



UNDERSTANDING HOW TIMBER IS HARVESTED IN GHANA

**AN ABRIDGED HANDBOOK
FOR CIVIL SOCIETY ON TIMBER LOGGING
OPERATIONS IN GHANA**





Civic Response is a leading natural resource governance policy advocacy organization working to entrench resource rights. Founded in 2003 in Accra Ghana, by a group of well experienced activists with great concern for the poor governance in the sector, particularly the challenges of local forest communities, Civic Response works to advance the rights of communities that depend on natural resources for their livelihood, particularly forests.

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PREFACE

Ghana is known for her ability to develop very good policies but ironically, always face challenges with policy implementation and enforcement of laws. The forest sector has been no exception. A 1994 Forest and Wildlife policy developed after a thorough analysis of the challenges of the sector was only backed by a legislation for timber industry development which was hardly enforced. Satellite imagery of Ghana's forest resources showed that Ghana lost a great deal of its forest cover between 1990 and 2000 mostly through illegal logging and expansions of agricultural. Bad governance has been identified as the main reason behind the loss of Ghana forest cover.

Forest governance is about who has decision making authority over forest resources; how institutions with responsibility for managing our forest resources are making and enforcing the laws including how stakeholder participation; how these institutions are held accountable; and how they are transparent in their actions. These were the ideals for good forest governance, something that civil society groups like Forest Watch Ghana has campaigned for. The Ministry of Lands and Natural Resources and the Forestry Commission led Ghana into a Voluntary Partnership Agreement with the European Union to address the underlying governance challenges including weak law enforcement in the forest sector; and to better regulate timber trade. Though there are different interests from government and the logging industry, civil society sees this as a good means to improve the governance of forests in Ghana.

As a result of this effort to reform forest governance and new Forest and Wildlife Policy (2012) has been passed. Forest laws have been clarified and all the scattered and pieces forest laws will be put together into one single law. One main benefit of this forest governance reform is that most of the problems of local forest communities are being addressed. These include the tenure or ownership and management of trees in off-reserve, benefit sharing and community participation in forest decision making. Essentially, the rights of forest communities have been recognized as well as their important role in forest management.

It is against this backdrop that GIRAF I (2009-2013) and GIRAF II (2014-2016) projects became very relevant, providing the resources for CSOs to raise awareness on the rights and responsibilities of local communities as well as the rights and responsibilities of the Forestry Commission and

Timber Industry. A lot has been done but there is still a lot left to be done. It is hoped that manuals, such as this and many others, will provide useful tools that can be used by CSOs to continue to enhance the capacity of other forest fringe communities in Ghana.

Knowledge is power. A well informed civil society, community and other forest stakeholders working together to support and also to hold duty bearers accountable for their stewardship is the best approach to ensure that forest resources are managed sustainability to improve the lives of the people the future generations

LIST OF ACRONYMS:

CEO :: Chief Executive Officer
CoP :: Certificate of Purchase
CP :: Compartment Pillar
CSO :: Civil Society Organization
Db :: Diameter at butt end
Dbh :: Diameter at breast height
DFO :: District Forestry Office
DM :: District Manager
Dt :: Diameter at tapered end
ERP :: Economic Recovery Programme
FC :: Forestry Commission
FIP :: Forest Inventory Programme
FLEGT :: Forest Law Enforcement Governance and Trade
FMU :: Forest Management Unit
FSD :: Forest Services Division
GIRAF :: Governance Initiative for Right and Accountability in Forest Management
HCV :: High Conservation Value
LI :: Legislative Instrument

LIF :: Log Information Form
LMCC :: Log Measurement and Conveyance Certificate
MoP :: Manual of Procedure
NTFP :: Non-Timber Forest Product
OFR :: Off-Reserve
PPE :: Personal Protective Equipment
RM :: Regional Manager
RMSC :: Resource Management Support Centre
RFO :: Regional Forestry Office
SP :: Salvage Permit
SRA :: Social Responsibility Agreement
TIF :: Tree Information Form
TUC :: Timber Utilization Contract
TUP :: Timber Utilization Permit
VPA :: Voluntary Partnership Agreement

CHAPTER 1: INTRODUCTION

1.1 Background

Attempts to sustainably manage forest resources in Ghana have varied over time as social, political and economic conditions change. Logging policies have similarly changed frequently over the last few decades with various measures adopted at different stages in an attempt to optimise the production base. In pursuance of sustainable forest management in Ghana, timber production in the past was permitted through long-term concessions and short-term licenses. In the 1970's there was considerable decline in all the sectors of the timber industry including log products, sawn lumber and processed wood products due to general economic depression in the country.

Under the Economic Recovery Programme (ERP), the timber industry was revitalised and timber production has increased dramatically but at the expense of the environment. Although, some measures were introduced at the time to prevent over-exploitation, they seem not to have yielded the needed results anticipated by all. Currently, there seem to be a revisit of the 1970 decline in the timber industry probably as a result of lack of raw material to feed the industries or lack of market for the wood industry as a result of which most of the industries have closed down.

There is therefore the need to sustainably develop and manage the remaining forest and wildlife resource so as to leave future generations and their communities with richer, better, more valuable forest and wildlife endowments than we inherited. The current Forest and Wildlife policy attempts to address the issue of sustainability through forward looking strategic objectives and prescriptions.

1.2 Purpose of the Handbook

This handbook has been prepared at a time where there is growing local and international concerns about illegal logging and its accompanying effects on deforestation. These concerns have given rise to international agreements and conventions aimed at minimizing the current trajectory of forest loss. One such agreement is the FLEGT-VPA that is led by the European Union. This FLEGT-VPA seeks to support timber producing countries to enforce their forest laws and governance regimes. Ghana concluded negotiations with the EU and finally signed and ratified the FLEGT-VPA document in 2009, by so doing becoming the first timber producing country to achieve that milestone.

The FLEGT-VPA process has opened the forest governance environment to other stakeholders such as Civil Society Organizations, Communities, Traditional authorities and other non-state actors. All these new entrants and not so new ones need to appreciate the technicalities and processes involved in timber harvesting in Ghana. This handbook attempts to address the information gap by taking readers through the various procedures and process involved in timber harvesting in Ghana. This handbook is not an authority book, it is only aimed at providing information and appreciation of the logging process. There are several authority books such as the Logging Manual and the Manuals of Procedures (MoPs) that are available for guidance and information. The target audience are CSOs and other non-state actors who might not be familiar with timber logging procedures and processes in Ghana. It might also be handy for foresters and timber company workers for easy referencing.

CHAPTER 2: STRATEGIC AND OPERATIONAL PLANNING

Before entering a forest to undertake timber logging, a lot of planning activities takes place. Planning is a core activity at the very heart of the Forestry Sector and can be divided into strategic and operational planning.

2.1 Strategic Planning

Strategic Planning sets the goals/objectives for the management of the resources in the long-term and describes the sort of changes to be enacted in order to achieve the goals/objectives. This planning process provides for local consultation with the resource owners, district assemblies and other interest groups.

Strategic planning is also a mechanism for ensuring that forest resource management at the local level is carried out in accordance with requirements of the National Forest Policy in Ghana. It ensures that all forest management activities are aimed at sustainably developing and managing the nation's forest and wildlife resources, and providing for people's participation in forest governance.

Importance of strategic planning process

Forest Reserves

- Ensures environmental and biological protection
- Ensures production of timber and NTFPs
- Ensures provision of benefits to local people, the resource owners, the managers, and the nation as a whole

Outside Forest Reserves

- Ensures controlled exploitation of the remaining timber resources
- Encourages improved management of the remaining forest resources within the context of local development aspirations

2.2 Operational Planning

Operational planning defines work programmes to be undertaken in order to achieve the strategic objectives, especially ensuring that the resource requirements in terms of labour, transport, materials and funds are available at the right time. It prescribes the requirements for the planning of forest operations in forest reserves and off-reserve areas in order to successfully implement the strategic plans. Strategic and operational planning merge at some point and therefore setting a dividing line is sometimes difficult to do. The important thing to remember is that, strategic planning sets the long-term vision of where we wish to reach, while operational planning provides details of how this is achieved.

2.3 Forest Reserve Management Plans

Forest Reserve Management Plans are key strategic planning tools required by Regional and District Forestry Staff. They provide the overall management direction for an individual forest reserve or group of forest reserves combined for ease of management into Forest Management Units (FMUs). The forest management plan provides details of the extent and composition of the forest resource, ownership issues and local rights, management zones (working circles) and their respective prescriptions. The forest reserve management plans document the aims of management and the scheme of operations by which the aims are to be attained. Most reserves will have a number of objectives: watershed protection, non-timber forest products (NTFP) production, bio-diversity protection, revenue generation and timber production. The areas suitable for timber production are those areas remaining after all conservation areas have been excluded together with those areas of forest regarded as being at such a low stocking that they must be rested (so-called convalescence areas). Most timber production areas will also be non-timber forest product (NTFP) production areas.

Maps indicating both the extent of each working circle and the layout of the compartments are an essential component of the management plan. All applicants for a TUC will be provided with the essential basic information from the management plan. Timber production areas are to be managed on a 40 year felling cycle – this being the time required to allow sufficient regeneration.

Forest Reserve Management Plans set out the medium to long term planning objectives for forest reserve(s). The main purpose of Forest Reserve Management Plans is to present:

- the current state of the extent and quality of the forest resources
- the utilisation of the forest resources
- the zoning of the forest into recognised management categories based on defined principles
- the synthesis of the ownership and legal status of the reserve
- the overall management objectives to be followed and
- the state of the forest desired within a time framework

Forest Reserve Management Plans are prepared by Forest Services Division and Resource Management Support Centre (RMSC) in full collaboration with the land owners and must be endorsed by their representatives. Such plans, therefore, represent a statement of intent by the FSD in managing the resources and provide a means of judging their performance in this duty.

2.4 Harvesting Schedule

One critical component of the Forest Reserve Management Plans is the harvesting schedule. The management plan defines the location and numbering of all compartments. The standard size for a single compartment is 128ha; however this is not fixed and varies with topography. For each TUC area, compartments are grouped into harvesting coupes composed of one or more compartments. The harvesting schedule lists the compartments that can be considered for harvesting in every coupe of five years, for the period of the felling cycle. A harvesting schedule for the timber production area is prepared to ensure that a sustainable harvest of timber can be continuously produced from the timber production area over the 40 year standard felling cycle.

Logging operations is not permitted in areas where harvesting schedules have not been prepared and no logging is permitted outside the defined harvesting period for each coupe of compartment(s). All logging operations are expected to continue progressively through each coupe; all harvestable trees are felled and extracted on a compartment by compartment basis. Following the completion of felling in a single compartment, that area is closed to further logging and the contractor will be expected to move into the next compartment within the coupe. Returning to a closed compartment is not allowed. A contractor who completes logging operations prematurely within a five year coupe area is not allowed to move into the next five year coupe until the allocated time.

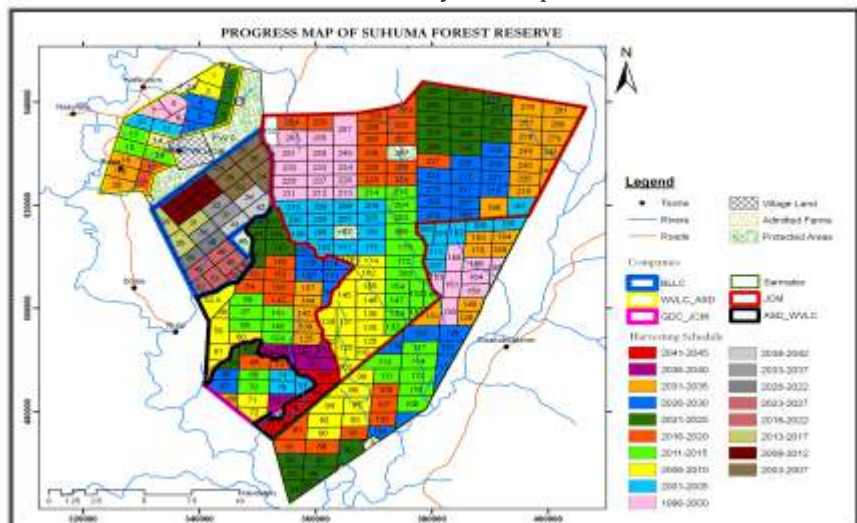


Figure 1: Map showing harvesting schedule of a Forest Reserve

CHAPTER 3: TIMBER RESOURCES ALLOCATION

Until 1998, timber harvesting was undertaken by timber concession holders who leased the land for a period from 3-99 years, logged under the defunct Forestry Department's regulations until the concession expired after which they had the option to renew the lease. Within the limits defined by law, the power to grant natural resources rights is vested in the President. Under the laws of Ghana, there is a distinction between land and the natural resources that occur on or under it. Article 257 of the 1992 Constitution is a much cited example in this respect. This article vests minerals in their natural state under or upon any land in Ghana in the President. In the same way, timber rights are vested in the President by virtue of the Concessions Act of 1962 (Act 124). Section 16 of the Concessions Act provides for all timber rights to be vested in the President except for pre-existing (customary or otherwise) rights in forest reserves or pre-existing concessions in off-reserve areas (section 16 (1) – (4)).

Natural resources are resources that occur naturally and are therefore not produced or planted. For timber, the law makes the distinction between naturally occurring and planted trees. Timber rights, as part of natural resources rights, only concern naturally occurring trees, no matter whether they occur on lands previously subject to timber rights, public or stool lands or even alienated lands (family and private lands). However, section 4 of the Timber Resources Management Act (1998, act 547) as amended Act 617 in 2002 clearly states that timber rights do not apply to land with private forest plantations or land with timber grown or owned by an individual or group.

3.1 Types of timber rights

There are four main timber rights existing in Ghana which confer rights to harvest. However, only three of those rights allow for commercially disposing-off timber. There was also a fifth timber right usually issued by the Minister in the form of permit to harvest timber. But this “ministerial tuc/permit” has been generally agreed among all stakeholders that it is alien to our constitution and hence has been rescinded.

The four (4) main timber rights are:

- Timber Utilization Contract (TUC)
- Salvage Permit (SP)
- Certificate of Purchase (CoP)
- Timber Utilization Permit (TUP)

3.1.1 Timber Utilization Contract

The enactment of the new Timber Resources Management Act of 1998 (Act 547) by the management of lands and forestry in 1998 replaced the concession system with a process of competitive tender under the Timber Utilization Contracts. The law sets guidelines for the identification of the TUC areas, endorsement of Timber Contract Advertisement and allocation to prospective applicants. Once a Timber Utilization Contract has been awarded to a concessionaire, there is a laid down technical procedure to be followed to enable the concessionaire gain access to the Forest Reserve to commence exploitation.

3.1.2 Salvage Permit

Regulation 38 of L.I 1649 provides that the Chief Executive Office of the Forestry Commission may upon application and subject to the approval of the Forestry Commission issue a permit for the salvage of trees from an area of land undergoing development such as road construction, expansion of human settlement or cultivation of farms. So the minister cannot sign these kinds of permits. The Legality Assurance System in the Voluntary Partnership Agreement (VPA) between Ghana and the European Union provides a little more information on the procedure by stating that a salvage permit needs to be accompanied by the applicants' application and an inspection report from the Forestry Services Division. This report needs to confirm the reality of development plans for forested land not yet subject to a Timber Utilization Contract. From the logic underpinning the Timber Resources Management Act (ACT 547), it seems SPs are not timber rights, they are merely permits to ensure efficient resource use in a specific situation. Therefore SPs would not be subject to parliamentary ratification.

3.1.3 Certificate of Purchase (CoP)

Regulation 37 of L.I. 1649 empowers Forest Officers to sell seized or abandoned timber. Such a sale is accompanied by a Certificate of Purchase (CoP). However, a CoP is not a felling permit, it merely validates that the buyer of such timber has legal ownership of it. Timber covered by a CoP can be legally sold and exported.

3.1.4 Timber Utilization Permit (TUP)

Section 18 (i) of Act 547 permits the Minister to make regulations prescribing conditions for harvesting trees for domestic or social purposes. This provision is given further clarity in regulation 35 of L.I

1649 where it states that the Chief Executive Officer of the Forestry Commission may on an application by a district assembly, town committee, any rural community group or a non-governmental organization and subject to certain conditions, issue a Timber Utilization Permit (TUP). The TUP is limited to harvesting a specified number of trees for social or community purposes in an area of land not subject to a Timber Utilization Contract. Further, timber or lumber originated from TUP cannot be sold or exported.

Summary table for Timber Rights Allocation

RIGHTS ALLOCATIONS	PROCEDURE FOR ALLOCATION
Timber Utilization Contracts	<ol style="list-style-type: none"> 1. Logger participates in competitive bidding process; 2. The Forestry Commission recommends to MLNR to award a TUC to Logger; 3. Logger complies with all conditions specified in Minister's notice of award under the Act. This includes a secured consent from concerned individual, group or landowner; 4. The Minister executes the TUC in the prescribed format; 5. Parliament ratifies TUCs.
Salvage Permit	<ol style="list-style-type: none"> 1. Enterprise applies to FC; 2. FSD conducts inspection and submits a report to CEO of FC about the justification for commercial trees in a defined location to be salvaged; 3. FC issues salvage permit; 4. FSD enters details of Salvage Permit into the central database.
Confiscated Timber	<ol style="list-style-type: none"> 1. FC determines the offence and court authorises the sale of confiscated timber product; 2. CoP issued to the buyer according to statute. Due process for auctioning confiscated timber is followed.
Timber Utilization Permit	<ol style="list-style-type: none"> 1. Upon receipt of application 2. District Manager causes inspection of the specified number of trees 3. The DM processes the application through the FSD hierarchy to the Chief Executive for consideration and approval.

Roles of Stakeholders in Timber Rights Allocation

CATEGORY OF STAKEHOLDER	ROLE(S) IN TIMER RIGHTS ALLOCATION PROCESSING
Timber industry operators	Main clients are represented at the various stages of field inspections and negotiations for consent letters from resource owners and SRAs.
Forest Services Division	State regulatory institution responsible for various inspections at the various management levels and facilitation of SRA negotiations
Traditional Authorities (Resource owners)	They own the resources and give their consent to prospective timber operators before they can operate. Also negotiate SRA
Farmers	Their written authorisation is required before the grant of permit on their farm lands and also participate in pre-felling inspections
District Assemblies	They issue letters of endorsement for areas earmarked for permit and facilitate SRA negotiations. They are also represented in pre-felling inspections outside forest reserves
Administrator of Stool Lands	Represented on the Timber Rights Evaluation Committee. Responsible for evaluating applications for Timber Utilization Contracts
Parliament	Ratification of TUCs or authorisation of relevant government agency to approve TUCs.

CHAPTER 4: TIMBER HARVESTING OPERATIONS

The harvesting of compartments that make up the production working circle within a forest reserve is carried out in a sequence determined by the Harvesting Schedule. This schedule lists the compartments that can be considered for harvesting in each year, for the period of the felling cycle (currently 40 years). When a compartment is due for harvesting, the District Forest Manager and TUC holder carry out a Pre-survey Compartment Inspection. If the compartment is found to be suitable for harvesting, a stock survey operation can commence. In the off-reserve areas, the quota system is used to allocate areas that can be harvested based on stocking levels and threats to the timber species from farming or other activities such as settlement establishment, road construction and bush fire.

4.1 Pre-harvesting activities (Forest Reserves)

4.1.1 Pre-survey compartment Inspection

Before commencement of stock surveys, pre-survey compartment inspection is carried out by the District Manager and the TUC holder or his or her representative to:

- assess whether or not the compartment should be harvested or stock surveyed
- allow the District Manager and the TUC holder to become familiar with factors that will affect the planning of the harvesting operations, e.g. topography and vegetation of the compartment
- ensure that cost expenditure involved in stock surveys are avoided on a condition that the compartment may prove to be unsuitable for harvesting

During pre-survey compartment inspection, three randomly selected sites are chosen within the compartment and inspected.

4.1.2 Stock Survey

Stock survey provides both qualitative and quantitative information upon which a final decision on whether or not to harvest is made. The stock survey provides information necessary to identify all FIP Class I species in a compartment. Stock survey also helps in identifying areas that should not be disturbed during harvesting, and assists with harvest planning. Stock survey is 100% assessment of the compartment to be harvested and it is done by a duly trained and certified team.

The various sub-activities under stock survey are explained below:

● **Compartment boundary demarcation**

Before the stock survey begins, the compartment boundary is re-surveyed by following the survey instructions provided in the schedule by the Cartographer. The boundary must be cleared of all vegetation to ground level and to a width of two (2) metres. As the compartment is surveyed a new record of the schedule, and of all important features along the boundary is kept by the Stock Survey Supervisor. If there are discrepancies between the original schedule and the new survey, these should be noted in the survey book and on the sketch map. Any missing compartment pillars are to be replaced. All compartment pillars must be inscribed with the letters "CP" and they should be re-painted with blue oil paint so that they can be easily identified. It is important that the boundary is easily visible at all points along the perimeter.

● **Stock enumeration**

The main component of stock survey is stock enumeration, which is carried out to identify, measure and mark specific trees to be removed within a compartment. Every tree that has a diameter of more than 50 centimetres and belongs to FIP Class I is recorded. With the exception of *Antrocaryon micraster* (APROKUMA) and *strombosia glaucescens* (AFENA), which have a minimum felling limit of 50 centimetres, trees in the 30-50 centimetre class are measured.

The following information is recorded for each tree:

- distance along the survey strip to the nearest metre;
perpendicular distance from the survey line which is
- estimated and recorded to the nearest 5 metres;
- species code;
- stock survey number for the tree which is a serial number given to every tree in the compartment.

Once the diameter has been measured, the stock survey number is marked on each tree with a scribing knife, in a position that will not be disturbed if the tree is felled.



Figure 2: Taking of tree measurement during stock survey

- **Check survey**

When the stock survey (enumeration) has been completed for a compartment the field book is handed to the District Forest Manager who will arrange for a 10% check survey to be carried out. A check survey should be carried out by senior Forestry Commission staff from the District Office/Regional Office within one month of completion of the stock survey. The check should be carried out by a new team leader, and preferably by a different stock survey team.

- **Stock map**

Once stock survey has been checked, a stock map showing the location of all trees accessed is prepared from the field data by the District Cartographer. The stock map summarizes the stock survey information and serves as a basis for yield selection. Stock maps are prepared showing the species, diameter size class and position of all trees above 50cm diameter at breast height (dbh). Trees are numbered in the field on the map. Key features of the landscape such as rivers are also shown on the stock map.



Figure 3: Sample stock map

● Yield Allocation

Trees to be felled are currently allocated according to an interim yield formula based on minimum diameter limits, site and general distribution of trees and species.

Standard yield formula for moist forest is given as

$$Y = 0.5Z + 0.2X$$

Reduced yield formula for dry or open forest is given as

$$Y = 0.25Z + 0.2X$$

Where:

Y = Yield or actual number of trees to be felled

Z = Total number of stems in the exploitable class

X = Total number of stems immediately below the minimum felling diameter

● Yield Selection and Yield Map

Once the yield has been calculated for each species, trees to be removed during harvesting are selected by the District Manager/Regional Manager. The yield must be allocated evenly throughout the compartment so as to minimize damage during harvesting and encourage forest regeneration. Trees should be selected taking into consideration the distribution of all other selected trees. As trees are selected their stock survey numbers should be recorded in a yield table showing species and size class.

The following guidelines should be followed during yield selection:

- No trees with diameter below the minimum felling limit are to be included in the yield;
- No seed trees are to be included in the yield;
- Trees to be retained after harvest should be evenly distributed through the compartment;
- Not more than three trees should be removed per hectare;
- Trees within riparian areas must not form part of the allocated yield;
- Trees on slopes of between 20% and 30% should not be included in the yield;
- Trees designated as “damaged but merchantable” during the stock survey should be the first to be selected;
- Special permit species must not be included in the yield.

Once the yield selection has been completed the yield map is prepared. The yield map shows all topographic features; forest condition zone; the position, species, diameter and stock number of all selected trees.

● **Yield approval**

Yield approval is in the form of a felling permit for forest reserves which lists the stock survey number and species of all trees that can be felled. Every felling permit must be dated; normally the contractor is required to remove all trees indicated in the yield. Removal of only a few species leads to a gradual reduction in the value of the forest as a consequence of an increasing proportion of less desirable species. Where a contractor argues strongly against the felling of currently non-marketable species, then a case must be made prior to logging. Failure to remove at least two-thirds of the approved yield will be considered unacceptable. Yield is defined on a species by species basis and cannot be transferred between species.

4.2 Pre-harvesting activities (Off-Reserves)

Using the off-reserve inventory results as basis, the Forest Services Division in the past, prepared district felling quotas which set the total number of trees to be felled in an administrative district each year. The quota system was, however, abolished in order to salvage trees that are

being destroyed through farming and chain sawing activities. In addition, there are prospects for sustaining the timber resources outside forest reserves because the Forest Services Division has published operational manuals that deal with:

- Pre-felling inspection with stakeholders
- Issuance of felling permit
- Post-felling inspection
- Tree information collection
- Issuance of conveyance certificate for logs in transit

The above strategies are expected to affect logging in the following ways:

- Reduction of illegal and speculate logging
- Provision of opportunity to participate in the planning of felling operations on farms and receipt of commensurate compensations for crops damage
- Removal of old disincentives to farmers in respect of tending of traditional economic species on their farms, and the fear of indiscriminate destruction of their farms during logging.

The off-reserve timber resource is not secure. There is therefore the need to carefully plan to achieve as near a sustainable cut as possible.

4.3 Harvesting Operations

Actual timber harvesting operations involve a lot of technical expertise and professionalism. The Forestry Commission has designed an extensive logging manual for this operation. Timber Contractors are also required to recruit competent and qualified foresters to supervisor the timber harvesting operations. The information provided herein is only an abridged version of some of the more technical activities undertaken on the field. Harvesting of timber is as labour intensive as it's also very intellectually stimulating. Several internationally recognised standards such as HCV protection and environmental standards are to be adhered to during timber harvesting.

The main stages in timber harvesting operation are explained below:

4.3.1 Compartment logging/harvesting plan

The Contractor is enjoined to prepare a Compartment Logging Plan. Basically the logging plan is a map detailing certain key commitments,

which is prepared based on the compartment map. The map contains information from the pre-survey compartment inspection, the stock survey, the contractors own survey and assessment of the compartment. The main components of the Logging Plan include:

- proposed road and track construction
- proposed bridges and culverts
- location of areas where soil erosion control is needed
- skid track location
- log dump location
- streams, rivers and areas of coarse grain protection

The Logging Plan is attached to the yield application submitted through the District Manager to the Regional Manager (RM) for approval. Felling can only commence when approval is given.

4.3.2 Road Construction

Road construction in timber logging requires proper planning and a lot of investment. Where the logging plan requires the construction or rehabilitation of public roads, the specifications will first be agreed with the Ministry of Roads and Highways and the specification and agreement appended to the plan. Prior to construction, all roads must be surveyed out in accordance with the logging plan. It is the responsibility of the TUC holder to ensure that the construction team adheres to the agreed alignment and avoid streams. Roads shall be designed in such a way that there is minimum disturbance to the forest and farms. Where areas are being re-logged, there should be an attempt to use the old road system as much as possible. All forest roads shall be compacted to prolong road life. No road construction shall be carried out during periods of wet weather. Marshy areas are to be filled with gravel, compacted and if essential, decked with scantlings from selected timber species.

All water courses, culverts and drains to be kept clear. To prevent excessive soil disturbance, any tree with a diameter above 15 centimetres that is located within the road alignment, must be felled into the road corridor with a chainsaw (not pushed by a bulldozer) prior to road construction. Where these are commercial species with a diameter above the minimum girth limit they will be deducted from the yield and royalties will be charged. The contractor is responsible for constructing and maintaining all roads in accordance with the specifications described

until the compartment is closed. Non-adherence will lead to suspension of harvesting activities until such a time that corrective measures have been carried out.

Bridges shall be constructed perpendicularly to courses of streams and rivers. Single log bridges are recommended for small streams while bridges designed with piles, beams, deck-runners and kerbs are recommended for large streams and rivers.

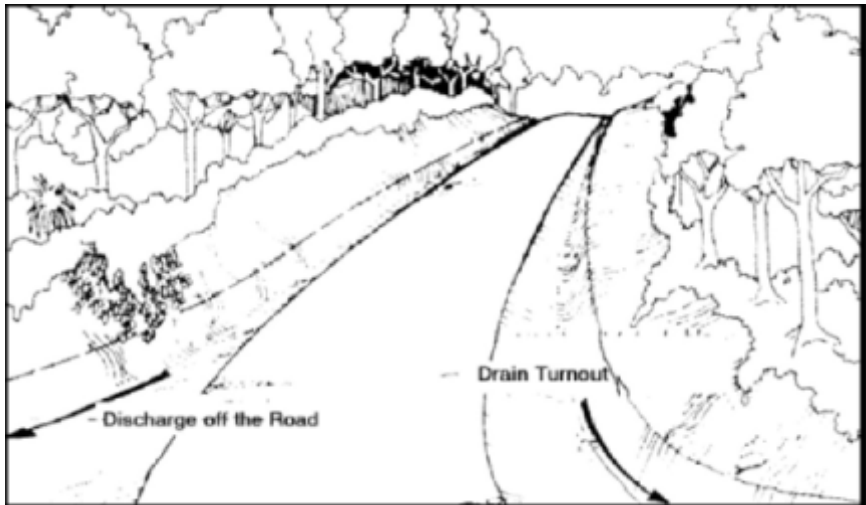


Figure 4: *Diagram showing approved logging road drainage system*

4.3.3 Adhering to Environmental Standards

Siltation of watercourses is a major cause of water pollution and environmental degradation. No logging operation is permitted within a buffer strip; 25 metres either side of any stream or 50 metres either side of a river. No tree felling into the buffer strip is permitted either. Any tree or debris that falls within the watercourse must be removed.

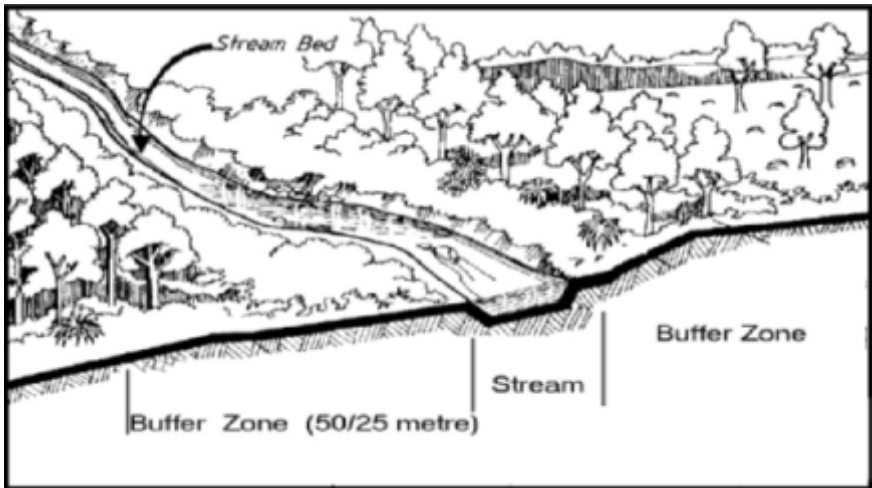


Figure 5: *Diagram showing buffer zones and how they are treated during timber logging*

No smoking is permitted during high fire hazard periods except on a roadway cleared of inflammable material. Any fire for cooking or other purpose must be at least 5 metres away from any inflammable material and must not be left unattended. The contractor or operator must ensure that all vehicles are equipped with fire extinguishers and that members of the logging team are equipped with fire swatters or beaters. In the event of a fire outbreak, the District Manager may require the contractor or operator to assist with fire fighting, by providing manpower, equipment, vehicles or earth-moving machinery. The contractor or operator will not normally be entitled to compensation or payment for such assistance.

On any day that the Range Supervisor determines that fire risk is high, there shall be no lighting of fires by the contractor or operator for any purpose. Any tree species classified as Black Star cannot be felled under any circumstances. Any species classified as a Special Permit Species cannot be felled, unless this is specifically authorized by the Director of Resource Management Support Centre (RMSC).

No logging operation, including felling, skidding, road and log yard construction, is permitted in a protected area. Such areas include sacred groves, hill sanctuaries, provenance protection areas, convalescent areas, special biological protection areas, and swamps. Protected areas must be clearly marked on the TUC Operational Plan.

4.3.4 Identification and felling of trees

Felling of trees shall be carried out only by workers competent in the use of chainsaws. The contractor must ensure that his/her workers are properly clothed with the appropriate personal protective equipment's (PPEs) before felling trees. Before felling commences, the tree-spotter uses the yield map and yield summary to identify trees to be felled. Only trees that have been awarded to the contractor can be felled. Felling outside yield is an offence. Trees are to be felled as close to ground level as possible, and must be felled using a scarf and back-cut so that the direction of felling is controlled. Where fluting does not occur, and the species is usually sound at the butt, stump height should not be greater than 30 cm.

Prior to felling, an area around the tree, an escape route must be cleared. Trees to be felled are to be directed towards skid tracks or canopy openings so that they cause minimum damage to surrounding trees. They should be felled so that log extraction will require minimum disturbance to the surrounding forest. Aim to assist efficient skidding by laying the crown or the butt towards the skid tracks. Any tree that is cut but becomes caught up against other trees must be brought to the ground before operations continue.

The following categories of trees must not be felled even if they are in the yield:

- tree within buffer or protection areas including stream
- banks and marshy areas
- trees on any slope of more than 30 per cent
- trees marked as seed trees
- trees earmarked for canoe production

4.3.5 Stump markings, Log Measurement and Volume calculation

● Stump marking

After felling, the tree must be converted to logs as efficiently as possible and both the log and the stump must be painted appropriately. Logs are to be marked as soon as they are cut from the felled tree and before they are extracted. The tree stump is to be marked at the same time in a similar manner. All logs must be marked clearly on both ends with white waterproof paint. Letters and numbers must be clearly written.

Every log must be marked with:

- the species code
- the locality mark
- the contractor's tree number which is a sequential number beginning with 1, which is the number of trees felled since registration of the contractor's property mark;
- the log number which is the number of the log cut from the tree; log number 1 is the butt log;
- the contractor's property mark.

Logs from within forest reserves must also be marked with:

- the reserve code;
- the number of the compartment from which the tree was felled;
- the stock survey number allocated to the tree by the stock survey team;

Logs from off-reserve areas must also be marked with the code "OFR"



Figure 6: Picture showing stump markings

● Log Measurement

Within 48 hours after felling a tree, the Range Supervisor in the presence of the contractor or his representative and the representative of the landowner must take the appropriate measurements of the tree before the tree can be cross-cut into logs. The measurements are for the purpose of computing the volume of the tree. The length of the tree is also measured starting from the point of cut to cover the merchantable portion

of the tree but not necessarily the first branching.

Data taken from log for volume calculation (as shown in figure 7):

- Length (L)
 - ✓ When log is longer than 30 meters two length measurements are taken ($l_1+l_2=L$)
- Diameter at butt end (Db)
 - Average of 2 measurements taken perpendicular to each other $\left[\frac{(db_1 + db_2)}{2} \right]$
- Diameter at tapered end (Dt)
 - Average of 2 measurements taken perpendicular to each other $\left[\frac{(dt_1 + dt_2)}{2} \right]$
- Diameter at middle of log (dm)
 - Only applicable when log is longer than 30 metres

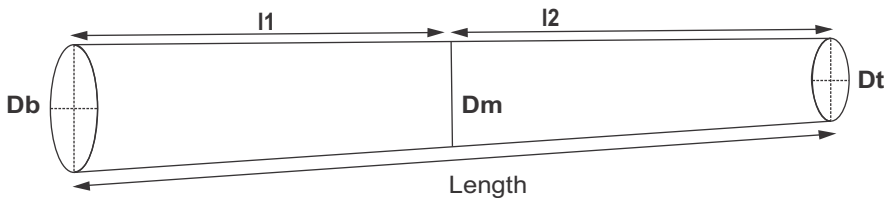


Figure 7: Illustration of log measurement

● **Volume calculation**

After log measurement, Regulation 22 (schedule 3) of L.I 1649 clearly stipulate the formula to be used in calculating the volume of timber by the Forestry Commission. The Smalian's formula is prescribed by the law for computing volume of logs.

By the Smalian's formula,

$$\text{Volume} = 0.098L [(db_1+db_2)^2+(dt_1+dt_2)^2] \times 10^{-4}$$

Illustration:

For example a log with the following measurements:

- db1 = 110cm
- db2 = 106cm
- dt1 = 80cm
- dt2 = 78cm
- L = 22.60m

Using Smalian's formula:

$$V = 0.098L[(db_1+db_2)^2+(dt_1+dt_2)^2] \times 10^{-4}$$

$$V = 0.098 \times 22.6[(110+106)^2+(80+78)^2] \times 10^{-4}$$

$$V = 2.2148[(216)^2+(158)^2] \times 10^{-4}$$

$$V = 2.2148[(46656)+(24964)] \times 10^{-4}$$

$$V = 2.2148[71620] \times 10^{-4}$$

$$V = 158623.98 \times 10^{-4}$$

$$V = 15.86m^3$$

However, due to time constraints and cumbersome nature of using the formula while on the field, the READY RECKONER has been developed by RMSC to be used for computing volume.

4.3.6 Logging Assessment / Inspection

The District Manager is responsible for ensuring that all logging operations are inspected at regular intervals. During the inspection the District Manager or his representative will check compliance with the Contract Area Plan and prescriptions in the logging manual. In particular, he will check road, bridge, culvert and log yard construction and maintenance; the standard of felling and skidding operations; compliance with requirements for log and stump marking; and the impact of operations on the soil and on the forest.

If for any reason, the District Manager is not satisfied with the standard of operations he may take action as he considers necessary including a suspension of operations and the imposition of penalties. If such action is taken, the reasons must be recorded in writing and copied to the contractor and Regional Manager. During operations on-reserve, the contractor will need to work consistently through the selected compartment removing all approved trees as a single operation. Returning to a particular locality for a second cut will not be allowed and will be regarded as bad logging practice. Providing there have been no unsatisfactory reports on the operation of the logger, he will be allowed to move into the next compartment for which all planning has been completed and approved. A detailed inspection will be undertaken of the first compartment by the District Manager and a checklist completed that standards have been maintained at an acceptable level.

If these have been fully met a Compartment Closure Certificate will be issued and the compartment closed for harvesting until the next 40 years. The logger will not be allowed to move into a new compartment until the

first compartment has been signed off. Therefore at no time will more than two compartments normally be open for logging by a single contractor. A contractor will be expected to complete logging within any one compartment in no more than 2 years. Before a contractor will be permitted to vacate a completed compartment He/She should meet the following requirements:

- all waste material has been removed,
- all logs have been taken of the site
- the contractor has extracted all the yield
- water ways have been cleaned of debris
- logging yards have been cleaned up and ripped.
- all waste material from the camp and vehicle maintenance areas has been removed



Figure 8: *Diagram showing desilting of streams after logging operations*

The exceptions allowed to the “two compartment” rule are:

- Wet weather conditions - it may be necessary to allow a contractor to move temporarily to a drier compartment if weather conditions necessitate suspension of activities in the open compartments.
- Large-scale operators logging more than one compartment per month will require a greater flexibility to ensure that operations are not delayed. This should be defined in the TUC Operational Plan, but would not be allowed to exceed five compartments.

CHAPTER 5: DOCUMENTATION AND TRANSPORTATION OF LOGS

5.1 Documentation

Documentation during logging operations is critical to ensure compliance to required standards. Three main documents are needed during and after logging before transportation of timber can take place.

- Tree Information Form (TIF)
- Log Information Form (LIF)
- Log Measurement and Conveyance Certificate (LMCC)

These documents have been detailed out in the preceding pages.

5.1.1 Tree Information Form (TIF)

The TIF is a guide to ensure that the stumpage fees assessment is calculated on the true measured volume and not using average volumes as had been earlier practice. Soon after tree felling, the Range Supervisor (field staff) measures the tree length, measuring from the point of felling to the limit of commercial utilization. This should be taken as the upper point where the wood could still be sawn and should not be necessarily linked to the point of branching. Diameter is measured at both ends-taken two readings at right angles. Ideally, the TIF should be completed in the forest ensuring that species, tree reference number, tree length and the four diameter measurement are entered. In the office, district staff should enter the species code number and calculate the tree volume.

The TIF form is distributed as follows:

- 1 copy to the permit holder
- 1 copy retained by the District Forestry Office
- 1 copy to be forwarded to the Regional Forestry Office.
- 1 copy to retained in the book

The image shows a completed Tree Information Form (TIF) from the Forest Department, Government of Karnataka. The form is titled 'TREE INFORMATION FORM' and includes fields for 'Project Name' and 'Site Name'. The main table has columns for 'Tree No.', 'Species', 'DBH', 'Height', 'Circumference', 'Volume', and 'Remarks'. The table is filled with handwritten data for several trees. At the bottom, there are sections for 'Remarks' and 'Signature'.

This is another sample of a completed Tree Information Form (TIF) from the Forest Department, Government of Karnataka. It follows the same format as the first sample, with handwritten entries in blue ink. The table contains data for multiple trees, and the bottom section includes a signature and date.

Figure 9: Samples of completed Tree Information Form (TIF)

5.1.2 Log Information Form (LIF)

The LIF is a reconciliatory form prepared by the Contractor and used in the application for Log Measurement and Conveyance Certificate (LMCC). The purpose of the LIF is to ensure that all logs after cross cutting are numbered and to provide the link between the information on TIF and the Conveyance Certificate. The LIF also provides an indication of the performance of the contractor with respect to waste. After cross-cutting into logs, the contractor should measure the butt diameters for each log (two measurements at right angles at each end) and record the total log length. The correct tree number should be shown against each log.

The District Manager checks the log volumes in the LIF against the tree volume in the TIF before LMCCs are issued. In all cases the total log volume should be just less than the total tree volume, but the difference should not be more than 20%. If a contractor regularly submits LIFs which indicate differences greater than this then it indicates wasteful practices with too much material being left in the forest. A field inspection to determine the problem is then needed.

The distribution of copies of the forms are as follows:

- 1 copy to Regional Forestry Office
- 1 copy retained by Contractor
- 1 copy to District Forestry Office
- 1 copy retained in the book

5.1.3 Log Measurement and Conveyance Certificate (LMCC).

An LMCC is needed to transport all timber products, especially logs or carved canoe anywhere within the country. The certificate is issued by the DM or his representative following post-logging inspection or in the case of a TUC after the LIF has been properly completed by the contractor. The function of the LMCC is to inform concerned officials including TIDD that the logs being conveyed out of the forest are legal.

The distribution of the conveyance certificates (after endorsement by TIDD) is as follows:-

- Original and duplicate copy held by Contractor (white and yellow copies)
- Triplicate copy goes FSD (pink copy)
- Quadruplicate copy goes to TIDD (blue copy)
- Book copy retained by District Forestry Office

5.2 Transportation of Logs

Regulation 18 of L.I 1649 clearly spells out conditions for transport of logs. It indicates that logs cannot be transported away from the contract area (forest) except between the hours of 6:00am and 6:00pm on working days. However, on exceptional cases as approved by the Forestry Commission in writing (weekend permit) logs can be transported on weekends but still within the 6:00am to 6:00pm timeframe.

Nobody is permitted to transport timber (logs) outside the forest gate without a validly executed LMCC form. It is the responsibility of the District Manager or his representative to inspect the logs and the truck to ensure that they are in good condition before LMCCs are issued. It is a common to see timber trucks broken down and in terrible conditions on our roads, however, if District Manager or their representatives as well as TIDD checkpoint staff were diligent in their work such trucks should not be issued with LMCCs. Again, the DM or his representative should ensure that the logs are safely secured with double chains before LMCCs are issued. LMCC should be refused even if the LIF and TIF are in order but the truck has deficiencies.

REFERENCES

- **ClientEarth (2013)**. Understanding the legality of rights, permits and certificates to harvest naturally occurring timber in Ghana. Legal briefing notes for CSOs in Ghana.

- **Forestry Commission (1998)**. Manual of Procedures:
 - Section A** – Strategic Planning
 - Section B** – Operational Planning
 - Section C** – Sustainable Timber Production (On-Reserve)
 - Section D** – Stock Survey and Yield Allocation
 - Section E** – Timber Harvesting Schedule
 - Section F** – Controlled Timber Production (Off-Reserve)

- **Forestry Commission (2003)**. Revised Logging Manual for Ghana, Guidance to Companies operating Timber Utilization Contracts in the High Forest of Ghana. Forestry Commission.

- **Timber Resources Management Act 1998 (ACT 547)** as amended by Timber Resources Management (Amendment) Act 2003 (ACT 617)

- **Timber Resources Management Regulation 1998 (L.I 1649)** as amended by Timber Resources Management (Amendment) Regulation 2003 (L.I. 1721)