting activities are described and located on the forest stratification map.

3.3 Annual audit report

This section will aim at clarifying the results and the lessons learned from the previous Annual Coupe harvesting. The main topics to be addressed will be:

- the respect of the land-use planning and the harvesting planning;
- the respect of the management parameters: DBH Cutting Limits, protected species, …;
- the volumes and number of harvested trees (per species), consistency with the planning, compare to the results of the Pre-harvest enumeration;
- the respect of the harvesting rules;
- the unexpected environmental impacts, on soils, stands, linked to chemical pollution…;
- the illegal harvesting inside the Annual Coupe;
- the wildlife management;
- the respect of the social planning;
- the shifting cultivation evolution.

4 PRE-HARVEST ENUMERATION RESULTS

4.1 Methodology

The FMC Holder will summarize in this section the methodology applied.

The general rules to be applied on the Annual Coupe are provided in the Liberia Code of Forest Harvesting Practices. The methodology and the implementation is detailed in Standard Operating Procedure n°7.

The characteristics of this inventory are:

- the division of the Annual Coupe area into Km-square blocks to facilitate the work on the inventory crews;
- a 100% forest inventory according to a regular grid (100% of the area inventoried);
- the records and marking of all the trees above 50 cm DBH.

4.2 Criteria for harvestable tree selection

Among all the trees inventoried, some of them are not harvestable, according to the following criteria:

- Diameter : only the trees above Diameter Cutting Limit are harvestable;
- Quality : the holder may decide not to harvest trees of bad quality;
- Location : some trees located in protected areas can not be harvested;
- Species: the holder may decide not to harvest some species, due to market conditions;
- Maximum level of harvesting reached on some Blocks: it is not allowed to harvest more than 30 m^3/ha on each Block.

A list of the trees inventoried is provided by the inventory tally-sheets, with an indication of which trees are harvestable. This selection is validated by the FDA.

4.3 Results

This section provides the results of the Pre-harvest enumeration following the models of tables bellow:

- In number of trees (per species and diameter class):

Table 4: Pre-harvest enumeration results: number of trees

N°	Species	DCL	Number of stems per species and diameter class (in cm)							Total stems	Stems/ha (on harvestable area)	% of species
			50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 and more			
Class A												
Total class A												
Class B												
Total class B												
Class C												
Total class C												
TOTAL												

- In volume (per species and diameter class):

Table 5: Pre-harvest enumeration results: volumes

N°	Species	DCL	Gross standing volumes per species and diameter class (in cm)							Total volume (m^3)	Volume m^3/ha (on harvestable area)	% of species
			50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 and more			
Class A												
Total class A												
Class B												
Total class B												
Class C												
Total class C												
TOTAL												

- Mapping of the resource: provide a map (GIS) at the Annual Coupe level (scale between 1/15.000 and 1/30.000) including:
  - ✓ the Km-square blocks;
  - ✓ the location of trees to harvest and those to protect (future trees, mother trees, harvestable trees located in buffer strips, trees of specific social value…) during the logging operations;
  - ✓ the hydrographic network;
  - ✓ the main and secondary roads proposed within the Annual Coupe;
  - ✓ the identified areas of protection, conservation and the logging constraints within the Annual Coupe (rocks, slopes, water crosses, sacred sites, ancient villages…).

INSERT IN THIS CHAPTER

Map 7: Location of the timber resource on the Annual Coupe

- Harvesting forecasts

The harvesting forecasts are calculated from the results of the pre-harvest inventory by taking into account requirements of the company (harvestable species, diameter and quality of stems) specified by section 4.2 and the logging regulations (mother trees, trees into protection area…).

Table 6: Harvesting forecasts in effectives and volumes by species

Species	DCL (cm)	Quality required	Field results						Assessment	
			Effectives			Gross standing volumes			Commercial volumes	
			Total	Harv.	Harv. /ha	GSV[3]	NSV[4]	NSV /ha	total	/ha
Class A										
Total Class A										
Class B										
Total Class B										
Class C										
Total Class C										
TOTAL										

Table 7: Harvesting forecasts in effectives and volumes by blocks for all class A species[5]

Blocks	Field results						Assessment	
	Effectives			Gross standing volumes			Commercial volumes	
	Total	Harv.	Harv. /ha	GSV[6]	NSV[7]	NSV /ha[8]	total	/ha
Block 1								
Block 2								
TOTAL[9]								

[3] *Gross Standing Volume*

[4] *Net Standing Volume*

[5] *All the figures provided by this table are the total obtained for all the trees*

[6] *Gross Standing Volume*

[7] *Net Standing Volume*

[8] *Can not be upper than 30 m^3/ha*

[9] *Figures must be consistent with table 6*

4.4 Respect of the Annual Coupe Delineation rules

This section will not be covered for the AOP concerning the Annual Coupes of Forest Compartment 1.

The two main rules governing the Annual Coupe designation are the following, except for Annual Coupes of Forest Compartment 1:

1 HV AC = (HV FC / 5) +/- 5%

2 HA AC < 115% x (HA FC / 5), even if rule 1 is not fulfilled. This second rule is not applicable for the last Annual Coupe of each Forest Compartment

Where:
HV AC: Harvestable Volume on Annual Coupe
HV FC: Harvestable Volume on Forest Compartment
HA AC: Harvestable Area of Annual Coupe
HA FC: Harvestable Area of Forest Compartment

The FMC Holder must prove the compliance of the AOP with these 2 rules, with a table following the model below.

Table 8: Annual Coupe delineation compliance (not to be included in AOP for the Annual Coupes of the Forest Compartment 1)

	Unit	Value
Harvestable Volume[10] on Forest Compartment (HV FC)	m^3	
Harvestable Volume on Annual Coupe (HV AC)	m^3	
[(HV AC - (HV FC/5)] / (HV FC/5)[11]	%	
Harvestable Area on Forest Compartment (HA FC)	ha	
Harvestable Area on Annual Coupe (HA AC)	ha	
HA AC / HA FC[12]	%	

[10] *Gross standing volume of the trees of class A species above DCL*

[11] *The value must be between lower than + 5%*

[12] *The value must be lower than 115%*

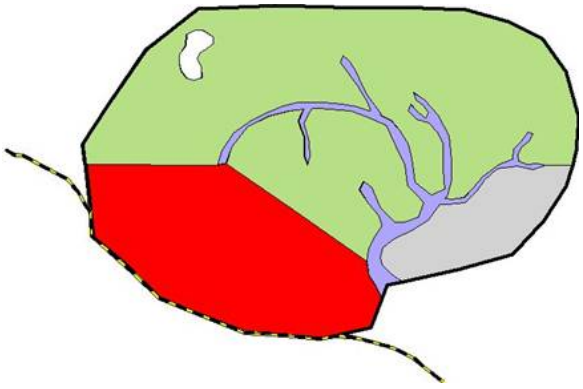
5 PLANNING OF WORKS

5.1 Planning of logging activities

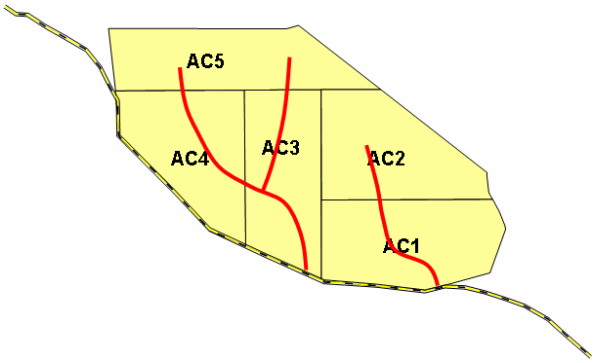
- Demarcation of the Annual Coupe and the Km-square blocks:

This section aims at providing a schedule which plans the field delineation of the Annual Coupes;

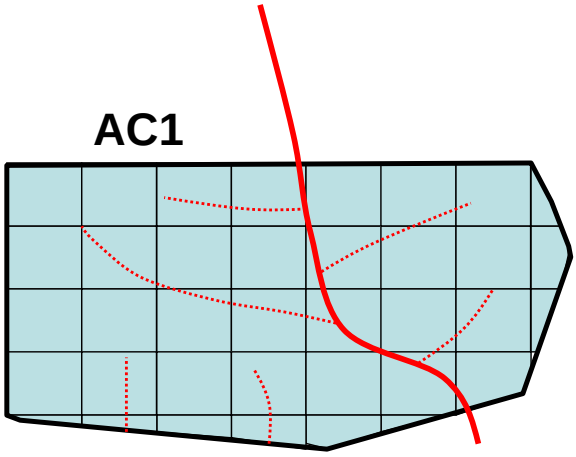
The Annual Coupe is divided in several Km-square blocks which are numbered according to Standard Operating Procedure n°7. The location of these blocks is specified on the Annual Coupe map.



SFMP version 1: FC 1 mapping



5YFMP: AC 1 to 5 mapping and main road planning



AOP: Annual Coupe map, block mapping and secondary roads planning

Figure 2 : Partitioning into Forest Compartment, Annual Coupe and blocks and infrastructure planning (for Forest Compartment 1)

- Opening schedule:

According to section 3 on 5 Year Forest Management Plan, the permanent closure of the Annual Coupe will be effective only 3 years after its opening date.

Each Km-square blocks inside an Annual Coupe may be opened only during one logging season according to the Liberia Code of Forest Harvesting Practices – section 7. Only the Km-square blocks not opened during the logging season may be harvested during the 2 following logging seasons

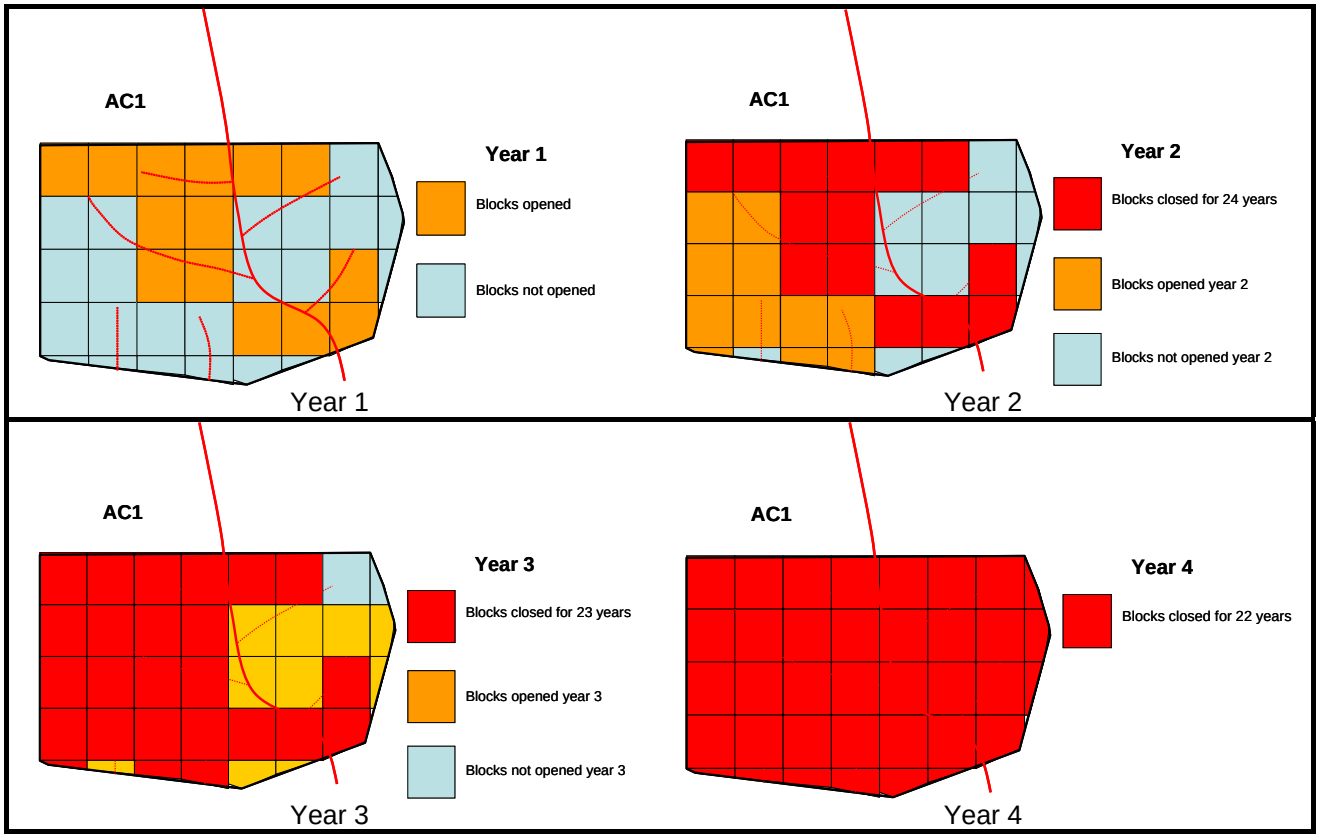


Figure 3 : Block opening schedule on an Annual Coupe

In this section, the FMC must provide the annual coupe closure date (3 years after opening date) and a commitment to the block closure concept explained above.

- Identification of the areas under specific rules (conservation or harvesting specific rules) for social or environmental issue:

Some special areas (included in Protection and Conservation Units or additional areas), for social or environmental purpose, may be identified and located on the Annual Coupe map: exclusion area (small area that have not been identified in the SFMP, buffer zones… The field demarcation of the boundaries of these areas is planned in the Annual Coupe Plan.

The definition of the Agriculture Unit is based on the concessionaire's local community consultations which conduct to fix in the field the definitive boundaries of this management unit.

The management rules of these areas must be described in this section.

- Location of trees to be protected:

According to the results of Pre-harvest enumeration, some trees may be identified in order to be protected: future trees, mother trees, harvestable trees located in buffer strips, trees of specific social value, protected species…

The protection of these trees is ensured during logging activities thanks to:

- ✓ the field marking of the concerned stems;
- ✓ the mapping on the stock maps.

- Planning of the road network, the bridges and the log landings;

The planning of the road network and the other infrastructures (watercourse crossings, road drainage and log landings) has to follow the prescriptions supplied into the Liberia Code of Forest Harvesting Practices – sections 4 and 5.9 (construction, timing, size, maintenance and closure).

The location of these infrastructures will be provided on the Annual Coupe map and on the stock maps. The AOPs will provide the characteristics of these infrastructures (length, width, surface…), according to the model provided by table below.

Table 9: Program of the road openings and the other Infrastructure on the Annual Coupe

Type of network/Infrastructure	Length	Location	Id. (map)	Programmation

- Procedures for planning and monitoring the logging operations:

The planning of the logging operations (tree marking, skid trails, felling, log preparation, skidding and transporting) has to follow the prescriptions of the Liberia Code of Forest Harvesting Practices – section 5.

This section aims at describing the procedures to plan and monitor the logging operations:

- ✓ Km-square block's demarcation;
- ✓ skid trail planning: final validation of the harvestable and protected stems, field marking of skidding tracks, trees to be protected…;
- ✓ reduced impact logging rules;
- ✓ stock and production monitoring…

- Harvest monitoring and post-harvesting diagnosis: this section will describe how the company is going to monitor and control the logging activities of the Annual Coupe:
  - ✓ post-harvesting diagnosis and field controls: assess the impact of the logging activities, control the implementation of the AOP (especially Reduced Impact Logging Requirements) and assess the log waste during harvesting;
  - ✓ post-harvesting activities: management of the Km-square block closure, the road maintenance and closure, the measures to mitigate the negative impacts…;
  - ✓ harvesting report on the AC and Annual Audits: implement corrective actions for the next Annual Coupe.

- Schedule of operations and maps

The planning of logging activities on the Annual Coupe is planned through a schedule, according to the model provided by Table 10 (§0).

The planning of logging activities requires the establishment of an Annual Coupe map (scale between 1/15.000 and 1/30.000) which locates:

- ✓ the Annual Coupe and Km-square block boundaries;
- ✓ the management units and other protected areas;
- ✓ the logging constraints including streams, steep areas, rock outcrops and swamps;
- ✓ the infrastructures existing or planned: watercourse crossings, roads, camps, quarries, landings…

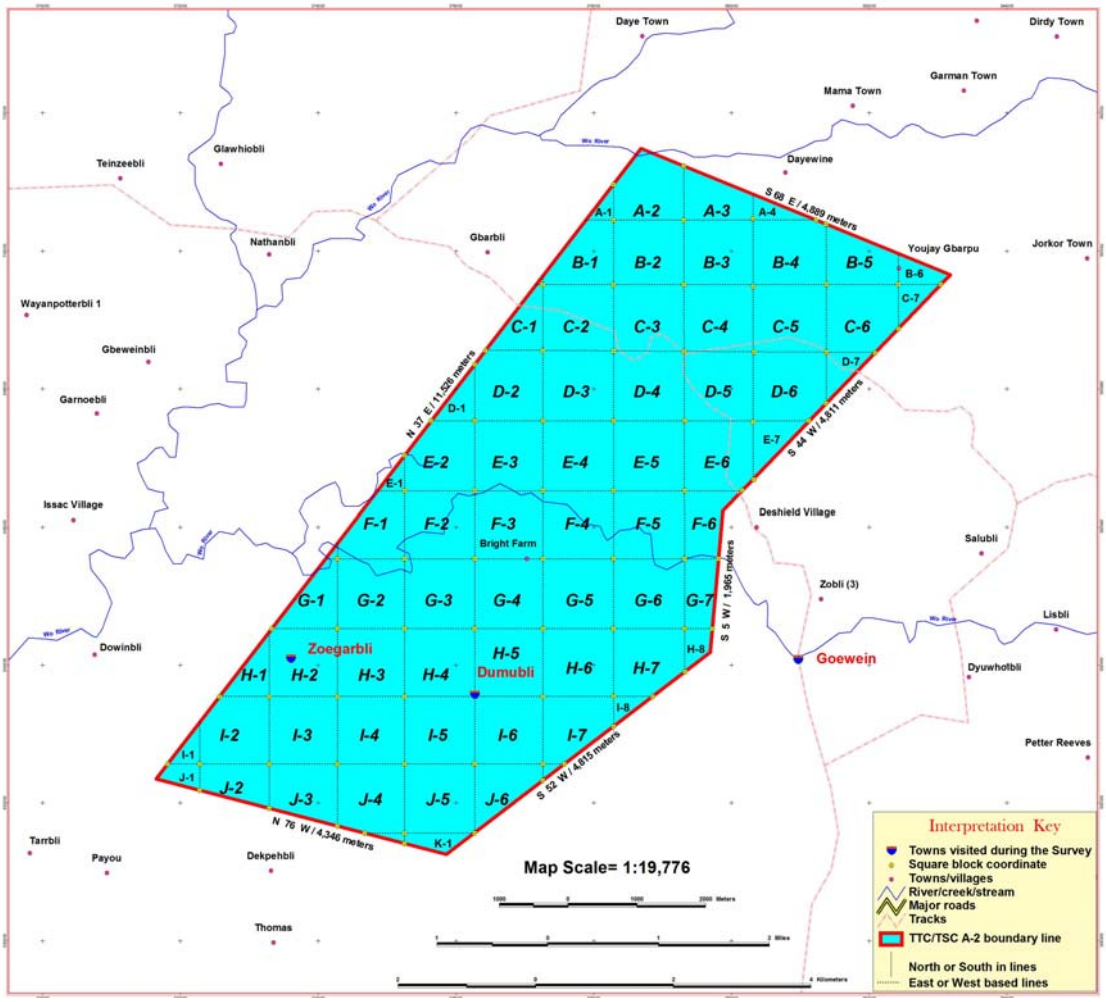


Figure 4 : Extract of an Annual Coupe map

INSERT IN THIS CHAPTER

Map 8: Annual Coupe map

The features of this Annual Coupe map will be included in stock maps at the Km-square block level (scale between 1/1.000 and 1/5.000) which show, besides the previous information, the following elements:

- ✓ the location of trees to be harvested and those to be protected;
- ✓ the Pre-harvest enumeration transects.

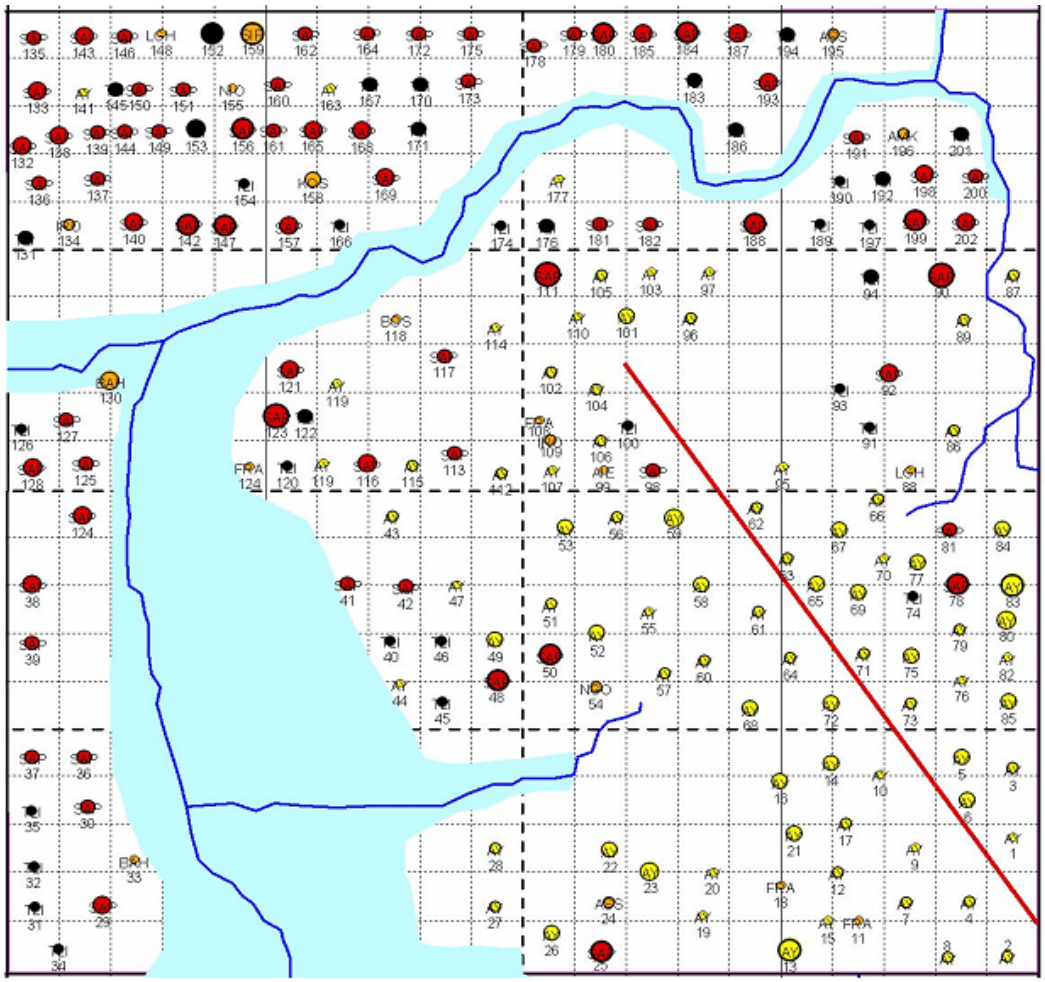


Figure 5 : Extract of a stock map

INSERT IN THIS CHAPTER

Map 9: Stock maps (Annual Coupe's Km-square blocks)

5.2 Planning of other activities

- Sylvicultural activities:

If special sylvicultural treatments are planned on the AC, this section will detail their nature, the objectives, the intensity and the operation planning.

This section will describe also the measures implemented of the Reforestation Units inside the Annual Coupe.

- Social program:

This section details the actions to implement (planning of concrete realizations), according to the 5YFMP, during the Annual Coupe logging period in the local villages: delineation of the Agriculture Unit, social mapping of trees and areas with social value, information and consultation of local communities (especially dates and description of public meetings).

- Environmental program:

This section will describe:

- ✓ the demarcation of the Protection and Conservation Units boundaries included in the Annual Coupe;
- ✓ the measures implemented on the Protection and Conservation Units included in the Annual Coupe;
- ✓ the measures against pollution;
- ✓ the wildlife management measures.

5.3 Activity planning / Implementation chart

The planned activities, during the concerned AOP period are provided in a scheduled table according to the following model:

Table 10: Planning schedule of logging and non logging activities

Year/Month / Activities	Year 1			Year 2								
	10	11	12	1	2	3	4	5	6	7	8	9
Planning of logging activities												
Coupe boundaries demarcation												
Pre-harvest enumeration												
Annual Coupe Plan submission												
Main road building												
Secondary road building												
Harvesting												
Harvesting report on the Coupe												
Post-harvesting operations												
Planning of other activities												
Consultation												
Units delineation												
Public meetings												
Social mapping												
Social program												
Other social activities												
…												
Sylviculture activities												
Nature of the action												
…												
Environmental program												
Nature of the action												
…												

TABLES TO BE INCLUDED IN THE AOP

MAPS TO BE INCLUDED IN THE AOP

Republic of Liberia

FORESTRY DEVELOPMENT AUTHORITY

GUIDELINES FOR FOREST MANAGEMENT PLANNING IN LIBERIA

APPENDICES

July 2009

With the technical assistance of

APPENDICES

Appendix 1: Liberia Legal framework

Appendix 2: Class of tree species

Appendix 3: Available data on annual growth rates for Class A species

Appendix 4: Survey questionnaire for social aspects

Appendix 5: Methodology for DHP Cutting Limit definition

APPENDIX 1

LIBERIA LEGAL FRAMEWORK

NATIONAL FORESTRY REFORM LAW OF 2006

Section 3.1 Objectives of Forest Management

FDA in charge of forest management - precautionary approach

Section 5.3 Forest Management Contracts

b. Forest Management Contracts must meet all of the following requirements:
(iii) The contract must require the Holder to perform actions necessary for sound, long-term forest management, including inventories, preparation of management plans, and annual operations plans.
(viii) The basic term of the contract must approximate the length of a forest rotation on the land based on a sustainable yield of Timber products, although the contract may be terminated sooner for cause.
(ix) The land area subject to the contract must be at least 50,000 hectares and no more than 400,000 hectares.
(x) The Annual Coupe must allow the Holder to harvest every suitable area once during the term of the contract.

e. The Authority shall issue to a Holder an Annual Harvesting Certificate only after all of the following conditions have been met for the year:
(i) The Holder has an approved annual operations plan.
(ii) The Holder has an approved forest management plan that covers the specific area to be harvested.
(iii) The Holder has met the previous logging season annual audit requirements.

Section 6.1 Termination of Forest Resources Licenses

The Authority may terminate Forest Resources Licenses on any of the following grounds:

c. For Forest Management Contracts, failure to complete all Pre-Felling Operations within twelve months of the Contract Effective Date, and for Timber Sale Contracts, failure to complete all Pre-Felling Operations within 90 days of the date of signature by the Authority.

Section 8.2 Sustainable Management and Utilization of Forest Resources

a. The Authority shall monitor Forest Lands to ensure that all use, harvest, and transport of Forest Resources is lawful and based on a sustainable yield, as established by Regulation of the Authority.

FORESTRY DEVELOPMENT AUTHORITY - REGULATION NO. 104
REGULATION ON ALLOCATION AND ADMINISTRATION OF FOREST MANAGEMENT CONTRACTS, TIMBER SALE CONTRACTS, AND MAJOR FOREST USE PERMITS

Section 74. Sustainable Practices

(c) The Holder of a FMC or TSC shall carry out Operations in accordance with the terms and conditions of the contract and in a manner that promotes the sustained development of Forest Resources and environmental protection for the common good of the people of Liberia, as provided for in applicable laws, statutes, rules, and regulations of Liberia.

FORESTRY DEVELOPMENT ENT AUTHORITY - REGULATION NO. 105
REGULATION ON PRE-FELLING OPERATIONS FOREST MANAGEMENT CONTRACTS

PART FIVE: FOREST MANAGEMENT PLANNING

Section 51. Preparation of a Forest Management Plan

(a) The FMC Holder shall prepare a forest management plan covering the entire area subject to the contract.

(b) In developing the plan required by this Part, the Holder shall ensure that the plan conforms to the requirements, including the requirements for public consultation, of the following:
(1) The Forest Management Guidelines issued by the Authority; and
(2) The Code of Forest Harvesting Practices issued by the Authority.

(c) In developing the plan required by this Part, the FMC Holder may seek input and guidance from the Authority to ensure that the plan incorporates sound forestry principles and addresses any concerns that the Authority may have.

(d) The FMC Holder shall submit its completed forest management plan, together with any supporting document or other information, to the Authority for approval.

Section 52. Approval by the Authority

(a) Upon receipt of a forest management plan, the Authority shall review it for completeness, accuracy, and conformity with the requirements of the National Forestry Reform Law of 2006, this Regulation, the Forest Management Guidelines, the Code of Forest Harvesting Practices, and the terms of the Holder's FMC.

LIBERIA CODE OF FOREST HARVESTING PRACTICES

2.2 Pre-Harvest Enumeration

Pre-harvest enumeration shall be completed in advance of, and must receive approval from the Authority, cutting any trees at the start of each harvesting period. Regulations and the individual Timber Sale and Forest Management Contracts define the timing and process for completing and pre-harvesting procedures.

Pre-harvest enumeration shall conform to the following standards:

- All blocks shall be surveyed for 100% stocking of trees 50 cm dbh using regular grid (north-south/east-west) in each kilometer square blocks to develop tree location map

Moreover, the following parameters shall be assessed and recorded during the field inventory for each marked tree:

- Location and the number of the tree;
- Botanical identification of tree species;
- Girth or diameter at dbh
- Quality features and visible defects a high for
- Location of size of any utilizable dead trees
- Topographic features that may influence harvest planning.

III EXCLUSION AREAS AND BUFFER STRIPS

3.1 Exclusion Areas

Exclusion areas include (a) protected areas, (b) protected animal species habitat (c) protected tree species (ex. IUCN Red List Trees, etc) (d) sites that are especially susceptible to degradation (e) watercourses and (f) cultural and customary tenure areas. Buffer strips of different widths will be used to protect such are

3.1.4 Sites susceptible to degradation

No harvesting operations shall be carried out on areas with slopes gradient above 30%.

3.2 Buffer Strip Protection

Buffer strips are required whether or not an exclusion feature is identified on available maps. Field inspection during pre-harvest inventory work will identify the areas that require buffer strips before forest operations start, and depending on the type of feature and how wide the strip shall be.

Buffer strip distances

Type	Minimum width
Conservation and declared protected areas or other buffer boundaries	50 meters
Cultural, spiritual and historic sites	100 meters
Villages, farms, settlements	100 meters
Rare, endangered, mother/seed trees	10 meter radius
Watercourses: Width <10m Width < 20m Width < 40 m	15 m on each bank 20 m on each bank 30 m on each bank
Natural springs	50 meters circumference
Lakes,	25 meters from the waters edge
Creeks and streams	15 meters from the waters edge
Gullies	15 meters from the waters edge
Lakes	25 meters from the waters edge
Swamps and other wetlands	15 meters from the waters edge

VII POST-HARVEST ACTIVITIES

7.1 Block closure

Blocks shall be closed once the logging of the approved yield has been completed. A block that has been closed shall not be re-entered and shall remain closed until the next scheduled cutting cycle except for the collection of non-timber forest products by the local communities.

Logging operations in a specific block should be completed in a single logging season. The only exception to this rule that may be applied is when weather conditions have prevented the approved yield to be felled and extracted. In such cases the FDA shall provide an extension to complete harvesting operations.

FMC CONTRACT (2009 VERSION)

B3.0 – OBLIGATIONS OF CONTRACTOR

B3.11 – Forest Management Plan

AT least 90 days before the first annual operating season, HOLDER shall submit to AUTHORIY a Forest Management Plan covering the entire term of this contract and looking far enough into the future to demonstrate that the HOLDER's proposed management activities during the contract term will be sustainable.

B3.14 – Initial Annual Operationnal Plan

(a) Within 90 days before the first annual operating season, HOLDER shall submit to AUTHORITY an initial ANNUAL OPERATIONNAL PLAN.

(b) Except for the timing of submission specified in this section, the initial ANNUAL OPERATIONNAL PLAN must conform t the requirements of section B6.11.

B6.11 – Annual Operations Plan

At least 60 days prior to the beginning of each annual operating season, HOLDER shall submit to AUTHORITY an ANNUAL OPERATIONAL PLAN
The ANNUAL OPERATIONAL PLAN must describe the next operating season major activities, including logging, environmental protection measures, road construction and maintenance, and other actions required by law or AUTHORITY regulations.
The ANNUAL OPERATIONAL PLAN must be consistent with the Forest Management Guidelines, the Liberia Code of Forest Harvesting Practices, HOLDER's five- year Forest Management Plan, and HOLDER's Strategic Forest Management Plan
The ANNUAL OPERATIONAL PLAN must identify Harvesting Blocks and all MERCHANTABLE TREES within the HARVESTING BLOCKS on block maps, according to the specification of the CHAIN OF CUSTODY SYSTEM standards for operations.

APPENDIX 2

CLASS OF TREE SPECIES

Classes of tree species

BOTANICAL NAME	LOCAL AND TRADE NAMES LIBERIA	CLASS (stumpage fee)
Hallea ciliata	Abura (Bahia)	A
Canarium schweinfurthii	Aiele	A
Guibourtia ehie	Amazakoue (Bubinga)	A
Anigeria robusta	Aningre (Annegre)	A
Guarea cedrata	Bosse	A
Ceiba pentandra	Ceiba (Fromager)	A
Piptadeniastrum africanum	Dahoma	A
Afzelia spp (bella, africana)	Doussie (Afzelia, Apa)	A
Lophira alata	Ekki (Azobe)	A
Terminalia superba	Frake (Limba, Afara)	A
Terminalia ivorensis	Framire (Baji, Emire)	A
Chlorophora spp (regia, excelsa)	Iroko (Odum, Kambala)	A
Khaya anthotheca	Khaya (Acajou blanc)	A
Khaya ivorensis	Khaya (Acajou d'Afrique)	A
Entandrophragma candollei	Kosipo (Abourd, Kro)	A
Nauclea diderrichii	Kusia (Bilinga, Opepe)	A
Gilbertiodendron preussii	Limbali	A
Lovoa trichilioides	Lovoa (Dibetou)	A
Tieghemella heckelii	Makore (Baku, Douka)	A
Distemonanthus benthamianus	Movingui	A
Brachystegia leonensis	Naga	A
Heritiera utilis	Niangon (Whismore)	A
Triplochiton scleroxylon	Obeche (Samba,Wawa)	A
Entandrophragma cylindricum	Sapele (Sapelle, Aboudikro)	A
Entandrophragma utile	Sipo (Utile)	A
Tetraberlinia tubmaniana	Tetra (Sikon)	A
Entandrophragma angolense	Tiama (Edinam)	A
Pericopsis elata	Afromosia	B
Chrysophyllum spp	Akatio (Longui)	B
Antiaris africana	Ako	B
Rhodoguaphalon brevicuape	Alone (Kondrotti)	B
Cynometra ananta	Apome	B
Turraeanthus africanus	Avodire	B
Haplormosia macrophylla	Black gum (Idewa)	B
Bombax buonopozense	Bombax	B
Didelotia idea	Bondu	B
Nesogordonia papaverifera	Danta (Kotibe)	B
Daniella thurifera	Faro	B
Pycnanthus africanus	Ilomba	B
Anopyxis klaineana	Kokoti	B
Pterygota macrocarpa	Koto (Ake)	B
Mammea africana	Mammea (Oboto)	B
Mansonia altissima	Mansonia (Bete)	B
Oldfieldia africana	Oldfieldia (Dantoue)	B
Sacoglottis gabonensis	Ozouga	B
Erythrophleum ivorensis	Tali (Sassawood)	B
Combretodendron macrocarpum	Abale	C
Ongokea gore	Angueuk (Kuwi)	C
Anthonotha fragrans	Anthonotha (Kibokoko)	C
Araliopsis tabouensis	Araliopsis (Grenian)	C
Calpocalyz aubrevillei	Badio (Calpocalz)	C
Celtis spp (aldolfi-friederiei)	Celtis (Lokenfi)	C
Dialium spp	Dialium (Eyoum)	C
Alstonia boonei	Emien	C
Copaifera salikounda	Etimoe	C
Fagara macrophylla	Fagara (Olondu)	C

BOTANICAL NAME	LOCAL AND TRADE NAMES LIBERIA	CLASS (stumpage fee)
Funtumia elastica	Funtumia (Mutundu)	C
Hannoa klaineana	Hannoa (Effeu)	C
Beilschmiedia mannii	Kanda	C
Klainedoxa gabonensis	Klainodoxa (Eveuss)	C
Amphimas pterocarpoides	Lati (Bokanga)	C
Parinari excelsa	Parinari (Songue)	C
Parkia bicolor	Parkia (Lo)	C
Berlinia confusa	Pocouli (Ebiara)	C
Uapaca guinensis	Uapaca (Rikio)	C

APPENDIX 3

AVAILABLE DATA ON ANNUAL GROWTH RATES FOR CLASS A SPECIES

Available data on annual growth rates for Class A species

BOTANICAL NAME	LOCAL/TRADE NAMES LIBERIA	Annual Growing rate (cm/year)	Source
Hallea ciliata	Abura (Bahia)	0,3	Ivory Coast - Irobo
Canarium schweinfurthii	Aiele	no data	
Guibourtia ehie	Amazakoue (Bubinga)	0,35	Gabon - Nature +
Anigeria robusta	Aningre (Annegre)	0,4	Ivory Coast - Mopri
Guarea cedrata	Bosse	0,4	Ivory Coast - Mopri
Ceiba pentandra	Ceiba (Fromager)	1,5	Ivory Coast - Mopri
Piptadeniastrum africanum	Dahoma	0,4	Ivory Coast - Mopri
Afzelia spp (bella, africana)	Doussie (Afzelia, Apa)	0,25	Ivory Coast - Mopri
Lophira alata	Ekki (Azobe)	0,45	Gabon - Nature +
Terminalia superba	Frake (Limba, Afara)	0,75	Ivory Coast - La Tené
Terminalia ivorensis	Framire (Baji, Emire)	0,75	Figure for T. superba
Chlorophora spp (regia, excelsa)	Iroko (Odum, Kambala)	0,5	Ghana
Khaya anthotheca	Khaya (Acajou blanc)	0,4	Ivory Coast - Mopri
Khaya ivorensis	Khaya (Acajou d'Afrique)	0,4	Figure for K. anthoteca
Entandrophragma candollei	Kosipo (Abourd, Kro)	0,35	Ivory Coast - Mopri and Irobo
Nauclea diderrichii	Kusia (Bilinga, Opepe)	0,45	Gabon - Nature +
Gilbertiodendron preussii	Limbali	0,1	Ivory Coast - Irobo (G. dewevrei)
Lovoa trichilioides	Lovoa (Dibetou)	0,45	Ivory Coast - Irobo
Tieghemella heckelii	Makore (Baku, Douka)	0,3	Ivory Coast - Irobo
Distemonanthus benthamianus	Movingui	0,45	Gabon - Nature +
Brachystegia leonensis	Naga	no data	
Heritiera utilis	Niangon (Whismore)	0,6	Ivory Coast - Irobo
Triplochiton scleroxylon	Obeche (Samba,Wawa)	1,4	Ivory Coast - Mopri and La Tené
Entandrophragma cylindricum	Sapele (Sapelle, Aboudikro)	0,4	Ivory Coast - Mopri and Irobo
Entandrophragma utile	Sipo (Utile)	0,35	Ivory Coast - Mopri and Irobo
Tetraberlinia tubmaniana	Tetra (Sikon)	no data	
Entandrophragma angolense	Tiama (Edinam)	0,35	Ivory Coast - Mopri and Irobo

APPENDIX 4

SURVEY QUESTIONNAIRE FOR SOCIAL ASPECTS

DATE: _____ **SURVEYOR:** _____ **N°**

(Number of men present: _____ *Number of women present:* _____*)*

ADMINISTRATIVE IDENTIFICATION AND ORGANISATION

1. Department:

2. Sub-Prefecture: _____

3. Village: _____

3.1. *Name of the village committee President:* _____
3.2*. Name of Vice-President:*_____
3.3. *Name of the village committee Secretary*: _____
3.4. *Committee of elders*

- _____
- _____
- _____
- _____
- _____

GIS GEOGRAPHICAL POSITIONING DATA

4. Centre of village: Lat. (Y) _____
Long. (X)_____

5. Entrance to village: Lat. (Y) _____
Long. (X)_____

6. Exit of village: Lat. (Y) _____
Long. (X)_____

7. Neighbourhoods (name of each if necessary; large village or town)

7.1. Neighbourhood _____ Lat. (Y) _____
Long. (X)_____

7.2. Neighbourhood _____ Lat. (Y) _____
Long. (X)_____

7.3. Neighbourhood _____ Lat. (Y) _____
Long. (X)_____

… **…**

8. Camps

8.1. Camps _____ Lat. (Y) _____
Long. (X)_____

8.2. Camps _____ Lat. (Y) _____

Long. (X)_____
*8.3. Camps*_____ Lat. (Y) _____
Long. (X)_____
…

9. Sacred sites or sites with reserved access
Nature: cemetery, ancient village, crop site, sacred tree, source, clump of trees,…

9.1. *Name:* _____ Lat. (Y) _____
Nature: _____ Long. (X)_____
9.2. *Name:* _____ Lat. (Y) _____
Nature: _____ Long. (X)_____
…

10. Other site of particular interest (specify)
(cave, waterfall, salt deposit…) Lat. (Y) _____
Long. (X)_____
…

11. Dependent camps of the village

Nature: agriculture; hunting; fishing; other (specify)
Type: temporary; permanent

CAMP NAME	PRINCIPAL NATURE OF THE ACTIVITY	TYPE OF CAMP	NAME OF CAMP LEADER

…

Comments:

POPULATION	*To fill in after analysis of the population census sheet*

12. Numbers and repartition by sex and age class

	0-5 years	>5-15 years	>15-25 years	>25-35 years	>35-45 years	>45-55 years	>55-65 years	>65 years	*Total*
MEN									
WOMEN									

Total									

13. Distribution of the ethno linguistic groups

**specify the periods and approximate dates if possible*

ETHNO LINGUISTIC GROUP	NUMBER	%TOTAL POP.	NATIVE POPULATIONS *	NON-NATIVE POPULATIONS *

…

ACCESS TO THE VILLAGE AND CAMPS

14. Modes of access to the village

Tick the corresponding case

TYPE OF ACCESS	PERMANENT	SEASONAL	COMMENTS AND REMARKS
• ***Pedestrian path***			
• ***Track suitable for vehicles***			
• ***Track non suitable for vehicles***			
• ***River***			

15. Distance to the nearest market?

15.1. *Is there a market in the village?* _____

15.2. *If yes, how often is the market? daily, weekly…:*

_____

15.3. *If no, how many kilometres to the nearest market:* _____

15.4. *Easiest mode of access and time necessary:* _____

15.5. *Most used mode of access and the time necessary: _____*

16. Costs of transport of the merchandise (carrying, taxi, canoe…):

_____
_____
_____

17. Are the products easy to sell for the villager? If not, what are the constraints?

_____
_____
_____

18. Modes of access to the dependent village camp(s)

* Pedestrian; by road suitable for vehicles, river

	TYPE OF ACCESS*		
CAMP NAME	**PERMANENT**	**SEASONAL**	**TIME OF ACCESS TO THE VILLAGE**
•			
•			
•			
•			

…

Comments

SERVICES, SOCIAL INFRASTRUCTURES AND COLLECTIVE EQUIPMENT

19. School and training establishments:

19.1. *Number of functional establishments: _____*

19.2. *Number of non functional establishments:_____*

- *Status :_____*
  (primary, secondary, technical, public, private, not religious, confessional,…)
- *Number of classed: _____*
- *Number of students:- boys_____ - girls_____*
- *Maximum school level*
- *State of infrastructures and equipment_____*
  _____

- *Reasons for bad functioning :*
  _____

MODES OF FINANCING TEACHERS	STATE	
	DEPARTMENT	
	PARENTS OF THE TEACHERS	
	CHARITABLE ASSOCIATION, CHURCH	
	OTHERS:_____	

19.2. If there no school, where are the children educated?
_____

20. Health infrastructures

20.1. *Is there a dispensary: _____*

20.2. *Is the dispensary functional: _____*

20.3. *If not, what are the reasons:_____*
_____

20.4. *What staff look after the dispensary and what is there level of training?*
_____
_____

20.5. *How is the dispensary supplied with medicine?*
_____
_____

20.6. If there is no dispensary, where do the villagers go to be treated?
_____
_____

20.7. If there is no dispensary, where do the villagers get there medicines?

XXX ***almost exclusive supply;*** **XX** ***equal supply;*** **X** ***occasional supply***

	TRADITIONAL MEDICINES	TRAVELLING MEDICINE SALESMEN	NEAREST PHARMACY OR HEALTH CENTRE
IMPORTANCE FOR THE VILLAGERS SUPPLY			

21. Hydraulic equipment yes_____ no_____

21.1. *Number of functional equipment and type of existing installation(s) (wells, pump, bore, captured source…):*
_____
_____

21.2. *Number of non functional equipment and type of existing installation(s):*
_____
_____

21.3*. Origin and mode of finance:*

_____
_____

21.4. *Reasons for the non functioning:*

_____
_____

21.5. If there is no equipment, where does the population go to get water, and how far is it from the village?

_____
_____

PEOPLE

22. Lineages

NAME OF LINEAGE *(LIKANDA)*	ETHNO LINGUISTIC GROUP	NAME OF LINEAGE CHIEF

…

Comments

24. Names and location of village chiefs

NAME	FUNCTION	LOCATION

…

24.1. *What services do you provide your 'intellectuals' to improve the village?*

_____
_____
_____
_____
_____

24.2. Surveyors impression of the representatives and the assumed role of the village elites: how are they perceived?

ASSOCIATION LIFE AND SOCIO-ECONOMIC COHESION

25. Solidarity groups

Tontine, cooperative, association, group, committee, health insurance, support groups (agricultural work, fishing, house and village infrastructure construction,…), …

Level of functioning

XXXX	*perfectly functioning and very active*	**XXX**	*functional and active*		
XX	*average functionment and active*	**X**	*poorly functioning or in a crisis*	**O**	*inactive*

TITLE AND/OR OBJECT	STATUS	LEVEL OF FUNCTION	NAME OF PERSON RESPONSIBLE

…

26. Cultural and cult groups

Initiation association, religious…

TITLE AND/OR OBJECT	STATUS	LEVEL OF FUNCTION	NAME OF PERSON RESPONSIBLE

…

27. Sporting and leisure associations

TITLE AND/OR OBJECT	STATUS	LEVEL OF FUNCTION	NAME OF PERSON RESPONSIBLE

…

BASIC STRUCTURE OF THE SEMI-STRUCTURED INTERVIEW ABOUT THE MODES OF MANAGEMENT OF RESOURCES AND THE FOREST SPACES FOR THE FOREST POPULATIONS AND THE LOCAL DECISION MAKING POWERS

28. Rules of access to the natural resources

- ***28.1.*** Who has access to the resource (do foreigners have access or is there simply a relationship with a members of the village…)?
- ***28.2***. Who does one need to ask (family, clan, village head…)?
- ***28.3***. Is the access free, paying (cash – indicate the price of the transactions – on in nature), or based on exchanges…?
- ***28.4.*** If the rules are not really applied, what are the reasons for abandoning them or for the changes in these customary rules?

29. Decision process and modes of control (sanctions)

- ***29.1***. Are there bans linked with access and/or the use of one or more resources and forest spaces?
- ***29.2***. Who has the power to sanction and what sanctions are applied?
- ***29.3***. Are there sacred sites and where?
- ***29.4***. Do the bans still apply today and if not why?
- ***29.5.*** Who has the power, authority, legitimacy that will be respected? By which means (human or supernatural)?

30. Modes of resolving the conflicts

- ***30.1.*** *How are conflicts linked to access to a resource resolved?*
- ***30.2.*** *Are the modes of resolution identical for all types of resource?*
- ***30.3.*** Who are the people who resolve the situations, and do they differ depending on the type of resource or place (lineage territory…)?

DATA ON THE MODES OF EXPLOITATION OF THE NATURAL RESOURCES

3.2. Agricultural production

32.1. Importance of agricultural and fruit production

XXXX totality; **XXX** dominant; **XX** equal weighting; **X** little importance; **O** marginal or none

** Number 1 to 5 the five main products*

COMMON NAME	VERNACULAR NAME	❺	SUBSISTENCE PART	COMMERCIALISED PART
CITRUS FRUIT				
BANANA				
AUBERGINE				
AVOCADO				
SWEET BANANA				
PLANTAIN BANANA				
CACAO				
SUGAR CANE				
LOCAL CUCUMBER				
SQUASH				
GOMBO				
YAM				
CORN				
MANGO				
BITTER CASSAVA				
SWEET CASSAVA				
GUINEAN SORREL				
PALM OIL				
PAPAYA				
SWEET POTATO				
CHILLI				
SAFOUTIER				
TOBACCO				
TARO				
…				

32.2. What is the average size of fields and the average length of rotation?

(Make measurements during a field visit)

32.3. What is the distance of the fields from the village?

32.4. Are there enough men and women in the village for agriculture?

32.5. What prevents an increase in agriculture in the village?

(lack of workers, expensive labour, damage from pests, cassava diseases,…)

- _____
- _____
- _____
- _____
- _____

32.6. What solutions can you suggest?

- _____
- _____
- _____
- _____
- _____

3.3. Animal rearing

33.1. Importance of animal rearing in the village

***** **XXXX** totality; **XXX** dominant; **XX** equal weighting; **X** little importance; **O** marginal or none

** Number 1 to 5 the five main products*

SPECIES OF ANIMALS RAISED	❺	SUBSISTENCE PART *	COMMERCIALISED PART *
• CHICKEN			
• GOAT			
• SHEEP			
• PIGS			
• DUCK			
• OTHER :_____			

33.2. What prevents an increase in animal rearing in the village?

Do not interpret, but note constraints listed

3.4. Fishing

34.1. Importance of fishing

XXXX totality; **XXX** dominant; **XX** equal weighting; **X** little importance; **O** marginal or none

** Number 1 to 5 the five main products*

COMMON NAME + (VERNACULAR NAME)	5	SUBSISTENCE PART	COMMERCIALISED PART

34.2. Are there enough men and women in the village to fish?

34.3. What are the most commonly used techniques?

34.4. What prevents an increase of fishing in the village?

- _____
- _____

34.5. What solutions do you suggest?

- _____
- _____
- _____
- _____

Comments:

3.5. Hunting

35.1. Importance of hunting

XXXX totality; **XXX** dominant; **XX** equal weighting; **X** little importance; **O** marginal or none

** Number 1 to 5 the five main products*

COMMON NAME + (VERNACULAR NAME)	❺	SUBSISTENCE PART	COMMERCIALISED PART

35.2. What are the most commonly used hunting techniques?

- _____
- _____
- _____
- _____

35.3. What type of meat gets the most money? *(what species, fresh meat, smoked meat, speared meat,…)*

35.4. Are there traders in the village? Where do they come from?

36. NTFP

36.1. Importance of non timber forest products

* **XXXX** abundant and nearby **XXX** abundant but far away **XX** quite rare **X** rare or very rare

COMMON NAME	VERNACULAR NAME	USES	ABUNDANCE*

36.2. Socio-economic importance of NTFP

XXXX totality; **XXX** dominant; **XX** equal weighting; **X** little importance; **O** marginal or none

** Number 1 to 5 the five main products*

BRUT OR PROCESSED PRODUCT	❺	SUBSISTENCE PART	COMMERCIALISED PART	PRICE AND UNIT OF SALE*

** bag of foufou, kilo,…*

36.3. Are there artisans in the village and what are their specialities?

37. Relative importance of revenue generating products

Tick the corresponding case

TYPE OF PRODUCTS (specify the most sold product)	**N°**	**PRINCIPAL REVENUE**			**INTERMEDIARY REVENUE**			**ACCESSORARY REVENUE**		
FRESH AGRICULTURAL PRODUCTS: •		(1)	(2)	(3)						
PROCESSED PRODUCTS: •										
FRESH MEAT: •										
SMOKED MEAT: •										
IVORY										
BRUT **NTFP:** •										
PROCESSED **NTFP:** •										
CHICKEN										
SHEEP										
GOATS										
FISH: •										
ARTISAN AND OTHER (SPECIFY): •										

(1) Does not exceed 10000 CFA/month

(2) Up to 50000 CFA/month

(3) Often exceeds 50000 CFA/month

38. After all the questions asked, what are the village priorities?

Existing species which are hunted in the zone

Rate of capture: XXXXX very frequent; XXXX quite frequent; XXX infrequent; XX rare; X very rare

COMMON NAME	VERNACULAR NAME	NEVER OBSERVED OR EXTINCT (X OR O)	RATE OF CAPTURE
MAMMALS			
African bush-tailed porcupine			
Cane rat			
Buffalo			
Blue duiker			
Black-backed duiker			
Yellow-backed duiker			
Black-fronted duiker			
White-legged duiker			
White-bellied duiker			
Peter's duiker			
Crowned guenon			
Gray-cheeked mangabey			
DeBrazza's monkey			
African golden cat			
Water chevrotain			
Chimpanzee			
African civet			
Black colobus monkey			
Western tree hyrax			
Forest elephant			
Servaline genet			
Lowland gorilla			
Hyena			
Lion			
African clawless otter			
Mandrill			
Black-legged mongoose			
Moustached monkey			
Dwarf antelope			
Tree pangolin			
Giant pangolin			
Panther			
Peccary			
Giant rat			
Greater white-nosed monkey			
Sita-tunga			
REPTILES			
Gabon viper			
Tortoise			
Nile monitor			
African slender-nosed crocodile			
Crocodile			
BIRDS			
Crested guinea fowl			
Great blue turaco			

APPENDIX 5

METHODOLOGY FOR DHP CUTTING LIMIT DEFINITION

Methodology for DHP Cutting Limit definition

- **Growth index (%Re):**

Growth index is calculated by using the following formula which provides the means to determine the number of trees that would enter the DCL and above DHP classes during the twenty-five years of a cutting cycle:

$$\%\,\mathrm{Re} = \frac{[No.(1-\Delta)].(1-\alpha)^{T}}{NP}.100$$

%Re: reconstitution indexes of the initial number of harvestable stems

No: Number of stems per species that will become harvestable after 25 years

Np: Total number of the initial harvestable stems per species

α : natural mortality rate (1%)

T = Rotation length: 25 years
= DCL-the lower Diameter divided by the annual average growth rate

Δ = Rate of the harvesting damages (10%)

Example:

Calculation of the Growth indexs of 2 tree species:

- Species 1: DCL = 50 cm and Annual Diameter Growth Rate (ADG) = 0,4 cm/year;
- Species 2: DCL = 60 cm and Annual Diameter Growth (ADG) = 0,5 cm/year.

Diameter class		Species 1 (number of trees)	Species 2 (number of trees)
D_{inf}	D_{sup}		
20	30	14	2002
30	40	5	1825
40	50	16	1642
50	60	16	798
60	70	25	1033
70	80	15	214
80	90	22	168
90	100	10	109
100	110	4	0
110	120	0	0

Step 1: Definition of the initial number of harvestable trees (first rotation period): Np
Np is obtained by adding the number of trees above the DCL:

- Species 1: Np = 16 + 25 + 15 + 22 + 10 + 4 = 92
- Species 2: Np = 1 033 + 214 + 168 + 109 = 1 524

Step 2: Calculation of the lower diameter which will produce the harvestable trees for the second rotation period:

D_L = DCL – (T x ADG) with T = Rotation period = 25 years

- Species 1: D_L = 50 – (25 x 0,4) = 40 cm. The trees, which are expected for the second rotation period, are ranging from 40 cm to 50 cm diameter classes;
- Species 2: D_L = 60 – (25 x 0,5) = 47,5 cm. The trees, which are expected for the second rotation period, are ranging from 47,5 cm to 60 cm diameter classes.

Step 3: Calculation of the number of trees that will become harvestable in the second rotation period: No, stems that are expected to enter the diameter classes above the DCL after 25 years.
If the calculated D_L correspond to a threshold diameter class, No is obtained by adding the number of trees with diameter classes ranging from D_L to DCL.
If the calculated D_L is not a threshold diameter class, No is obtained by adding:

- the part of number of trees ranging from D_L to the first superior threshold diameter class ($D_{L\text{-}sup}$): divide by 10 the number of trees of the concerned diameter class to obtain the number of trees of each diameter unit. This number of trees by diameter unit is multiplied by the factor (10-U) with U being the number of unit between $D_{L\text{-}inf}$ and D_L (example D_L = 53,7; U = 3,7);
- and the number of trees with diameter classes ranging from $D_{L\text{-}sup}$ to DCL.

Species 1: No = effective of class 40-50 = 16;
Species 2: No = [(effective of class 40-50 / 10) x (10 – U)] + effective of class 50-60
= [(1 642/10) x 2,5] + 798 = 1 209

Step 4: Calculation of the Growth indexs:

- Species 1: %Re = [16 x (1 – 0,1) x $(1 – 0,01)^{25}$ / 92] x 100 = 12,17%;
- Species 2: %Re = [1 209 x (1 – 0,1) x $(1 – 0,01)^{25}$ / 1 524] x 100 = 55,53%.

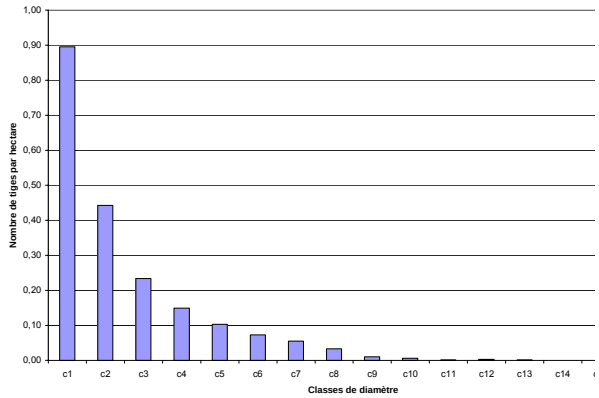
- **Species group reconstitution Rate (%Rpop):** Calculation of the weighted average of the Reconstruction rates for each class of species, according to the following formula:

$$\%Rpop = \frac{\sum_i \%RiNoi}{\sum_i Noi}$$

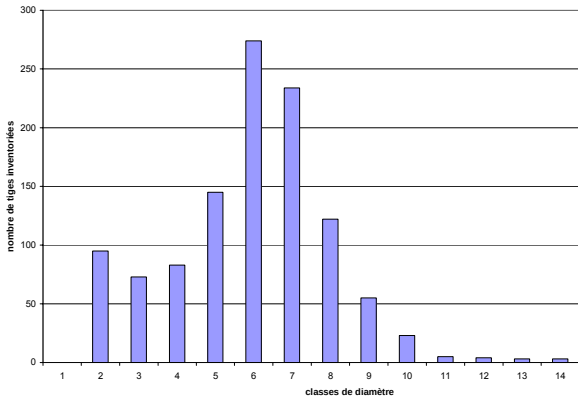
%Rpop : Reconstitution rate of an harvestable class of species
%Ri : Reconstitution rate of the species *i*
Noi : effective of the species *i*

- **Stand structure analysis:**

Stand structure analysis is the key element to asses the harvesting sustainability. On the Figure 1, it is clear that stand regrowth of species 1 will be more bad in the long term than stand regrowth of species 2.



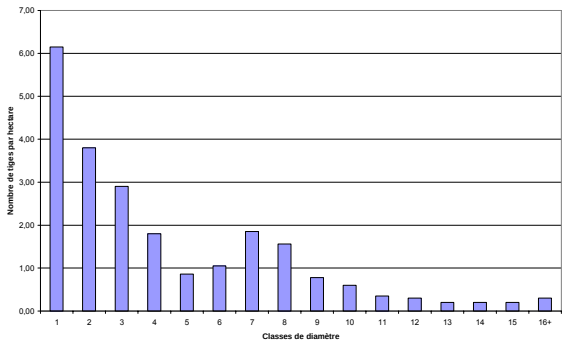
Species n°1 : « Exponential » structure, with numerous young trees : favourable structure



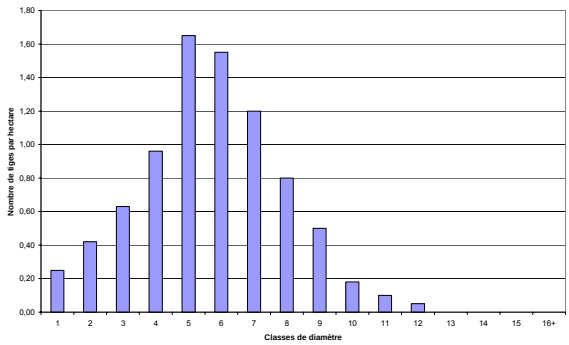
Species n°2 : Bell-shaped structure, with a lack of young trees : unfavourable structure

Figure 1 : Stand structure examples

Stand structure analysis can be a very helpful additional information, as they enable a comprehensive view of the long term regrowth, and not only the first rotation cycle regrowth. In some cases, the Growth index can be low even if the stand structures shows an abundance of young trees, as it is illustrated by Figure 2.



Species n°1 : Growth index on 25 years : 29 % sur 25 ans (DCL = 70 cm), abundance of young trees: favourable structure



Species n°2 : Growth index on 25 years :76 % (DCL = 70 cm), even with a lack of young trees: unfavourable structure

Figure 2 : Stand structure examples

- **Inventory data to be used**

This calculation will be done at the national level or a at the region level (for each of the 2 Liberian forest regions). The decision regarding this issue will be taken by the FDA. A first calculation and adjustment of DCL will be performed within 4 years by the FDA using the first multi-resource inventory data. The analysis shall be refined each time a multi-resource inventory has been completed on a FMC.

The new DBH cutting limits list will be submitted to a consultation process before approval by the FDA

- **DHP Cutting Limit adjustment**

The following rules will be applied:

- For each class of species (A, B and C) the **%Rpop** has to reach a minimum of 75%;
- For each tree species the **%Re** has to reach a minimum of 50%, except if the stand structure is favourable (see figures 1 and 2 above).

If the Growth indexs do not reach the acceptable limit (previous paragraph), the DHP Cutting Limits have to be adjusted according to fixed rules:

- Species with **%Re < 50%** and an unfavourable stand structure: increase the DCL at least of 1, or 2 maximum, the diameter class in order to reach the acceptable limit of **%Re** (50%);
- Class of species with **%Rpop < 75%**: increase the DCL of some species in order to reach a **%Rpop** of 75% even if all the species of the class reach the acceptable limit of **%Re**;
- Species with **%Re > 100%** and a favourable stand structure: possibility to decrease the DCL of 1 or 2 diameter class, with keeping a **%Re > 100%**;
- Rare species:
  - ✓ density < 0,02 stems/ha (for stems of DHP > 10 cm) at the forest region level: harvesting not allowed;
  - ✓ density < 0,04 stems/ha (for stems of DHP > 10 cm) at the National territory level: harvesting not allowed.

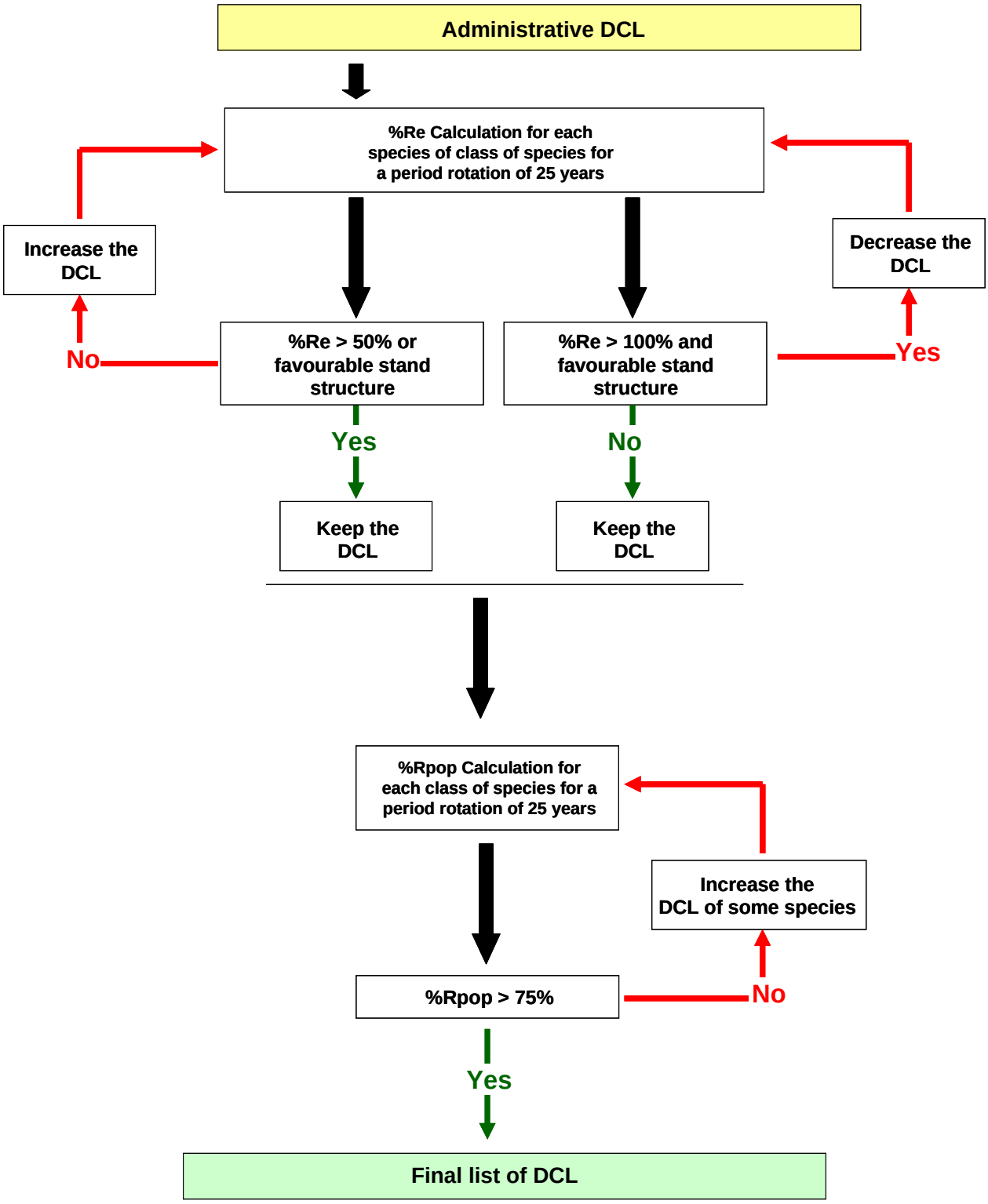


Figure 3: DBH cutting limit adjustment process