DEVELOPING ALTERNATIVES TO ILLEGAL CHAINSAW MILLING THROUGH MULTI-STAKEHOLDER DIALOGUE IN GHANA AND GUYANA PROJECT

GHANA CASE STUDY OF ILLEGAL CHAINSAW MILLING

FORIG RESEARCH REPORT NO.....

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EXECUTIVE SUMMARY

Generally, the 19994 Forest and Wildlife Policy set out a direction for regulating timber harvesting within sustainable levels. Act 547 and the LI 1649 specifically criminalize the use of chainsaw to convert logs to lumber and the transportation and sales of chainsaw lumber. The FSD is the frontline agency in charge of enforcing the ban. This effort is expected to be complimented by the judiciary, policy, CEPS, communities and District Assemblies playing different roles of monitoring, prosecution and administration of justice. However, current levels of illegal operations as evidenced by the proliferation of timber markets, mainly selling chainsaw timber suggest that the enforcement of the ban has not been effective.

Under the EU funded project on developing alternatives for illegal chainsaw milling in Ghana and Guyana through multi-stakeholder dialogue, a number of research activities were carried out by the Forestry Research Institute of Ghana. The research activities focussed on some key issues that can be summarised as follows:

- What is policy, legal and institutional framework within which chainsaw milling takes place and how has the enforcement of chainsaw ban and policy measures to contain the situation been effective?
- What are the markets, socio-economic, political and environmental factors that have driven chainsaw milling in Ghana?
- How does chainsaw milling compare with other 'improved' techniques in terms of their investment cost, milling efficiencies, contribution to local livelihoods and supply of timber for domestic consumption?
- What are the social, economic and environmental impacts of chainsaw milling? And
- What lessons can we draw from these in order to inform a policy-dialogue process?

These questions have been broadly answered in this report which contains several research reports (chapters) written by several authors and presented in a style that makes each chapter able to stand on its own. Generally, the case studies for the research were carried out in the eight project areas; Nkawie, Juaso, Begoro, Assin-Fosu, Kade, Oda, Goaso and Sunyani Forest Districts of Ghana. However, some studies were supplemented by a national survey. The specific methodological approach used for each study is captured in the respective reports even though desk study, survey interviews, actor narratives, expert round table meetings, field experiment and market surveys using structured questionnaires were the main data collection techniques. Data analysis has involved content analysis and the use of SPSS to present results in tables, graphs and charts.

The report is organised into four parts, the first is more on background issues derived from a desk review of literature while the other three are based on empirical research. Part 1 contains three chapters, the first chapter is a general introduction that gives the background, terms of reference of the research and how the entire report is organised. The other two chapters are mainly reports obtained from desk study and expert consultation in order to give a general background on the policy, legal and institutional framework and the genesis and structure of chainsaw milling in Ghana. Part 2 contains four reports that to a large extent explain the driving forces behind chainsaw milling in Ghana. The first, chapter 4, is on the report of a national expert

roundtable which attempts to give a general interpretation of the relevant laws and how they respond to various scenarios in practice in order to help deal with the legal complexities associated with enforcement. Chapter 5 looks at situation of the market and financial environment that complicates the enforcement of chainsaw milling and trade, and in fact drive the activity. In chapter 6, the social and political factors that influence chainsaw milling and its enforcement are identified, mainly based on stakeholder perceptions and assessment. Chapter 7 takes a look at the issue accessibility to timber within the context of the existing land use and land and tree tenure systems and how these realities drive chainsaw milling.

In part III, all the reports attempt to give a comparison between chainsaw milling and other 'improved' techniques of milling such as the use of chainsaw-with-attachments, such as Logosols and Wood Mizers in terms of their cost of investment, processing efficiency, employment generation and lumber supply to the domestic market. Chapter 8 looks at cost and investments, comparing free-hand chainsaw with Logosol milling. Chapter 9 is a report on a comparative study of milling efficiencies using three (four) milling machine techniques; free-hand chainsaw, chain-with-milling guide attachment, Logosol and the wood Mizer. Chapter 10 looks at lumber supply, comparing the contribution of chainsaw lumber and saw mill to the domestic market. Chapter 11 attempted to validate the level of jobs created by chainsaw milling activities and assess the sustainability of these jobs against the background of the risks imposed by the ban. In all, the chapters in part III are meant to contribute to discourse on developing alternatives to addressing the supply of timber to the domestic market by highlighting the comparative merits of the different milling techniques including chainsaw. To support any possibility of accepting chainsaw milling, understanding its impact on the environment and society is crucial. Part IV contains four reports geared towards this goal. Chapter 12 looks at social impact in terms of conflicts related to access to timber, harvesting and milling and transportation of chainsaw lumber within the context of the enforcement of the ban. Specifically, it assess the impact in terms of time and money cost to farmers/landowners, operators and officials at the community level. Chapter 13 looked at the economic impact, particularly on rural economy while Chapter 14 highlighted some of the observed ecological impact of chainsaw milling activities. Chapter 15 though under part IV, is a conclusion chapter of the report that attempts to highlight the main conclusions of the various studies in the light of the underlying research questions in the terms of reference and draw lessons. Particularly, the lessons drawn are those that are targeted to inform the multi-stakeholder dialogue process in its attempt to evolve policy options and develop specific alternatives and mechanisms for addressing resource conflict and sustainable timber supply for domestic consumption.

The following are the main general conclusions drawn from the studies:

- The 1994 Forest and Wildlife policy of Ghana opens political space for all
 possible options that have been suggested by previous study in dealing with
 the chainsaw issue. It supports strict enforcement of the ban as well as a
 possible regularisation and integration of chainsaw milling into mainstream
 forest management.
- However, the legal framework criminalises the use of chainsaw milling and trading for commercial purposes but its enforcement has been fraught with difficulties and some inconsistencies in the interpretation of the law.

- The legal analysis of this study does not support criminalisation of using registered chainsaw to mill timber for domestic use. However, the procedures in the FSD's Manual of Operations do not adequately provide for this opportunity to be realised
- In spite of the ban of chainsaw milling in Ghana, the study has shown that it is highly accepted among the general public and even among stakeholders, except the timber trade associations, especially the GTMO.
- Over 50% of District FSD Managers explicitly agreed to a review of the ban and a possible regularisation of chainsaw operations. This suggests that a more serious attention is paid to the enforcement of the ban.
- The study could not adduce sufficient evidence to support the involvement of FSD staff in chainsaw operations but can conclude that corruption by FSD staff is one of the factors identified as contributing to ineffective enforcement.
- The other significant factors identified as contributing to ineffectiveness of the enforcement include corruption by law enforcement agencies, the cheaper price of chainsaw lumber, lack of political will to enforce the law and high rate of rural unemployment
- The study can conclude that the enforcement of the ban cannot be realised without addressing three key sector governance problems; corruption by FSD District-level staff, corruption by the police and a political will on the part of the executive arm of government.
- The study observes that while the current tenure arrangements hinder access of trees to chainsaw operators, farmers have and continue to play an important role in sustaining operators' access to timber
- The average amount chainsaw operators are willing to pay for high quality trees are at least comparable with current stumpage fees.
- The study can conclude that ignorance about the illegality of chainsaw operation is not a major root cause for the proliferation of chainsaw milling.
- Availability of timber, access routes and proximity to roads are important factors that influence choice of operation site
- Farmlands are by far the most preferred areas for chainsaw operations
- The study can also conclude that without addressing the domestic timber supply issue within the context of the production and supply of legal timber, it may almost be impossible to enforce any ban on chainsaw milling
- The average lumber recovery from logs using chainsaw milling is about 43%. This is lower than improved techniques like Logosol (chainsaw with guide bars attached) which gave a recovery of about 49%. Sawmills were reported to have given average recovery of 53% though as low as 28% recovery was also reported.
- 86% of lumber retailers in the domestic market interviewed receive their supplies from chainsaw operators. Supply of boards to Furniture and Joinery shops is sourced almost equally from chain saw-millers (37%), sawmills (31%) and lumber retailers (30%).
- The study suggests that it is not entirely the case to suggest that sawmillers have failed to supply timber products to the domestic market. The study shows that as high as 36% of furniture and joinery shops have had supplies from sawmills.
- The study concludes that chainsaw milling and trade offer a significant amount of jobs to people. The study estimated total jobs created by chainsaw

- related activities as between 86,770 and 92217 in 2007 using recovery rates of 34% and 50% respectively.
- The 2005 estimate and 2007 estimate by this study of chainsaw related jobs show an increase of 19% (i.e.14, 636 additional jobs). The study suggests that all things being equal, the trend might go up in 2009.
- Comparing to the conservative estimate of 100,000 jobs provided by the timber industry in Ghana, the study argues that chainsaw milling offer competitive levels of jobs or economic engagements to people.
- Individuals, small-scale carpenters and local contractors are the largest consumers of chainsaw lumber in the domestic market
- On investment in chainsaw milling, the study identified fuel, lubricant and labour costs as the most significant cost items
- The study indicated that, overall, the net revenue for chainsaw operators is positive. However, the profitability of chainsaw operations depended on the extent to which FSD and police task force monitoring activities were prevalent and the price of lumber which differed from to place. Therefore, chainsaw lumber production may not be all that lucrative for the chainsaw operators and members of communities since a significant amount of cost is involved in the form of payment of bribes, labour, fuel and lubricant.
- To enable chainsaw lumber production to improve the well-being of forest fringe communities and encourage them to support the effort of minimizing forest degradation, the economic rent from this activity needs to be redistributed to their greater advantage than all other stakeholders.
- One key challenge to any improved chainsaw milling system is the marketing
 of its lumber at prices that would enable it to break even and be sustainable.
 The lumber from any improved chainsaw milling is likely to face
 manipulation from these dealers and may find it difficult to compete with
 cheaper chainsaw lumber in the local market.
- What may be advisable is for the chainsaw milling to be replaced with the improved chainsaw milling and the local communities and their chainsaw operators empowered to operate the system to their mutual benefit with the state.
- The structure of chainsaw enterprise is generally small scale in nature, and it is generally informal, and loosely structured in its organization.
- Informal in structure as it may be, the chainsaw enterprise has a number of departments or units that operate jointly or independently. These units may be classified as processing or production, transportation, marketing, and end-user arrangements among others.
- Logging of timber is often initiated by local or regional chainsaw operators who hire labourers or by single individuals with one or several assistants.
- Only occasionally, are they organized into a recognized, productive and solidly structured business establishment. This implies that monitoring of their activities to ensure sustainability and efficiency by the authorities can be problematic. This may be explained to be due to lack of proper record keeping for avoidance of tax payment and clandestine operation of its activities due to the ban on chainsaw lumbering in Ghana.
- Results of the financial and market drivers indicate that the economic factors contributing to the upsurge in chainsaw lumber production and supply to the

- domestic market in the country include the relatively cheaper prices for chainsaw lumber.
- Also chainsaw lumbering is on the increase because there is a high demand for lumber locally which is not being met by legal supplies from sawmills and the fact that the practice, although illegal, provide a wider range of species and dimensions for local application. Also, about 27 species are harvested with three major species, Dahoma, Wawa and Ofram being the dominant species supplied to the domestic market.
- Chainsaw operation is self-financing. This together with the availability of pre-financing from lumber dealers and/or financiers facilitates lumber production and supply. It is noted that processing is done by using the low capital intensive portable chainsaw machine and engaging rural labour at relatively cheaper rates.
- Trees can also be accessed from multiple sources, irrespective of the nature of terrain. Thus chainsaw lumber is not only cheaper but it is readily available in preferred species and dimensions, contributing to increase in patronage by clients.
- Chainsaw lumber production has contributed to the emergence of community enterprises, mainly carpentry shops, lumber markets, charcoal production among others and has provided employment for rural people in forest areas.
- The social, economic and environmental impact studies have shown that most of the negative impacts are not inherently linked to the use of chainsaw per se; they are consequences of the structured policy of prohibition with its attendant problems of ineffective monitoring capability.

The recommendations of the study are not generally supportive of continuing the ban. It outlines potential problems associated with continuing with the ban. Rather, it supports the need to use multi-stakeholder dialogue to generate innovative ways to rationalise and regularise the operations. Particularly, it suggests that the supply of timber for the domestic market is a central point of departure for any policy intervention. The key issues which need to be taken on board, based on the studies, have been outlined.

LIST OF ACRONYMS

CEDEP Centre for the Development of People

CFC Community Forest Committee

CEPS Custom, Excise and Preventive Service

CSM Chainsaw logging and milling
CSL CSL chainsaw logging
DA District Assembly
DCE District Chief executive

DFID UK Department for International Development

EIA Environmental Investigation Agency (UK)

EU European union

FAO Food and Agricultural Organisation

FC Forestry Commission
FD Forestry department

FLEGT Forest law enforcement governance and trade

FPID Forest Product Inspection Division

FSD Forest Services Division

FAWAG Furniture and Wood product Association Ghana

GSS Ghana Statistical Service

GSBA Globally significant biodiversity areas

GTA Ghana timber Association

GTMO Ghana Timber Millers Organization
GDP GDP Gross domestic product

HFZ High Forest Zone

ITTO International tropical timber organisation

IUCN International Union For the Conservation of Nature

MLME Ministry of Lands, Mines and Energy MLF Ministry of Land and Forestry MOU Memorandum of understanding MSD Multi Stakeholder Dialogue **MWH** Ministry of Works and Housing **MWH** Ministry of Works and Housing MLF Ministry of lands and forestry NGO Non Governmental Organization

NRMP Natural Resource Management Program

NPV Net present value

PFMP Participatory Forest Management Program

RCC Regional Coordinating Council
RUDEYA Rural Development Youth Association
SSCA Small Scale Carpenters Association
SRA Social Responsibility Agreement
SPSS Statistical package for social sciences

SOM Strategic Orientation Matrix

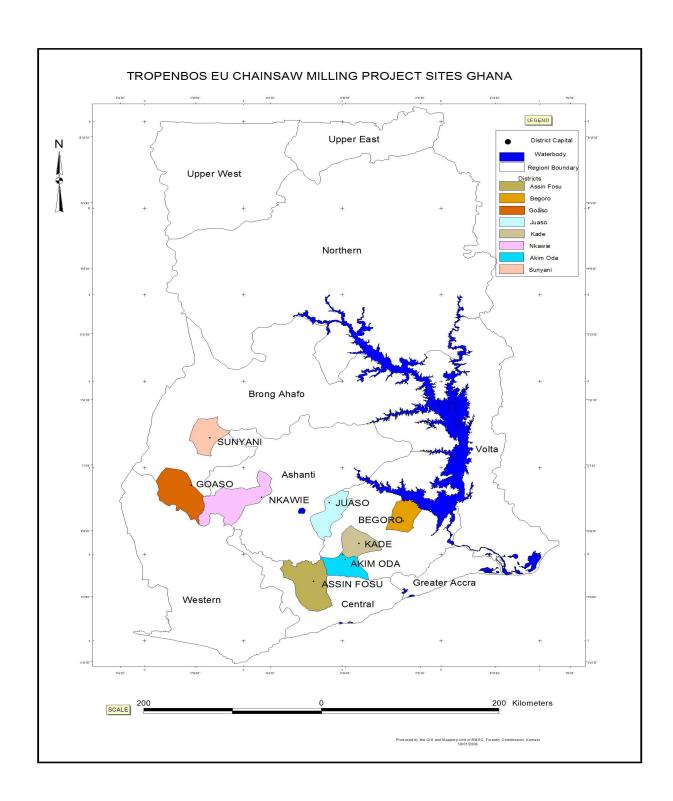
SWOT Strengths weakness opportunities and threats
TIDD Timber Industry Development Division

TUC Timber Utilization Contract
TUP Timber Utilization Permits
UNFF United Nations forest fund

VAT Value added tax

WWF Worldwide fund for Nature

WIEGO Women in Informal Employment: Globalizing and Organizing



PART 1

BACKGROUND TO CHAINSAW MILLING IN GHANA

Chapter 1

GENERAL INTRODUCTION

Emmanuel Marfo, K. Asamoah Adam and Beatrice Darko-Obiri

1.1 Background

"A significant part of the timber trade involves a world market in stolen goods. The impacts of their illegal trade on valuable ecosystems, the world's poor, the economies of developing countries and climate change mean there is a moral imperative to address this problem in every possible way" (UK House of Commons Environmental Audit Committee).

Illegal logging, which includes illegal chainsaw logging, has raised global concerns because it is believed to result in deforestation and loss of bio-diversity, government revenue losses of billions of dollars, vicious cycle of bad governance; corrupt individuals gain power through illegal revenue and then may support bad governance to sustain revenue and gain more power (Williams 2005; Tacconi 2007*). It also contributes directly to increased poverty when people lose their resources and indirectly as a result of reduction in government revenue (partly spent chasing illegal activities) which could be spent for development/poverty reduction projects.

Among other effects illegal logging is known to contribute to funding national and regional conflicts and thus exacerbating them but there are fundamental reasons that explain why the activity persists; it leads to the establishment of alternative land uses on illegally deforested land that may benefit those involved; national or local governments may receive more revenue as a result of illegal or legalized land conversion and increased timber production from illegal logging; military and police forces earn incomes from illegal logging and may be more willing to support the government; the poor and unemployed may derive income/livelihoods from illegal logging; lower timber prices increases the competitiveness of local industries; and consumers benefit from lower lumber prices (Tacconi 2007).

Illegal logging as a global forestry issue came to the fore at the World Bank/IMF meeting in Singapore in September 2006 where a platform was created to bring together legislators of the group member countries and key timber producing ones including Ghana, Brazil Cameroon etc, (Tacconi, 2007). Many international organizations such as UNFF, ITTO, IUCN, FAO, Non-governmental organizations that have created global awareness include EIA, WWF, Friends of the Earth, Green peace Global witness. In recent times and at an accelerating pace, the thrust of development assistance to forestry has been focused on illegal logging and its

*Comments on illegal logging were made by a number of eminent persons in this forum: Patrick Alley, Director, Global Witness Srey Chanthy, Agri-Business Institute-Cambodia; James Griffiths, Director, Sustainable Forest Products Industry, World Business Council for Sustainable Development and The Forests Dialogue; Mary Melnyk, Senior Advisor, Natural Resource Management, Asia & Near-East Bureau, U.S. Agency for International Development; Christine A. Pendzich, Deputy Director, Global Forest Program, World Wildlife Fund; Jim Schweithelm, Senior Associate, ARD, Inc.

suppression (Wells et al., 2006). A series of international initiatives have been launched (the G8 Action Program on Forests, 1999; the US President's Initiative against Illegal Logging, 2003; the EU Action Plan for FLEGT ([2003); the regional FLEGT processes (Asia, 2001; Africa, 2003; Europe and North Asia, 2005; Latin America (pending) and a number of bilateral agreements allied to FLEGT). The latter include the negotiation of Voluntary Partnership Agreements between the EU and timber producing countries on the legality of timber exported to the EU. As a result, timber-producing countries are under increasing pressure from their development partners, international NGOs and consumer countries to prove the legality of their timber production.

In Ghana, chainsaw milling constitutes the main item on the illegal logging agenda. The practice has been banned about a decade ago but the practice is widespread despite measures put in place by government to enforce the ban. Enforcement has been ineffective leading to proliferation of the practice at levels that threatens sustainability of Ghana's forest resources. Illegal chainsaw lumbering is an important component of livelihoods especially in local indigenous forest dependent communities and the conflict associated with it is high.

1.2 The EU-chainsaw project

Tropenbos International is collaborating with Forestry Research Institute of Ghana (FORIG) and Forestry Commission (FC) to implement an EU-funded project "Developing alternatives for illegal chainsaw milling through multi-stakeholder dialogue in Ghana and Guyana" in Ghana. The project focuses on the broad theme of forest governance in countries with a high incidence of chainsaw lumbering, particularly Ghana and Guyana.

The overall objectives of the project are to:

- Reduce poverty and promote viable livelihood in forest-dependent communities
- Reduce the occurrence of illegal logging
- Promote the conservation and sustainable management of tropical forest in developing countries

The specific objective is to 'reduce the level of conflict and illegality related to chainsaw lumbering by local communities'. The expected results are:

- Causes and consequences of chainsaw lumbering and links with illegality understood (National Level)
- Internationally best practice determined to address chainsaw lumbering (International Level)
- Multi-stakeholder learning platforms established to discuss chainsaw lumbering issues (National Level)
- National Consensus achieved in Ghana and Guyana about issues regarding chainsaw lumbering using an institutionalized mechanism for permanent dialogue between stakeholders (National Level)
- Communities dependent on chainsaw lumbering producing timber in a regulated and sustainable way (Local Level)

1.3 The role of the Forestry Research Institute of Ghana

In order to provide scientific information to support the project and the multistakeholder dialogue process in particular, the Forestry Research Instutute of Ghana (FORIG) as a collaborator of the project was tasked to undertake research on the Ghana case of chainsaw milling. The case studies were grouped into 6 main study areas:

- a. Background information (Genesis of Chainsaw lumbering, Technology/Practice over the years, Evolution and effectiveness of policy measures, Transformation of sector institution over the years and Structure of chainsaw enterprises)
- b. Chainsaw lumbering compared to sawmilling (Total chainsaw lumber production over time, Total lumber production by sawmills over time, Recovery factors (efficiency), Geographical distribution of CSL and Employment)
- c. Drivers of chainsaw lumbering (Market forces, Financing of the chainsaw practice, Tenure Factors, Availability of resources, Land use plans, Emergence of community-based enterprise, Economic condition, Financial incentives, Determinants of site of operation, Political factors and Other drivers)
- d. Analysis of Policy and legal framework (Adequacy and consistency and Effectiveness of implementation (Institutional and other factors))
- e. Impact of chainsaw lumbering (Economic impact (Cost-Benefit-Analysis)-effect on rural livelihood and economy, Distribution of benefits (benefit flow), Environmental and social impact conflict associated with chainsaw lumbering)
- f. Options for controlling/transforming chainsaw operation (*Identification of options*, Transaction cost of the various options, Monitoring mechanisms, Licensing and Way forward)

1.4 Terms of Reference

In order to focus the research work, a gap analysis was carried out by reviewing both local and international literature on chainsaw milling in Ghana. The areas that were not covered by existing, particularly those relevant to the project objective were identified as gaps and these defined the scope of the research work. Consequently, the gap analysis report identified the following:

a. Background information

- I. Overview of development of chainsaw lumbering in Ghana.
- II. Overview of current situation (structure, scope, actors etc).
- III. Assess the existing chainsaw lumbering technologies and the possibility of adopting them for the Ghanaian situation.

b. Chainsaw lumbering compared to sawmilling

- I. Compare the capital and labour cost and profit margins of average size sawmill to chainsaw lumbering.
- II. Assess the economic viability of chainsaw lumbering compared to sawmills
- III. Assess the sustainability of the chainsaw lumbering business
- IV. Establish actual sawmill supply compared to chainsaw supply to the domestic market
- V. Establish actual recoveries from average size sawmills and chainsaw lumbering

c. Drivers of chainsaw lumbering

- I. Identify market factors that provide basis for policy towards regularization of chainsaw lumbering.
- II. Identify political, market, social and economic factors that influence chainsaw lumbering.

d. Analysis of policy and legal framework

- I. Explore the consistency of existing policy and legislative framework as far as chainsaw lumbering is concerned
- II. Extent to which the law enforcement has help with controlling chainsaw lumbering
- III. Capability and performance of institutions involved in enforcement of chainsaw lumbering regulations

e. Impact of chainsaw

- I. Assess the social, environmental, economic (especially rural livelihoods) impact of chainsaw lumbering
- II. Conflicts related to chainsaw lumbering and how the various actors have coped with it.

f. Options for controlling/transforming chainsaw operation

- I. Validate options using the established multi-stakeholder dialogue
- II. Test proposed options for regularizing chainsaw lumbering against an agreed set of criteria and indicators identified through the multi-stakeholder dialogue process
- III. Determine the relative transaction cost for implementing each option
- IV. Assess the results and their policy, legislation and institutional implications to provide a clear set of policy recommendations and way forward.
- V. Validate recommendations and way forward using the multi-stakeholder platform.

1.5 Structure of the report

This report, which has been peer reviewed and house-edited, is a compilation of the various specific research reports covering research activities on items (a) to (e) in the Terms of Reference for the research. In the course of discussion about the implementation of the project, the research items under theme (f) were removed from the list. Instead, it was agreed to use the multi-stakeholder dialogue process to evolve the policy options and if need be, conduct issue-specific research to support the options identified through the process. The report contains 15 chapters grouped under four main parts and written in a style that allows each chapter to tell its own story and somewhat stand alone.

Two chapters follow this chapter to provide detail background to the issue of illegal chainsaw milling in Ghana. Chainsaw milling is legal in some countries such as Guyana and illegal in others such as Ghana. The illegality of chainsaw milling in Ghana has a history and one needs to understand how the issue has evolved over time in order to appreciate the dynamics of chainsaw milling and trade today. The chainsaw issue is complex both in its policy content and implementation trajectories. Therefore any attempt to reach or develop alternatives to dealing with chainsaw milling problems without a deeper understanding of its history may be unfruitful. To reach this level understanding, it was important to undertake a thorough background study into the subject. Following a gap analysis study, certain priority issues were

raised as important for addressing the needed background understanding into the issue. Five main thematic areas were identified:

- Genesis of chainsaw lumbering
- Technology and practices used over the years
- Evolution and effectiveness of policy measures
- Transformation of sector institution over the years and
- Structure of chainsaw enterprises in Ghana

Under these broad thematic areas, the priority issues identified were:

- Documentation of the complete developments of chainsaw milling in Ghana in order to present a better historical perspective
- Documentation of what informed the current policy and institutional arrangements to deal with the issue
- Documentation of what has limited the forest sectors institutions in achieving success in dealing with illegal chainsaw milling and how have their strategies evolved till date?
- Documentation of the structure of chainsaw enterprises and how they have survived?

Following these, the overall objective of the background study was to document the evolution of chainsaw milling, the policy, legal and institutional responses and their effectiveness and how the enterprise has emerged into its present form in order to provide a context for further research and policy enlightenment. Specifically, the study has two specific objectives:

- 1. to examine and analyse the historical development of chainsaw milling, the evolution of the current policy and legislative framework, the effectiveness of their implementation and institutional mechanisms that have evolved over the years
- 2. to describe the structure of chainsaw enterprises and how it has coped with the situation

To achieve the above specific objectives of the study, specific studies were conducted. These studies are presented in this part in separate chapters written as synthesis of the specific priority issues or questions contained in the gap analysis report (see terms of reference). Chapter 2 looks at the evolution of the current policy and institutional framework of the chainsaw ban and their effectiveness in addressing chainsaw milling. Chapter 3 presents the structure of chainsaw lumber production enterprise in Ghana.

Chapter 2

THE EVOLUTION OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK OF CHAINSAW MILLING IN GHANA

Emmanuel Marfo¹, Vincent Abankwa² and Victor K. Agyeman¹

2.1 Introduction

Timber exploitation in Ghana prior to 1994 was reaching unsustainable levels. Part of the problem was due to the use of chainsaw to convert timber to lumber. Chainsaw were introduced in Ghana in the 1960s to replace long manual saws, which were used for logging. Initially, they were used mainly for felling and crosscutting trees. TIDD (2005) has reported that conventional use of chainsaws in the processing of beams and lumber for commercial purposes in Ghana started and soon became widespread in the 1980s as sawmilling declined. In 1991, the state attempted to accommodate these chainsaw activities by introducing the Tree and Timber regulation. Notwithstanding the promulgation of this regulation, uncontrolled logging continued. The 1994 Forest and Wildlife responded by providing a basis for action to reverse this trend. There has been a series of policy reforms since 1994 to regulate logging including chainsaw activities in Ghana. Notwithstanding, illegal chainsaw operation is, today, one of the major factors contributing to the rapid decline of our forest resources. It was estimated by Forestry Commission in 1995 that timber harvesting of ecological species groups was exceeded by between 22% and 532% depending on the market demand of the species group due to illegal logging and chainsaw operations (Agyeman et al. 2004).

This paper summarizes the various policy reforms on illegal chainsaw lumbering, its achievements or otherwise, institutional arrangement that emanated from implementing the policy and their challenges. This review has been designed for the purpose of analyzing policy on chainsaw ban, its effectiveness or otherwise. The goal is to provide a background to understanding chainsaw milling in Ghana.

This paper has been prepared thorough a comprehensive desk study drawing from key documents. The main ones are the 1994 Forest and Wildlife policy, the Forestry Development Master Plan (1996-2020), Tree and Timber (Chainsaw Operations) Regulations, 1991 (L.I 1518), Timber Resources Management Act, 1997 (Act 547), Timber Resources Management Regulation, 1998 (L.I 1649), Forestry Commission Act, 1999 (Act 571), and Cabinet memo on Forestry Sector Policy Reforms (in July, 2002). In addition, various scientific journals, papers, proceedings, reports on chainsaw lumbering including materials from internet search were reviewed.

2.2 Evolution of the Policy Framework

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Ghana Forest Policy in Ghana has gone through a several periods of policy reform from forest protection in 1908 through "timberization" in 1948 and "diktat" in 1951 to forest conservation in 1994 (Kotey et al. 1998; Bilijo, 2005). The 1994 policy was meant to correct the crisis that resulted from the collapse of the timber industry during the late 80s. Drafted to correct "timberization" of the forest sector, the policy aimed at conservation and sustainable development of the forest and wildlife resources for maintenance of environmental quality and the perpetual flow of optimum benefit to all segment of society (forest and wildlife policy document of 1994).

Within the framework of the 1994 forest and wildlife policy, government aims at sustainable basis for utilization and development of forest resources, for modernization of the timber industry and for conservation of the environment, thereby maximizing the rate of social and economic development of the country and securing optimum welfare and adequate means of livelihood for all Ghanaians. As part of the strategies to achieve its objectives, the policy has gone through series of review to place a ban on chainsaw lumbering under the policy framework. According to Agyeman et al. (2004) major policy review of the chainsaw operation was carried out between 1996 and 1997. This resulted in the promulgation of the Timber Resource Management Act, 1997 (Act 547) and its accompanying Timber Resources management Regulation, 1998 (L.I 1649). Under the act chain saw processing of timber into lumber and other products, which hitherto was legalized by chainsaw Operations Regulation, 1991 (L.I 1518), was prohibited. Chainsaw processing of timber was consequently banned in 1998. The profile of government policy reviews since 1994 to address the problem of illegal chainsaw, as in Table 1, has evolved from the enactment of the Tree and Timber (Chainsaw Operations) Regulations, 1991 (L.I 1518) which accommodated the operations of the chainsaw operators.

Table 1: Review of past chainsaw policy measures

Up	No mention of chainsaw operations even in 1994 Forest Policy
1994	The state of the s
1994	The first series attempts to address the illegal chainsaw problem was in operations under the "interim measures" in 1994, probably after the Forest and Wildlife Policy was promulgated. A position accommodating
1996	chainsaw operations under legislative instrument and consolidating their regulations.
1990	Deployment of 1 st Police Task Force in 1996 to monitor illegal chainsaw
1997	activities, followed by a Military Task Force. Prohibition of chainsaw operations under the Timber resource
1998	Management Act, 1997 (Act 547)
	Prohibition of the use of unregistered chainsaw, chainsaw milling and selling of chainsawn lumber under the Timber Resources Management
2001	Regulations, 1998 (L.I 1649), Sec, 32(1),(2)
2002	Policy Advisory Committee set up by MLF
2003	Policy reform process begun to devise interventions to contain the upsurge
	Cabinet and parliament approval for illegal chainsaw operations/ban policy

Source: Agyeman et al, 2004

2.2.1 Review of Chainsaw Policy Measures

The 1994 forest and wildlife policy did not criminalize chainsaw operation; no mention of chainsaw operation was even made in the policy. Even before the coming into force of the 1994 forest policy, controlling illegal timber under the Tree and Timber (Chainsaw Operations) Regulations 1991 (L. I. 1518) which accommodated chainsaw lumbering, was ineffective. The problem of illegal timber harvesting was exacerbated in 1994 by conditions enumerated by Kotey *et al* (1998) as follows:

- No single institution has overall responsibility for overseeing exploitation of timber trees outside reserves, which led to confusion and collusion
- Monitoring and regulation of off-reserve harvesting was pitiful; the permit system being full of loopholes. The Forestry Department lacked the necessary information and resources required for the job
- Sanctions against illegal operators are ineffective; penalties were too low and prosecution too difficult. Support from the judiciary was meager
- Farmers, rural communities and the public were not well informed about the condition of the resource, the felling rules and the benefits to which they were entitled

2.2.1.1 The "Interim Measures" in 1994

In 1994 there was excessive and often uncontrolled felling in concession areas. This was compounded by various regulations which confused the situation. Chainsaw operators, District Assemblies, farmers, and landowners took advantage of the confusion with much unmonitored felling. There was widewspread speculative felling and trade malpractice, including illegal trading in property marks, and unauthorized subletting of concessions to illicit timber operators. The timber trade's failure to pay royalties and other statutory fees for trees felled in both the reserve and off-reserve forests had also reached serious proportions. Thus, there appeared to be an almost total lack of control over timber harvesting in the off-reserve areas, where production had risen to about 80% of total timber production (Kotey *et al.* 1998).

In response to addressing these problems of illegal chainsaw lumbering, the operations of the chainsaw operators were further consolidated and recognized under the "Interim Measures" to control illegal timber harvesting outside forest reserves". However, these measures did not have any legal backing but they were expected to supersede Legal Instrument 1518. Under these measures, the activities of the chainsaw operators were supposed to be regulated by the District Assemblies and the supervision of their operations were completely decentralized at the district level. The sole responsibility for the issuing of chainsaw permitting was given to the Forestry Department (FD) subject to conditions of sound forestry practices. The new Interim felling procedures were at the heart of the "Interim Measures" which aimed at regularizing timber production from stump to the port, with the involvement of farmers. Their key features of the felling procedures, enumerated by Smith (1996) and Kotey *et al* (1998) are:

- Applications for trees for community projects to the Forestry Department (FD) had to be accompanied by project documents (including a bill of quantities) approved by the District Assembly DA)
- Before felling begins, the desired trees will be inspected by the FD, DA, logger, community representative and farmer. Farmers may raise any objections they have over a tree being felled on their farms, even for

concession areas. Any tree felled on a farm against the wishes of the farmer is therefore felled illegally

- A Forest Officer will issue a felling permit before felling commences
- Post felling, farmers may bring any complaints about the felling operations to the attention of the Forest Officers
- A certificate of conveyance is issued by the FD for all logs, boards, canoes, charcoal or firewood (produced for commercial sale) before movement from the site
- Timber Industry Development Division (TIDD) roadside check points were to stamp and sign the felling permits accompanying lumber in transit and send monthly returns to the FD, and
- All chainsaw lumber on the market was expected to be covered at all times by both the felling permits and the certificates issued by the FD and be available for inspection whenever necessary by either FD or TIDD staff

In August 1995, the Minister of Lands and Forestry launched the "Interim Measures" to an assembly of timbermen and professional foresters. It is worth noting that the introduction of the Interim Measures was accompanied by grand rhetoric that at least symbolically signalled a serious political attention being paid to enforcement. For example, at the launching of the Measures, the Minister requested all responsible citizens to share with Forest Department the responsibility for monitoring felling of trees. The Minister was reported by Smith (1996) to have emphasized:

"The new policy is to sustain and develop the resource through the energies of communities, farmers, loggers and foresters working together.' The first step is to stop the illegal plundering which is spoiling our future. So the timbermen, chainsaw operators, millers and those officials who are colluding with illegal operators decide now, either you are with us or you are going to help look after the resource or not. If not, be warned, the farmers, communities, and foresters under these new 'Measures' will stop you'.

The institutions responsible for regulating chainsaw activities, particularly the Forest Services Division (FSD), under these measures did not have the necessary resources to undertake such intensive inspections in the rural areas. Reviewing the situation at this stage, Odoom (2005) indicated that there was no evidence from discussions at the FSD and TIDD offices that the lumber markets were inspected with regards to the felling permits and the conveyance certificates. There were inadequate checks in the rural areas while the bulk of the chainsawn lumber that found its way into the urban lumber markets was not inspected as required (Odoom, 2005).

Thus, even though, theoretically, there seemed to be a huge policy commitment, in terms of allocation of resources, one can argue that the policy commitment was not significant.

2.2.1.2 Deployment of Police Task Force and Military Task Force in 1996

The effect of the "Interim Measures" was short-lived. With eminent evidence that the "Interim Measures" could not help the situation, several policy instruments were employed to deal with illegal timber operations. As a result of concerns expressed about indiscriminate felling of trees for chainsaw lumber production. First, Timber Task Forces composed of staff of FSD, police and the military were formed in 1996 to

track down culprits and confiscate chainsaw lumber, equipment and vehicles used in the operations.

Second, members of the forces and resource-owning communities that assist with the arrest of chainsaw operators received 30% of the seized lumber from the chainsaw operators as an incentive to support the control of chainsaw operators and other forest offences. Despite this arrangement, Odoom (2005) alleged that some FC staff members and some officers of the security forces connive with the chainsaw lumber trade. On the other hand, the payment of such incentives to the forest-fringe communities that had provided assistance was reported to have been lagging.

The policy measure of using both the military and police to track down culprits and confiscate lumber, equipment and vehicles used in the operations has also been documented as not successful. Agyeman *et al.* (2004) have expounded on some reason accounting for this. The exercise has failed to make the desired impact mainly because of the rent-seeking bahaviour on the part of officers charged with this responsibility. In addition, state security agencies assistance needed to check the overland smuggling of timber product, particularly to northern neighbouring countries was inadequate. The judicial service failed to cooperate in the effective implementation of this exercise by either charging low fines or freeing the few suspects that were arrested

2.2.1.3 Prohibition of chainsaw operations in 1997/98

Abuses of the permit system for chains awing coupled with the inability of the FC to regulate it led to the outlawing of chain sawing. Following this a major policy review of the chainsaw operations was carried out between 1996 and 1997. This resulted in the promulgation of the Timber resource management Act, 1997 (Act 547) and its accompanying Timber Resources management Regulation, 1998 (L.I 1649). Under the act chain saw processing of timber into lumber and other products, which hitherto was legalized by chainsaw Operations Regulation, 1991 (L.I 1518), was prohibited. Chainsaw processing of timber was consequently banned in 1998. Several studies have reviewed the reasons that led to the criminalization of chainsaw lumbering. For example Agyeman *et al.* (2004) pointed out the following:

- High levels of wastage and inefficiency in converting logs to lumber
- Distorted or skew economic rent enabled wood processors to capture the lion's share of economic rent at the expense of the forest owners and local communities
- The construction sector and furniture makers who consume a large proportion of informal lumber because it is relatively cheap, and this depresses domestic lumber prices. Domestic sawmills are unwilling to sell into this low-priced market because of high opportunity costs involved
- To allow the Forestry Commission improve control over logs and lumber

The Timber Resources Management Regulation, 1998 (L.I 1649) give specific provisions that criminalize sawmilling and operations:

"no person shall use a chainsaw whether registered or unregistered, to convert timber into lumber or other forest products for sale, exchange or any commercial purpose" (Sec. 32 clause 1)

"No person shall sell or buy timber products which have been produced through chainsaw milling" (Sec. 32 clause 2)

However, the ban has failed to resolve the chainsaw milling issue even though its enforcement has led to forest officials spending a greater part of their time dealing with chainsaw operators sometimes in violent circumstances. Chainsaw lumbering operators continue and are reported by the FSD to be on the increase.

The level of illegality with regard to access to forest resources, especially timber, is quite high in Ghana. For example, forest invasion through extension of admitted farms is reported to have and still characterise forest operations (Kotey *et al.* 1998, Ohene-Gyan 2004). In addition, between January and July 2003 alone, a total of about 500 trucks of illegal chainsaw lumber were impounded at one Regional Forestry Office alone (Nketiah *et al.* 2004). It has also been estimated that about 46% of total timber harvest is sourced from illegal chainsaw operations (Birikorang *et al.* 2001). This figure is above the estimated annual allowable cut of 2 million cubic metres.

Furthermore, corruption in terms of rent-seeking behaviour among Forestry Commission (FC) staff, local government representatives and government task forces in the form of informal payments are high. For illegal chainsaw operations, it has been estimated at approximately ¢12 billion in 1999 and foreign exchange losses due to illegal chainsaw operations are estimated at over US\$ 60,000 each month (Anon. 1992, Birikorang *et al.* 2001).

These evidences show that the law has also failed as a policy instrument to deal with chainsaw lumbering³.

2.2.1.4 Alternative livelihood scheme for chainsaw operators in 2002

Government realizing the problem of controlling chainsaw operation within the limit of the Timber Resources Management Act, 1997 (Act 547) and Timber Resource Management Regulation, 1998 (L.I 1649) decided to adopt more positive and proactive approach to the resolution of the problem. For this reason, Forestry Sector Policy Reforms were approved by Cabinet for implementation in 2002. The reform accommodated chainsaw operators under the law to engage in alternative livelihood support schemes to create employment avenues for the rural poor, especially the youth. Forestry Commission was therefore directed to engage the chainsaw operators in the following programmes as an alternative to illegal chainsaw milling:

- The national Forest Plantation Development Programme
- Thinning in the existing forest plantations
- Forest reserve boundary cleaning and demarcation
- Forest plantation coppice management
- Recovery of off-cuts and branches in the forests for processing by small-scale timber companies
- In collaboration with the various District Assemblies, the Ministry will identify the resourceful chainsaw operators and facilitate the establishment and operation of mobile mills in strategic locations in the country to supply timber to local communities.

To make this effective, the Ministry of Lands and Forestry (MLF) pledged to hold consultations with the Attorney General and Minister of Justice in order to ensure that chainsaw operators who do not cooperate with MLF and Cabinet and operate illegally

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³ For an account of factors influencing the ineffective enforcement of the ban from stakeholder perspective, see Marfo and Nutakor (this report).

are speedily brought to trial by the courts and appropriate as well as deterrent sentences and fines are administered as prescribed by law. To further enforce the ban on chainsaw activities, the ministry consulted the big consumers of lumber and other wood products in the country including the Ministry of Works and Housing (MWH), Regional Coordinating Councils (RCCs, District Assemblies and Real Estate Companies to ensure that contractors working on government projects or any public construction activities source their lumber from the mills or other legitimate source. Government has also been engaged in decisions with timber trade associations to find practical ways to implement the provision in section 18(h) of Act 547, 1997, which require processing mills to set aside part of the production for the domestic market. In accordance with Section 36 of L.I 1649, the Ministry of Lands and Forestry directed that all milling companies should supply 20% of their lumber production to the domestic market. Prior to this, some processing companies had been granted special permits to produce lumber solely for the local market.

2.2.2 Implementation and Challenges of the policy reforms

2.2.2.1 Policy implementation

The Forestry Department instituted the "Interim Measures" in the districts through local for a for timbermen, chiefs and assemblymen were quickly implemented. Some new field equipment and motorbikes were produced by the Forestry Department, and field staff began to carry out the procedures. However, it became clear that the logistics of implementing the measures had not been adequately planned. With the assistance of police checkpoints all log, lumber, firewood and charcoal movements from the stump to the port were monitored by Technical Officers of the Forestry Department. Farmers also reported illegal chainsaw operations. Over the first two years of their implementation, the "Interim Measures" was reported to have had a strong impact (Smith, 1996). While illegal operators and their backers continued to complain about the system, some concession holders in areas previously riddled with illegal operators reported that they could sleep at night. The Planning Branch of Forestry Department undertook a review of the implementation of the "Interim Measures" about a year after their lunch and found that almost all FD districts in the high forest zone made a concerted effort to implement the procedures. The "Interim Measures" was reported to have made remarkable achievements and was seen by the Forestry Commission as the single most effective control measures that has been introduced by Forestry Department since 1948. What commanded the success was that for once the Forestry Department were committed to the new procedures, implemented them and the politicians backed them (Kotey et al. 1998).

The ban on chainsaw lumbering was enforced by creating a buffer stock of sawmill lumber to facilitate the following activities:

- The Forest Services Division identified sawmills at strategic locations in the high forest zone to supply sawmill lumber to the local market in order to ensure sustainable supply of sawmill lumber
- Sawmillers made a declaration and completed monitoring formats to be certified by Forest Products Inspection Division (FPID) that 20% of their lumber production will be set aside for the supply to the domestic market
- Compliance with the law was used as a condition for renewal of property marks. Small off-forest reserve areas were released to distressed but reliable

mills to ensure a sustained supply of sawmill lumber to the local market according to a set of laid down criteria

The staff of the Forest Services Division monitored the activities of illegal chainsaw operators and arrested them, including transporters. This activity was done with assistance of the police and in some cases the military. Monitoring teams operated at both the regional and district levels. The teams checked the illegal chainsaw operators by impounding chainsaw machines and chainsaw lumber. In addition to this, the culprits were sent to court or they are made to pay penalties. Some traditional leaders have been very supportive. The FC set up a six-man task force to conduct educational campaigned against chainsaw lumbering throughout the responsibilities of the task force included the determination of the modalities for the supply of lumber to the market by sawmills. In addition, they were to liaise with the DAs with regards to the monitoring of lumber supply by the sawmills and the trade in chainsaw lumber. Regional Timber Task Forces comprising the military, police and staff of the FC were employed to help stem the situation as the number of retail outlets of chainsaw lumber was increasing.

However, the cost associated with this strategy is quite enormous. Theses include threats as well as losses to human lives, loss of man-hours, social, economic, personnel and environmental considerations in fighting illegal chainsaw lumbering (Attah Owusu, 2004). A largely paper-based log monitoring system has been developed and operated by the Timber Industry Development Division (TIDD) and the Forest Services Division (FSD). The system tracks trees from stock-survey maps through felling and extraction, using district felling returns, to the mill (log measuring certificates), and unto export using permits that detail the ship on which the logs leave the country. However, because of staff limitations, the system do not cover all of the smaller sawmills operating in rural areas. Generally the tracking system does not accord the local market the same attention as the export market. For example, chainsaw operators who convert logs to lumber in the forest; bush sawmills or saw benches that dress and further process chainsaw lumber; and logs that arrive at sawmills overnight and are never declared to authorities have been identified by Odoom (2005).

There has been little incentive to rigorously enforce forestry sector legislations, particularly against forest offenders. The fines that were in force before 2002, according to Odoom (2005) were ridiculously low and the legal sanctions were outdated. Indeed, they served as stimuli rather than deterrents to rampant committing of forest offences. In some cases, there are problems as to which courts should try forestry cases, who should investigate and who should be prosecuted. For instance Odoom (2005) observed in Tarkwa District Forest Office that a Community Forest Committee (CFC) in the district had impounded a lorry transporting chainsawn lumber and sent it to the District Manager for prosecution. The case was taken to the local court only for the lorry owner to be cautioned and discharged based o the fact of lack of knowledge of the alleged culprit on the difference between sawmill lumber and chainsawn lumber. No forest law was quoted in the judgment. Newspapers and radio stations in Ghana have reported similar cases including alleged collusion of some members of the security agencies and forestry officials. In order to address this deficiency, the FC has held a series of workshops involving the judiciary, police and forestry officers to review forest legislation and enforcement mechanisms.

The FC has endeavoured to implement the alternative livelihood scheme through its Natural Resource Management Programme 1 (NRP 1) to improve the economic status of the communities living around forests and to encourage them to forgo incomes previously generated from exploitation of the forest. The World Bank, through its Global Environment Facility, has supported the FC. Investments in plantation development, whereby communities who forgo income from harvesting forest are compensated with shareholdings in plantation development schemes have also been supported. Some Non-Governmental Organizations such as Centre for the Development of People (CEDEP) and Rural Development Youth Association (RUDEYA) have endeavoured to assist farmers in forestry plans and supported alternative livelihood techniques to help reduce poverty of farmers and pressures on forests. Funding agencies, such as the United Kingdom Department for International development (DfID),have supported some FSD of the FC to train forest-fringe communities on the adoption of new technologies such as mushroom farming, grasscutter rearing, bee-keeping and snail farming(Owusu and Nketiah, 2005).

The reform of the 1994 policy that directed chainsaw operators into alternative livelihoods activities has failed. Forest districts that are currently promoting alternative livelihood activities in forest communities, according to Owusu and Nketiah (2005), do it on pilot basis under the Participatory Forest Management Programme (PFMP) by the FSD of the FC. They also realized that the effort of FC to direct chainsaw operators into boundary cleaning had failed because the benefits were not comparable with those of chainsaw operation. It has been reported by the Forest Services Division that 332 chainsaw cases were reported during 2002 most of which have been referred to court. Also during the first quarter of 2006, 110 cases of illegal logging and chainsaw activities were recorded and 33 vehicles conveying illegal chainsaw lumber were intercepted (Annual FSD Report, 2002 and FSD Report, April-June, 2006).

2.2.2.2 Challenges

The policy of banning chainsaw operations, according to Bamfo (2005), has proven both unrealistic and counterproductive. This is partly attributable to the fact that previous attempts to control illegal chainsaw activities in the country have focused on operations in the forests and allowed the marketing of illegal products to go on unchecked. The following challenges enumerated by Agyeman *et al.* (2004) and Abroquah (2004) have also contributed to the inability of the Forestry Commission to enforce the ban on chainsaw operations within the last few years:

Monitoring

It has been reported by Abroquah (2004) that, the monitoring teams failed to achieve their objectives completely and the operations were sometimes frustrating because transporters for example use several side routes and managed to outwit the monitoring teams. The Forest Service Division staff as well as police and military men who participated in monitoring activities were sometimes brutalized, beaten, shot and in some cases their vehicles are set ablaze. However, there are alleged cases of operators and transporters bribing the Forest Service Division staff and the police in order get the products to the market.

The inability of forestry sector agencies to devise appropriate strategies to effectively protect the forest resources has also resulted in an increase of illegal chainsaw

activities. This has been compounded by lack of cooperation from the law enforcement agencies and the law courts, which have woefully failed to prescribe sanctions against illegal chainsaw operations.

Lack of community support

Strong support of some local communities for illegal chainsaw operations has been observed by several studies as a major reason for the increasing trend of timber processing using chainsaws (Nketiah *et al.* 2004; Afful, 2006,). Even the development of mobile forest protection action groups, involving the police and military, has been unsuccessful due to the strong local support. Gianna (2005) also mentioned the inability of forest communities to develop the culture of sustainable resource management, and illiteracy as some of the challenges in implementing forest resource management programmes. The lack of local community involvement in forest resource protection, over the years, led to the excessive depletion of the forest. The Forestry Commission (FC) is in the process of forming Community Forest Committees (CFCs) to help control illegal forest activities such as chainsawing, logging and bushfires. According to Odoom (2005) more than 10 CFCs have been formed throughout the High Forest Zones (HFZs).

Many communities turn a 'blind eye' because it provides cheap lumber, creates local employment, and farmers are paid or compensated in cash by the chainsaw operators. Most of this lumber goes to furniture makers in the local market for whom illegal lumber is a source of cheap raw materials. This has been confirmed in a study conducted by Afful (2006) in the Asunafo District of Ghana where illegal chainsaw operators supplied 83% of lumber share in the local market. The study further revealed that chainsaw lumber was 20-50% cheaper than the sawmill lumber. But this depresses lumber prices, and domestic sawmills are unwilling to sell at such low prices. The requirement that mills sell some of their lumber to local markets, as part of the ways to check illegal lumbering, will continue to be ignored for this reason. This is exacerbated by the low rates of stumpage collection by the Forestry Commission (FC) and the slow disbursement of funds to the traditional authorities and district assemblies. The majority of households in forest adjacent communities perceive few real forest benefits. These conditions are powerful disincentives for the adoption of sustainable forest management practices, and explain much of the collusion in chainsaw lumbering.

Dangerous coping practices

Some recent studies (Marfo, 2004; Adam et al. 2007) have investigated the coping strategies of chainsaw operators to cope with the criminalization of their operations. Some chainsaw operators have developed strategies of dealing with the police and forestry officials. The studies revealed that the police engage in negotiations with the chainsaw operators using a front liner who might be the diver or a junior-ranked officer in the team to strike a deal. This initiates a coping network for subsequent trips; payment becomes a usual routine if same officers are encountered. Through such links, the truck is able to pass security checks. Some timbermen have managed to cope with the situation by linking up with forest officials to buy confiscated lumber, obtain official receipt and waybill to convey the lumber. To maintain this link, some officers use under-invoicing in order to maintain a portion of the sale. This establishes a business network for continuous supply of confiscated timber

Chainsaw operators are often armed with offensive weapons and operated deep in the night. As a result of this situation, some forest officers have either been killed or maimed by these operators. These illegal harvesting control measures failed to make the desired impact mainly because of the high demand for wood and the low penalties involved.

Impounding of vehicles carrying illegal lumber and low court fines do not deter chainsaw operators. Moreover, chainsaw dealers have the equipment to process lumber into desired shapes to meet consumers' taste - re-sawing to desired taste.

2.3 Institutional arrangements to enforce the ban

2.3.1 Evolution of institutions to deal with chainsaw lumbering

The historical account of commercial chainsaw milling prior to 1980s is limited. Perhaps because it was not an issue for national policy attention due to the relative abundance of the resource compared to the threat exploitation posed. Another reason is that the introduction of property marks and its requirement for timber exploitation by the Concessions Act of 1962 (Act 123) and the Trees and Timber Decree of 1974 (NRCD 273) focussed on exploitation for export glossing over the issue of chainsaw milling which was mainly to serve community and domestic timber needs. Thus all forest legislations prior to 1991 were virtually silent on chainsaw milling. Clearly this is an indication of a lack of any policy towards chainsaw milling and hence no formal institutions were created to deal with the issue. This is not too surprising as official practice and formal policy was to assume that unreserved forest would be converted to other land uses, particularly agriculture (Kotey et al. 1998). Thus control over commercial exploitation was focussed on timber concessionaires until chainsaw milling, especially outside forest reserves became significant and posed some threats to forest degradation.

The Trees and Timber (chainsaw operations) regulations of 1991 were passed and introduced registration of chainsaws and criminalised unregistered chainsaw milling. Here, new role for District Assemblies in forest governance was to register chainsaws. The District Assemblies also processed applications for felling including approval. The FD's role was to receive application, conduct inspections and recommend suitability to the DA. The Forest Product Inspection Bureue (FPIB) was assigned the role to conduct road checks by receiving copies of registration and permits. Thus, the main institutions involved in regulating chainsaw milling were the FD, FPIB and the DA.

Notwithstanding these regulations, the policy of liquidation of off-reserve forest resources did not help sustainable regulation of timber harvesting, including chainsaw milling (Kotey et al. 1998). The 1994 Policy introduced a significant policy shift from 'liquidation' to 'sustainable management of off-reserve forest resources'. It was at this stage that illegal chainsaw operations became a target for significant control. In 1994, the FD set up a National Working Group on control of illegal felling outside Forest Reserves. This increased the number of agencies and actors within the institutional framework for controlling chainsaw operations. The Working Group consisted of representatives of:

- National Chainsawyers Association
- Timber companies
- Local timber task force (FD, concession holders, district assemblymen, villages and military personnel)
- District Chief Executives
- FD District Forest Managers
- Stool chiefs and traditional authorities
- Farmers and communities
- Forestry Ministry

In 1995, the Working Group recommended actions to mitigate unsustainable harvesting of off-reserve timber, the so-called Interim Measures. A Logging Inspection Team which involved FD personnel, Assemblymen and farmers was created and institutionalised under the IM. It also streamlined pre-logging and post-logging inspection procedures of the FD to includ issuance of conveyance certificates to accompany vehicles transporting chainsawn wood. The Measures were known to have impacted positively on annual log production in the forestry sector (Kotey et al. 1998).

In 1997, there was a prohibition of chainsaw milling by the Forest Resource Management Act (Act 547). This led to the use of joint FSD-police-military task force for monitoring illegal chainsaw operations. Thus, the role of the police and the military in forest governance become more prominent. By 2001, chainsaw milling was becoming real problem in spite of the ban and this led to the formation of a Policy Advisory Committee at the Ministry. One of the outcomes was the increased linkage (collaboration) of chainsaw activities with other national programmes such as the National Plantation Development Programme in order to provide alternative livelihoods for the operators. This brought the National Plantations Development Centre into the institutional web of CSL.

Thus, as far as the emergence of institutions or institutional arrangement is concerned, one can conceptualised the evolution of sector institutions into four major phases.

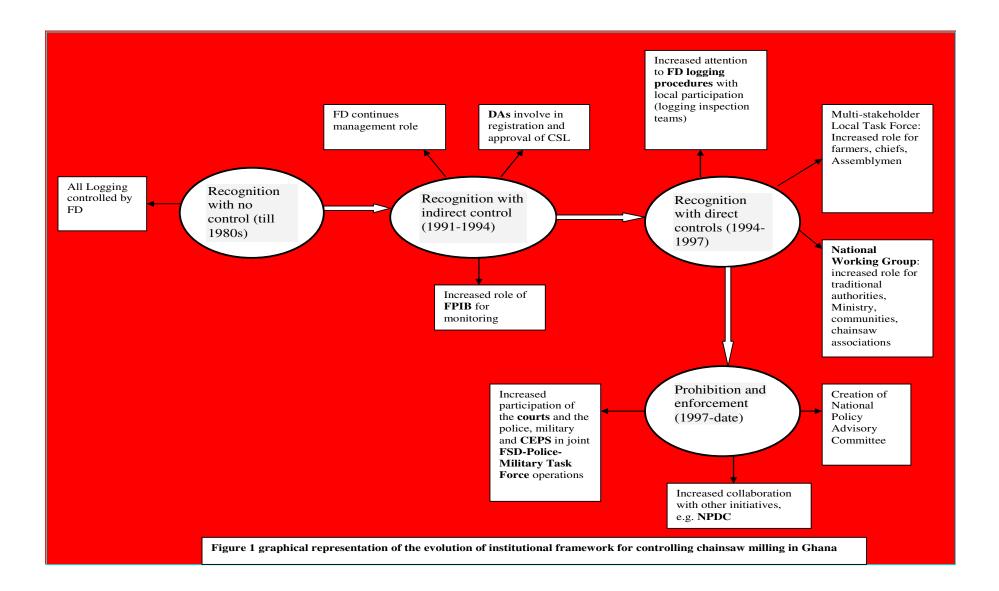
Phase 1 (before 1980s) recognition of chainsaw milling

Phase 2 (1980s-1990) recognition and indirect control

Phase 3 (1991-1996) direct control

Phase 4 (1997 till date) prohibition and enforcement

Following the discourse on the subject, Ghana is at a cross road of entering another phase as the debate on possible policy options continue to gain momentum. Figure 1 graphically represents the evolution of institutions within these four phases of chainsaw milling control regimes in Ghana.



2.3.2 Current institutions involved in chainsaw ban enforcement

Institutional arrangement here involves the various agencies and actors that have legitimate legal backing to govern and enforce the ban on chainsaw milling. These include the Forestry Commission, the Judiciary, the Police, the CEPS and any regulations and operational mechanisms they institute to help deal with enforcement.

The Ministry of Lands, Mines and Forestry

The Ministry of Lands, Forestry and Mines (MLFM) is the agency of the state responsible for formulating policies to guide the sustainable management of forest and wildlife resources.

The ministry, according to the Forestry development Master Plane 1996-2020, promised to strengthen its capacity so as to create an enabling environment and adequate capacity and infrastructure for both private entities and public agencies to perform at their best in implementing the policy reform on chainsaw lumbering. It is responsible for proper coordination of all programmes, projects and activities under the master plan including tracking of illegal chainsaw operators. It also provides the necessary approvals and support by way of fiscal measure, incentives, institutional reform and capacity building to ensure attainment of planned objectives. For example, to make the ban on chainsaw lumbering effective, the MLFM in collaboration with the various District Assemblies, is responsible to identify the resourceful chainsaw operators and facilitate the establishment of mobile mills in strategic locations in the country to supply lumber to local communities. The ministry has also pledged its responsibility in liaising with the Attorney-general's Department to initiate new legislations and amendments to some existing laws as a way of facilitating the effective and efficient implementation of the ban chainsaw operations (Cabinet Memo, 2002)). It has specifically requested the Attorney-General to work out modalities to allow the FSD to directly prosecute forestry offences (Armoo, personal communication)

The District Assemblies

The District Assemblies (DAs) are statutory institutions prescribed by the enactment of the 1992 Constitution of the Republic of Ghana, under Decentralization and Local Government in section 240 of the same Constitution, which calls for a decentralized local government administration with DAs as the pivot of local development. As enacted in section 10 (sub-section 1-3) of the Local Government Act 462 of 1993, the DAs are mandated to exercise political and administrative authority in the district, provide guidance, give directive and supervise all administrative authorities in the districts. Under this cause, the DAs are perceived by the FD to be able to evolve sustainable systems by which chainsaw operators can be controlled. Bylaws may be passed to back a comprehensive and meticulous vetting procedure for registration and licensing of chainsaw operators, owners and their machines to undertake specific activities. Apart from the main supervisory role of the FSD, the DAs may use their Area Councils and Unit Committees to strictly monitor the activities of the chainsaw operators and apply appropriate sanctions to defaulting operators to discourage prospective offenders. This is especially so as the DA obtains 55% of net revenue from forest stumpage fees from the District.

The Forestry Commission (FC)

The Forestry Commission is established by Act 543 as a semi-autonomous corporate body. All forestry sector agencies were brought under the Commission as Divisions to function as implementation bodies for the protection, development, management and regulation of forest and wildlife resources. The Forestry Department (now Forest Service Division) has been the line agency responsible for management of the national forest estate and implementation of forestry programmes. The reformed Forestry Service is expected to continue managing the forest estates in addition to concentrating on effective enforcement of the forest laws and regulations governing forest reserves and off-reserve areas while offering technical advice and support to individuals, communities and Districts that benefits from forestry in various ways. It has been the main frontline agency enforcing the ban on chainsaw milling.

Community Forest committees

In a bid to device an appropriate community forest management structure, the FSD in conjunction with communities and timber concessionaires implemented a project that explored and developed what has now come to be known as Community Forest Committees (CFCs). The original project aim was to devise innovative schemes by, which timber and forests outside forest reserves could be managed by communities and timber concessionaires with technical assistance from the FSD. Members constituting a CFC at a village level should be a total of seven, nine or eleven persons representing primary stakeholders that includes traditional rulers, landowners, farmers, the youth, migrants, Unit Committee, Assembly person, the FSD and security agencies. According to the FD (2000), the CFCs were set up as a permanent institution to be empowered by the nation's legal system to eventually be an official mouthpiece of the communities on forest management issues at the national level and to improve the capacity for community collaboration at the local level. The CFCs were supposed to, inter alia, encourage and support the arrest and reporting of forest offenders such as chainsaw operators to the FSD and/ the Police. Till date, the legal backing for the CFC is weak and unclear and the concept has not been well institutionalized into the FC structure and operations.

Customs, Excise and Preventive Service (CEPS)

The legal mandate under which CEPS operates currently is the Custom, Excise and Preventive Service (Management) Law 1993, PNDCCL 330, Section 2. In addition, the CEPS apply other laws and regulations which prescribe the mode of operation and penalties for various infringements. CEPS is responsible for designing and implementing strategies and programmes to collect, account and protect customs, excise and other assigned tax revenues at a minimum cost, while facilitating trade, investment and the movement of people across the boarders of Ghana through efficient and transparent service delivery. The CEPS is expected to extend its mandate to check overland smuggling of wood products including chainsawn lumber. The FC has held meetings with the Customs, Excise and Preventive Service (CEPS) to ensure that the export of lumber is covered by the Timber Industry Development Division (TIDD) export documentation.

The Police Service and the Judiciary

Article 200 (clause 3) of the fourth Republican Constitution (the 1992 Constitution) of Ghana mandates the Police Service to maintain law and order in the country. Since

chainsaw lumbering has been criminalized by the Timber Resource Management Act, 1997 (Act 547), the Police Service has the constitutional mandate to be part of the task force that enforces the law on chainsaw ban. It is, therefore, not out of order for the Police Service to have been used to control illegal chainsaw lumbering in recent past. In practice, it has been observed that the police and FSD sometimes clash on their roles, especially with regards to confiscation and prosecution of chainsaw-related offences (Marfo, pers. Comm.).

The judiciary, under article 125 (clause 5) of the 1992 Constitution of Ghana, has the jurisdiction in all matters civil and criminal. Cases of criminal offences relating to illegal lumbering are referred by the Police and other law enforcement bodies to be handled by the judiciary at its various courts of competent jurisdiction. In practice, it has been observed that the use of the judiciary in controlling chainsaw milling has not been very effective. There are evidences that their penalities are not detterent (due to the use of obsolete laws) and the process has been too slow (Inkoom 1999; Asante, 2005; Marfo, 2006). However, the capacity of the FSD to prepare prima facie cases before the courts has been largely questioned.

2. 4 Conclusion

The paper set out to pull documented information and studies together to provide a comprehensive background to the policy and institutional framework that governs chainsaw milling and their effectiveness in Ghana together. Generally, the 1994 Forest and Wildlife Policy set out a direction for regulating timber harvesting within sustainable levels. Act 547 and the LI 1649 specifically criminalize the use of chainsaw to convert logs to lumber and the transportation and sales of chainsaw lumber. The FSD is the frontline agency in charge of enforcing the ban. This effort is expected to be complimented by the judiciary, policy, CEPS, communities and District Assemblies playing different roles of monitoring, prosecution and administration of justice. However, current levels of illegal operations as evidenced by the proliferation of timber markets, mainly selling chainsaw timber point to the fact that the enforcement of the ban has not been effective.

Chapter 3 STRUCTURE OF THE CHAINSAW LUMBER PRODUCTION ENTERPRISE

Lawrence Damnyag and Beatrice Darko-Obiri⁴

3.1 Introduction

The informal economy, to which the chainsaw lumber enterprise belongs, is comprised of self-employment in small unregistered enterprises and wage employment in unregulated and unprotected jobs. In developing countries, informal employment comprises one half to three quarters of non-agricultural employment. In Sub-Saharan Africa, excluding South Africa, informal employment comprises nearly 80 per cent of non-agricultural employment. In Ghana informal employment represents over 90 per cent of total employment (GSS et al. 2005). Street vendors, workers in export processing zone factories, workers in small workshops, domestic workers, garbage pickers, small farmers and forest gatherers are all part of the informal economy. The least visible informal workers, the majority of them women, sells or produce goods from their homes: stitching garments, weaving cloth, embroidering textile goods, craft-making, shoe-making, food processing, or assembling electronic and automobile parts. Other common categories of informal employment include casual workers in restaurants and hotels, casual day labourers in construction and agriculture, and security guards, temporary office helpers and offsite data processors.

Due to apparent lack of the formal sector to meet the local demand of lumber in Ghana, the informal sector has become dominant in meeting the needs of the local market (Birikorang *et al.* 2001). The informal timber and wood products traders and allied operators i.e. saw millers, carpenters and illegal chainsaw operators became pronounced in the parallel economy that emerged in Ghana in the early seventies due to a crisis which hit the economy. The timber and wood products informal sector is growing and is dispersed throughout the country. According to Blackett et *al.* 2008, Ghana has a large informal timber sector sourcing from illegal chainsaw gangs deduced from the annual allowable cut (AAC) of 2 million m³, where 935,000m³ was officially harvested (2005).

The development of the modern petrol chainsaw that is has brought about this lumber enterprise is generally acknowledged to have been by Andreas Stihl in 1929, though prototypes had existed since 1830. Chainsaws were, however, principally designed and used for felling and cross-cutting and not intended for rip sawing or milling, and it was to be decades later still before adaptations were made to convert chainsaws to a milling machines (Pasiecznik, 2006). In Ghana though the ban on chainsaw lumber production for commercial purposes is being enforced, the enterprise is still in operation and is recognized as major supplier of lumber to the domestic market in Ghana.

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Generally, people employed in this enterprise like all other categories of people in the informal economy include: chainsaw machine operators and their apprentices; porters who carry the planks from stump site to loading points; loading gangs who on-load haulage trucks; transporters (truck owners, drivers and their assistants) who haul the lumber to the markets and from markets to consumers or users; market hands who assists in off-loading the trucks from the forest and loading trucks to consumer delivery points; lumber brokers who buy and retail the lumber from the chainsaw operators; and consumers (Carpenters, contractors, fishermen) who buy lumber from the timber markets or directly from the chainsaw operators (Adam *et al.* 2007a). Each link in the chain employs thousands of people.

Studies carried by Sarfo-Mensah 2005 in several forest fringe communities showed that chainsaw operators are mainly outsiders. However, they are often assisted by local young men who act as operator's assistants and porters. According to him the people involved in the chainsaw operation have been classified by local people to include the following:

- Operators fell and saw timber
- Operator boys assist operators; carry chainsaw to the site and help in felling and sawing of timber
- Owners chainsaw machine owners; they rent the machines to operators for fees or employ operators to work for them.
- "Shakers" or Porters carry sawn timber from the bush to loading points
- Loading boys those who load the timber onto trucks bound for the timber markets in the urban centres
- Buyers mainly located in the cities and other urban centres

From the findings of Sarfo-Mensah (2005), some local young men are also engaged by traders outside to fell timber for them. These young men are provided with chainsaws and paid for their services. He further revealed that syndicates of some local elders and young men who collaborate with outsiders to harvest timber or give assistance to chainsaw operators and their financiers also exist in the chainsaw enterprise.

The goal of this work is to identify major actors in the chainsaw lumber enterprise, their mode and stages of lumber production and trade as it pertains in the country. Specifically it seeks to establish the types and composition of these actors at each stage of the chainsaw lumber production and trade from the stump sites to the end use points. The ultimate aim is to provide an understanding of the chainsaw lumber enterprise for effective policy decisions regarding its restructuring and management under the overall goal of the EU chainsaw project of ensuring sustainable utilization of Ghana's forest resources.

3.2 Methodology

The approach used is mainly review of secondary documents on the chainsaw lumber production and trading activities. Also consultation with key informants in chainsaw lumber production communities and the domestic lumber markets was done. Such key informants included chainsaw operators, lumber carriers, lumber dealers and farmers on whose farms the trees are harvested, processed and sent to the markets for sale. The information gathered was processed through discerning the major actors and their

associates as well as establishing the stages of chainsaw lumber production and the directional linkages between these actors in the various stages.

3.3 Characteristics of the chainsaw enterprise

In Adam et al. 2007 study on the survey of chainsaw firms, three main ownership arrangements were identified. These were sole-proprietorship (79%); partnership (11%) involving several individuals; and group ownerships (10%) involving different independent operating units. The respondents to the survey in these firms also consisted of 7 categories of workers. This support the findings of Sarfo-Mensah 2005 regarding the categories of workers engaged in the chainsaw firm. In their findings, majority of these respondents were either owners of the firms or chainsaw machine Few were owner-operators and those who were owners ran sole operators. proprietorship businesses. One other feature of the sole proprietor firms was that some had managers and foremen who were engaged to help in the running of the business. People from diverse occupational backgrounds were found to be engaged in this chainsaw milling business. Majority of the people found, were farmers, traders and timber company workers or unemployed. This study also found that some people got into this business through their own initiatives, whilst others got in through apprenticeship. Also for the skills required for the job, majority of the actors got the training from previous masters, whilst a few got them through working with Timber Companies.

Regarding chainsaw business finances, three main sources of funding were identified in Adam et al. 2007 study. These were business network, personal finances and loans. The most important sources could be described as coming from business networking indicating funds as coming from owners of the firms, lumber dealers and income from machine rentals. The personal/family source of funding was next in importance. The personal sources comprised mostly of savings and some amounts also came from family members. Some other personal source was described as income from retirement, funds from cocoa farm and property sale. Loan sources were mostly from money lenders, friends, and loans from the banks in that order. Business initiative appears to be strong while individual effort to enter the trade supersedes reliance on bank loans probably because of the difficulty of dealing with the banks. In addition to these findings, interaction among all the chainsaw operators was found to be occasional meetings and informal exchange of ideas in this study. This may be explained by the fact that chainsaw lumbering has been banned. Therefore the chainsaw enterprise as it works now is deprived of the full benefits of social network that is generally recognized as a business enhancing element.

3.4 Production and marketing of chainsaw lumber

Figure 3.1 describes the stages of chainsaw lumber production and marketing. This figure was realized by the authors of this work upon interaction and consultation with various chainsaw lumber stakeholders in the eight forest districts under the EU-chainsaw project. These included chainsaw operators, lumber carriers, chainsaw lumber dealers, etc. Informal in structure as it may be, the chainsaw enterprise has a number of departments or units that operate jointly or independently. These units may be classified as processing or production, transportation, marketing, and end-user arrangements among others as depicted in Figure 5.1. The ticker arrow in figure 5.1 indicates the main route through which the chainsaw lumber passes beginning from

the stump site to the lumber markets where they are being taken up by intermediate and end-users such as the lumber dealers sponsors, individuals, estate developers, etc.

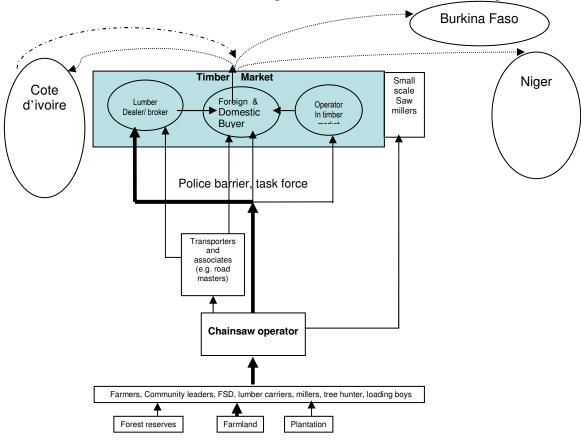


Figure 3.1: schematic representation of the stages of chainsaw lumber production and marketing as derived from authors' interaction with chainsaw lumber stakeholders in 2008

3.4.1 Chainsaw lumber production

Chainsaw lumber production is one stage of the process and the lumber is mostly produced by the chainsaw operators. These operators arrange for the timber trees for processing from farmlands, forest reserves and plantation. For the farmland trees, operators get the trees from the farmers and community elders through payment of small sums of money or freely without the knowledge of the farmer. Apart from paying for the trees at times, these operators pay some money to Forest Services Division staff in the form of bribe to be allowed to transport the processed lumber to the market for sale. The production of chainsaw lumber involved a lot of energy, as the chainsaw operator alone can not do it. At the stump sites the services of carriers, fellow operators and loading personnel are sought. In the past these chainsaw operators are youth in the communities where the chainsaw operation is carried out. However, in recent times there has been a change. Most of the chainsaw timber is no longer produced by small scale independent youth chainsaw operators, but organized gangs often financed by big business interests, with the connections to bribe their way through the various checkpoints of the security services (Amanor, 2006).

3.4.2 Transportation of chain sawn lumber

The transport sector of the chain saw enterprise is one important department of the whole enterprise. Movement of chainsaw lumber from the stump sites to marketing

centres is predominantly done with haulage trucks with capacity between 20 and 35 m³ (Adam et *al.* 2007). Each trip of lumber load will engage 9 people (1 driver, 2 driver mates, 3 member loading gang in the forest and 3 member off-loading team at the market place). More or less the same number of people is also involved in the secondary transport of lumber from the market to joinery shops and construction sites. In recent times other unorthodox means are used to convey lumber to the market centers. These include concealment of lumber in vehicles carrying goods like food stuff and charcoal to markets. As indicated in figure 3.1 the chainsaw operators transport the lumber obtained from the stump site to the market centers for sale. In addition, some small scale saw millers obtain their wood directly from these chainsaw operators.

From consultation with primary chainsaw lumber stakeholders it was observed that, whilst operators hire transport to convey their lumber to market, other transporters buy the lumber from these operators at the stump site and send to the market for sale. These categories of transporters constitute the second stage of the chainsaw lumber production. In that they inject capital into the system and incur cost such as payment made at the police and customs check points to get the lumber to the market and in addition they also get some positive or negative returns after sales. In connection with this, another group named 'road masters' in the chainsaw business has also emerged. In a way their activities which form one stage of the chainsaw lumber production is more or less services used to facilitate the movement of the processed lumber on the high way to the market centers or to consumers. They are believed to have established good working relationship with police, custom officials, and the FSD Task Force Team controlling the lumber movement on the high ways. Also they are believed to be in a better position to negotiate good bribing price with these agents on the high ways to allow passage of lumber to market than most other actors involved in the business. Therefore most of these actors prefer to hire their services to allow their lumber get to the market at a much reduced cost with less probability of seizure than they would have done themselves.

3.4.3 Marketing of chain sawn lumber

Apart from the processing and the transport units of the chainsaw lumber enterprise, the marketing unit of the enterprise is equally very important. This is organized in specific locations in all the 138 district capital towns in the 10 regions of Ghana despite the ban on chainsaw lumber production. The most important regional markets are the Anloga market in Kumasi, Ashanti, Ofankor and Muuse in Accra; Techiman in Brong Ahafo region; Kasoa in Central Region; and Kokompe in Takoradi, Western Region. These markets are run by lumber brokers who source their stock from both the traditional sawmills and from the chain sawyers and retail them to their consumers. The activities of these lumber brokers form another stage of the chainsaw lumber production and marketing. These brokers arrange for their stock in diverse ways. From the consultation with these stakeholders, some of these brokers provide the funds for the operators to produce the lumber for them at price much lower than what prevails in the market. Other brokers acquire the chainsaw machine and hire the services of the operators to produce the lumber for them. What is also emerging is that some of these brokers obtain the chainsaw beams/lumber from the stump site and send them to small scale sawmills within the area for reprocessing into the sawmill lumber to avoid detection by the police and custom at check points. From interaction with the chainsaw lumber stakeholders, most of this reprocessed lumber from these saw mills

are sent to the bigger timber markets for sale since the necessary documentation is usually provided by the saw millers.

3.5 End-users and informal arrangements

Local consumers of the chain sawn lumber include construction firms, individual builders, estates developers, carpentry shops, and joinery producers. The carpentry and joinery firms produce household and office furniture, panel doors, door and window frames, pallets, fruit crates, caskets, cabinets etc which accounts for about 75% of the annual sawn timber requirement of the country (Coleman, 2004, cited in Adam *et al*, 2007). The construction and building firms account for the remaining 25% of lumber requirement. These categories of consumers source the lumber directly from the lumber dealers in the market (figure 5.1). Lump together, this category of intermediate consumers also forms one significant stage of the chainsaw lumber production and trade.

3.5.1 Cross border trade in lumber and wood products

Apart from these domestic end-user arrangements, foreigners buy the lumber from these timber markets and transport them overland for retail and for various end uses. This could also be described as another stage of the chainsaw lumber production and trade (figure 5.1). Though it may not be widespread, there are reported cases that some of these foreigners also arrange for the wood directly from the bush in the country through the provision of funds to the chainsaw operators. However, there are no reliable statistics on this unofficial trade, covering both the domestic market and the overland trade with neighboring countries. The Timber Industry in Ghana is made up of both the formal and the informal sector.

The informal sector, widely dispersed around the forest areas, is focused mainly on supply to the domestic and regional markets. It consists of small to medium sawmills, which are weakly regulated. Rough-sawn planks produced by chainsaw loggers are the principal raw material. The mills re-saw the boards into dimensional sawn-timber, which is then legally transported within Ghana with official transport documents (VAT receipts) issued with disregard to the illegality of the supply (Blackett et *al.* 2008). As a result of this unreliable official statistics covering the domestic and regional timber trade in Ghana, no concrete conclusion can be made about the volume and value of the overland/regional timber trade. However, some observation regarding the trend and important trade products and routes made by Blackett et *al.* 2008 include the following and indicated in Table 1.

- Teak logs harvested from plantations in Ivory Coast and transported via Burkina Faso to Ghana and Togo. This is processed and re-exported directly, mainly to India.
- Regional markets, particularly Nigeria, that serve as major important markets for Ghana's plywood manufacturers and the issue of whether the raw material used in manufacture has been legally sourced is of limited or no concern.
- The Sahel region total dependence on supply of timber coming from Ghana, Guinea Conakry, Ivory Coast and Togo due to lack of timber resources in that region.

As indicated in Table 3.1 the acknowledged illegal trade, which is mostly the chain sawn lumber is lumber transported over land from Ghana to Burkina Faso, Niger and La Cote d'Ivoire. Apart from this, there is also documented legal trade which is mostly plywood traded between Ghana, Togo and Benin in Africa and Europe, India, China and the rest of the World. The findings of Blackett et *al.* (2008) indicate that, the regional market, particularly Nigeria, is growing in importance and the Sahel remains an important market, largely for the illegal chain sawn lumber/ timber.

Table 3.1: Direction of timber and wood products trade between Ghana and regional markets in West Africa in 2007

From	То	Product	Volume	Status
Ghana	Benin	Plywood	$2,500\text{m}^3$	Legal
	Benin	Lumber	Unknown	Illegal
	Benin (in transit to Sahel)	Teak sawn-timber	Unknown	Illegal
	Ivory Coast	Lumber	Unknown	Illegal
	Nigeria	Plywood	74,500m ³	Legal
	Nigeria	Lumber	Unknown	Illegal
	Sahel region	Lumber	39,000m ³	Legal
	Sahel region	Lumber	260,000m ³	Illegal
	Togo	Plywood	6,700m ³	Legal
	Togo	Lumber	Unknown	Illegal

Source; Adapted from Blackett et al. 2008

Of concern is the lack of knowledge about total timber use between Ghana and its neighbouring countries, and the general lack of statistics, which are needed as a proper basis for planning and policy decisions. This is particularly the case for local market lumber requirements and overland exports, which are less regulated than maritime exports. These statistics covering all trade, local and international are essential so that governments can match production to resource potential and determine how local demand can be met and what volume of external/overland trade is permissible.

3.6 Conclusion and policy implication

This work sought to determine the type, composition of the actors and the various stages of the chainsaw lumber production and trade from the stump sites to the end user points. The main stages of the chainsaw lumber production and trade identified included the production of lumber at the stump sites; transportation of lumber on the high ways, the trading of the lumber in the local markets, and the export of the lumber overland to the neighboring countries. The study also found the chainsaw enterprise to be generally small scale in nature, generally informal, and loosely structured in its organization, without most of the businesses in the industry registered. Logging of timber is often initiated by local or regional entrepreneurs who hire labourers or by single individuals with one or several assistants or family-run businesses (Ravenel & Granoff, 2004; Siebert & Elwert, 2004). Only very occasionally, are they organized into a recognized, productive and solidly structured business establishment. This implies that monitoring of its activities to ensure sustainability and efficiency by the authorities can be problematic. This may be explained to be due to lack of proper record keeping, avoidance of tax payment, influence of its operations by political

figures and influential people in the communities and clandestine operation of its activities due to the ban on chainsaw lumber production in Ghana.

The major challenge confronting this informal enterprise is how to restructure or streamline its operations by getting all the relevant stakeholders to dialogue and arrive at a consensus of the best way forward to ensure that the activities of the enterprise are run in a way that will be beneficial to all the parties involved and be sustainable without doing much harm to forest where the resources are drawn. What may be required is improved inter-sectoral collaboration and stakeholder involvement to address underlying socio-economic and cultural factors in this chainsaw lumber enterprise. In the view of FAO 2005, Forest law enforcement and governance should not be dealt with solely through national forest and development programmes, but in collaboration with other sectors, and where possible, within existing mechanisms. Any strategies to address the illegal forest activities in this enterprise need to take into consideration the complexity of these acts at all the stages of the lumber production and trade indicated in this work as well as their underlying causes. Efforts may also be required to get more reliable statistics on chainsaw lumber production and trade both for the domestic market and the overland exports to the neighboring countries, especially the Sahelian countries. This would to be necessary in order to support the relevant policy decision making regarding how local lumber demand can be met and what volume of external/overland trade is permissible.

PART II

DRIVERS OF CHAINSAW MILLING IN GHANA

Background to studies on drivers of chainsaw milling in Ghana

Chainsaw milling in Ghana has gone through several phases as far as its regulation is concerned. Marfo et al. (this volume), identified these as the recognition, recognition with indirect control, recognition with direct control and prohibition and enforcement phases. In terms of policy, they give a detail background account of how various policies have evolved in dealing with chainsaw milling. In terms of legislation, the first explicit law passed to control chainsaw milling was the Trees and Timber (chainsaw) Regulations of 1991 which prescribed the following as criminal offences:

- Failing to register chainsaw
- Using unregistered chainsaw to fell or saw any log
- Felling or milling with chainsaw without a permit and
- Failing to mark the stump of a felled tree with registration number serially

This was followed by Act 547 and L.I. 1649 which elaborated offences related to chainsaw milling making the activity illegal at the moment.

However, a discussion of the policy and legal framework of chainsaw milling in Ghana is not a straightforward one. It is entangled and linked to other sector and national policy dilemmas. Particularly, chainsaw milling cannot be discussed without a direct link to the domestic access of timber for local people and supply of timber to the domestic wood market. These three issues are inextricably linked because of the primary purpose that chainsaw lumber serves in the national economy. At the moment, it is estimated to contribute at least 70% of domestic timber supply and local people almost depend on it for all their domestic timber requirements. Therefore, any analysis of the policy and legal framework of CSL in Ghana without a reference to these areas will be short sighted. Additionally, in spite of the legal ban of CSL about ten years ago, why has enforcement been so difficult, especially when chainsaw lumber is sold on the open timber markets? Political consideration has come up in several studies as an important factor (Marfo, 2004; Adam et al. 2007). The extent to which this is influencing enforcement has not been well documented. Moreover, a gap analysis study of the project reveals that the financial, market and economic drivers of CSL need to be further understood, especially when there is increasing advocacy for a more pragmatic policy option to deal with the issue. Thus, in addition to legal aspects, the financial, market and political factors that drive CSL is worth investigating.

It is in reference to this linkage that the issue has generated significant debate and initiatives to address the attendant issues. The EU-funded project on developing alternatives for illegal chainsaw milling in Ghana is one of such attempts. The gap analysis preceding the development of the research programme identified three areas related to the debate on drivers for CSL that needs some further analysis. These were:

- Exploring the consistency of existing policy and legislative framework
- Exploring the extent to which law enforcement has helped with controlling chainsaw and the capability and performance of institutions involved in the enforcement, and
- Identifying market, social, economic and political factors that influence chainsaw milling

Building on these gaps, the studies that were carried out to address these concerns, in reference to the terms of reference, are presented. Chapter 4 will address the issue of

consistency of policy and legislative framework. To a large extent, chapter 2 in the background study (see Part 1) addresses how the institutions involved in the enforcement have performed over the years. Therefore, chapter 4 will focus more on the consistency of policy and the legislative framework. This is followed by chapter 5 which focuses on the social and political environment that drives chainsaw milling. Chapter 6 addresses the financial and market drivers of chainsaw milling.

Chapter 4

ANALYSIS OF POLICY AND LEGAL FRAMEWORK OF CHAINSAW MILLING AND TRADING IN GHANA

Emmanuel Marfo⁵ and Christain Teye Azu⁶

4.1 Introduction

The ban of chainsaw milling or the use of chainsaw to convert trees to lumber has generated a lot of debate, especially about the scope of the laws governing the ban, leading to some confusion. The confusion on the legal framework of the chainsaw ban complicates discussions aimed at finding effective ways to dealing with the problem, both in terms of enforcing the law or regularising the practice. Following national discourses on the subject, there is often confusion and multiple interpretations given by practitioners on various aspects of the law. There is a desire for a comprehensive review of the the relevant regulations in order to come out with an interpretation that addresses key questions. Examples of such key issues centre on whether registration of chainsaw has any bearing on the legality of the lumber produced, whether the ban really applies to exploitation for domestic use, whether lumber intended for domestic use should be permitted for transportation from the locality and whether the law applies to private trees and trees outside forest reserves. Thus, any effort to clarify the law, especially on this issue is believed to be one of the fundamental steps to addressing the chainsaw problem.

However, the problems are more than just legal complexity; they are forcefully linked to other sector issues. The major ones often cited are supply of timber to the domestic market as well as access to sawn timber for domestic use by rural dwellers. How does the chainsaw ban story fit into policies aimed at addressing access to timber in the domestic market and to what extent do the stories tie together?

One of the terms of references for the research activities under the Project aimed at exploring these stories by analysising the policy and legal framework, partculary on the consistency of existing policies and laws related to chainsaw milling. The main goal of this paper is to address three key questions to achieve this objective:

- 1. How is the policy on the ban of chainsaw milling consistent with other sector policies?
- 2. what coherent legal interpretation can be given to be effective at harmonising provisions in the various forestry laws existing in order to facilitate effective enforcement or provoke some amendment
- 3. What conclusions and recommendations can be drawn?

The chapter is structured along these main questions following a brief of the methodology in the next section. Following the methodology section, an analysis of consistency of the sector policies will be made. This will be followed by a legal analysis of the chainsaw law with a view to providing a coherent interpretation. The

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paper ends with a conclusion section where the policy implications of the observations made are highlighted and some recommendations given.

4.2 Methodology

Two main techniques were used in obtaining data for this chapter; literature review and national expert round table discussion. In all cases, the analysis benefited from some informal expert opinions and meetings.

The legal review has been produced through a team work of the authors and contributors during a national expert round table discussion of the relevant forest laws. The interpretations given in this Review is the collective view of the team of authors and contributors⁷ who engaged in the legal analysis. Our review and the recommendations have no political consideration in terms of our endorsement that the law is good or otherwise. We have strictly attempted to interpret the law as it stands and as we see it.

4.3 The Chainsaw milling ban and domestic timber supply policies

As far as supply of wood for domestic consumption, either directly by rural dwellers or traded is concerned, the policy has been regulated supply by sawmills.

The 1994 Forest and Wildlife policy make some explicit commitment to the supply of wood to the domestic market. The second policy objective seeks to:

"Promote the development of viable and efficient forest-based industries, particularly in secondary and tertiary processing, so as to fully utilise timber and other products from forests and wildlife resources and <u>satisfy domestic</u> and international demand for competitively-priced quality products"

Additionally, drawing from its various guiding principles, on the right of people to have access to natural resources for maintaining a basic standard of living and the urgent need for addressing unemployment, one can conclude that government, theoretically, has a clear policy direction towards addressing domesic timber issues.

The two specific instruments to implement this policy have been:

- issuance of special timber utilisation permits to selected 78 small to medium scale sawmills to produce entirely for the domestic market
- a directive in accordance with section 36 of LI1649 that all holders of TUCs were to supply 20% of their lumber production to the domestic market

According to recent reports (TIDD, 2005; Parren et al. 2007), these instruments have largely failed. In practice, one can argue that there is no well-enforced policy directive to ensuring supply of saw mill lumber. The lee way for communities to have access to timber was guaranteed by L.I 1649 in the form of issuance of timber utilisation permits (TUPs). However, Parren et al. (2007) in their review also observed that this has been abused and TUPs have mainly been given to commercial timber interests.

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However, domestic timber demand is high and there is increasing evidence that chainsaw lumber has largely been the source of supply (see Adam and Dua-Gyamfi, this volume). Using the average per-capita consumption of sawnwood in Africa of 0.02 m³/year (Whiteman, 2005), the domestic timber demand for Ghana's 22 million population can be estimated as 440,000m³. The conventional figure often quoted stands at about 456,000 m³ (TIDD, 2005).Parren et al. (2007) recently reviewed the domestic market situation with emphasis on off-reserve forest timber production. The review highlighted some facts that can inform an analysis on the consistency of sector policies with respect to chainsaw milling.

First, it established that during 2003 and 2004, sawmills together supplied 92,000 m³ of lumber to the domestic market. This was only 20% of the estimated domestic demand of over 450,000 m³. Second, it observed that the quantum of lumber supply, envisaged under regulation 36 of LI 1649 (20% supply by all sawmills) is inadequate to address the domestic demand. Third, the trend of supply of timber to the domestic market from sawmills has been dwindling since 1999, with an average of 25%. The report asked, so where does the difference come from? The answer they gave, which is very consistent with observation by Adam et al (2007) and Adam and Dua-Gyamfi (this volume) was chainsawing.

In spite of the ban of chainsaw milling, it has been documented that:

- It is the major supplier of timber to the domestic market and almost the main source for rural timber needs and
- It employs nearly the same number of people engaged in the formal timber industry. In 2005 and 2007, Adam et al. (2007) and Marfo and Acheampong (this volume) estimated employment levels in the enterprise as 77,500 and 92,000 respectively.

In many respects, it can be argued that the policies on chainsaw ban and domestic timber supply have been inconsistently implemented. First, the estimated amount of legal timber purported to be supplied by sawmills has been shown to be theoretically below existing domestic demand. This means that even if the enforcement of the chainsaw ban were effective, there would be some demand-supply gaps. Second, deviating from the use of TUPs to address domestic timber needs of communities meant an indirect official encouragement of chainsaw milling, as it exist as the only alternative source of wood aside sawmills. Third, allowing timber markets seling an illegal product to flourish when there is a regulation that bans its products meant that successive governments have approached the problem using essential pragmatism even though they clearly conflict sector policy.

Relating this to the 1994 Forest and Wildlife policy, the ban has been short-sighted in terms of its consistency with the provision on employment and local peoples' right of access to timber for their daily needs. To some extent, the nationalization of timber in off-reserve areas by the Concessions Act (Act 124) which led to loss of right to access to timber on farmlands has been inconsistent with the 1994 policy which sought to recognize such rights. Again, it is inconsistent to ban an activity that economically engages people when there is a clear sector policy commitment to creation of employment.

More recently, the introduction of the EU-Ghana Voluntary Partnership Agreement has deepened the need for resolving these inconsistencies. The issue of legal timber and how it can be addressed in the domestic market is central. Within the current regime of prohibition and ineffective enforcement, it is difficult to see how Ghana will be able to satisfy the legality assurance criterion of the Agreement when its domestic market is 'forced' to sell 'illegal' chainsaw lumber. Thus, if the legal timber dimension of the Agreement become enforced, it is likely that Ghana's export trade with the EU may be affected. Therefore, without the capability and political will to fully enforce the ban and all standing regulation on lumber supply to the domestic market, it may be useful to harmonise emerging sector policies and initiatives; one option that has been suggested is regularization of CSM. How to do this without compromising the abuses that characterized the pre 1997 situation is challenging and requires sustained multi-stakeholder dialogue and critical analysis.

4.4 A review of the legal framework of Chainsaw milling

4.4.1 Background

The applicable laws on this matter are the Timber Resources Management Regulations, 1998 (as amended) (LI 1649), Trees and Timber (Chain Saw Operations) Regulations, 1991 (LI 1518), Timber Resources Management Act 1997, (as amended) Act 547, the rules of common law and the laws of natural justice and equity save in so far as they are inconsistent with the express provisions of these laws. There are two main aspects of this topic; the production of chainsaw lumber for sale, exchange and for commercial purposes on the one hand and the production for domestic use by the indigenous people.

We have employed provisions in other legislations to highlight our opinions on the meaning of the letter and spirit of the main applicable laws. This is important as the chainsaw milling issue operate in a land use context, forestry, which is also governed by several regulations. Thus, we have attempted to interpret the applicable laws taking notice of other relevant provisions that makes the interpretation holistic. These complimentary regulations are the Plantation Development Fund Act of 2000 (Act 583) and the Manual of Operation for harvesting timber in on and off-reserve areas.

The outline of the review follows a structure that first elaborates the main applicable laws that prohibit chain milling by highlighting the main elements and scope of the law. This is followed by an analysis of issues that have characterised the chainsaw ban discourse as controversial and to provide some interpretations in the light of the relevant laws of Ghana. We conclude the review with a set of recommendations for improving the applicability of the law to smoothen its enforcement.

4.4.2 Prohibition of chainsaw milling

The Timber Resources Management Regulations, 1998 (as amended) (LI 1649) is the main applicable law. Regulation 32 of the Timber Resources Management Regulations provides as follows:

Prohibition of use of Chainsaw to Convert Timber into Lumber for Sale —

 $^{^8}$ Note that the EU buys 60% of Ghana's export timber; it provides about 70% of Ghana Government development budget and often about 40% of recurrent expenditure (see Opoku, 2006)

- (1) No person shall use a chainsaw whether registered or unregistered, to convert timber into lumber or other forest products for sale, exchange or any commercial purpose.
- (2) No person shall sell or buy timber product to which sub-regulation (1) applies.

This is the main regulation that prohibits the use of chain saw to convert timber into lumber or other forest products. The emphasis as far as this work is concerned is on the words for the purposes of selling, exchange or any commercial purpose. The regulation in our opinion has a clear meaning and therefore its ordinary meaning in context must be adopted.

This therefore means that once the lumber is not meant for sale, exchange or for any commercial purpose then it becomes permitted. For a better understanding of this provision we may have to critically look at the meaning of the words sale, exchange and commercial purpose. According to the Oxford dictionary "sale" means the exchange of a commodity for money etc; an act or instance of selling. "Exchange" means the act or instance of giving one thing and receiving another in its place. "Commercial" means to be engaged in or concerned with commerce, having profit as a primary aim rather than other artistic etc. value.

This therefore suggests that if one uses a registered chainsaw to convert timber into lumber and uses the lumber for his benefit which cannot be caught under the meaning of sale, exchange or commercial purpose then such an activity becomes legal. For example if the farmer in the village converts a timber tree on his farm into lumber using a chain saw and uses the lumber for constructing a house for habitation either by himself and/or his family and does do anything with that lumber to fall within the meaning of the words sale, exchange or commercial purposes then he cannot be said to be in breach of regulation 32 of LI 1649. This therefore answers the most often asked question as to whether or not a registered chain saw can be used to convert lumber for domestic use. The answer is yes once it does not violate regulation 32 of LI 1649. Natural law and justice will also suggest that indigenous people have the right to exist and to depend on the natural resources for their survival and therefore it will look unjust to deprive them the right to use this resource as a means of providing their basic needs of life with the excuse that registered chain saw cannot be used to convert timber into lumber.

4.4.3 Vested rights in trees, chainsaw milling and the law

The issue of land ownership and property rights though very important in forest governance and management has no bearing on the interpretation of regulation 32 of LI 1649. In other words, whether or not a person is the owner of a particular timber tree does not exempt him from what has been set out in regulation 32 of LI 1649. The main issue here once again is whether the timber sawn with a registered chain saw is for sale, exchange or for commercial purpose. In fact if the legislation is intended to exclude timber owned by individuals then it would have excluded same. It therefore means that the right that an individual can derive from timber on his farm by using a registered chain saw to sawn such timber into lumber is based on the fact that he will use such timber for his own benefit and not for any other purpose as captured in regulation 32 of LI 1649. This therefore answers the question as to whether timber owners in the form of plantations or trees planted by themselves can use a registered

chain saw to sawn such timber. The answer is yes but the usage of such lumber must not infringe upon regulation 32 of LI 1649.

It is also of great importance to state here that every individual has the right to enjoy his property but usage in the case of timber trees is regulated by LI 1649. Again whether or not the timber is coming from a forest reserve or outside forest reserve is not relevant.

Section 4 of the Timber Resource Management Act 547, 1998 has defined lands which are subject to timber rights:

- (1) Timber rights may be granted under a timber utilization contract in respect of—
- (a) Lands previously subject to timber rights, which have expired and are suitable for re-allocation;
- (b) Unallocated public or stool lands suitable for timber operations in timber production areas; and
- (c) Alienation holdings.
- (2) No timber rights shall be granted in respect of—
- (a) Land with forest plantations;
- (b) Land with timber grown or owned by any individual group;
- (c) Land subject to alienation holding; or
- (d) Lands with farms without the authorisation in writing of the individual, group or owner concerned.

This means that one needs timber rights under a Timber Utilisation Contract (TUC) before he can even harvest timber from such lands. However the mere rights under a TUC does not give any rights whatsoever to use a registered chain saw to convert timber to lumber for sale, exchange or commercial purpose. Act 547 has also exempted certain lands as not requiring a TUC. This therefore means that individual land owners do not need any permit whatsoever to fell a tree on such a land and can convert same into lumber with the use of a registered chain saw provided its usage does not fall within the ambit of LI 1649. It therefore means that by virtue of section 4 of Act 547, 1998 as amended that whenever there is a timber right in the form of TUC covering an area with farmland for which the landowner or farmer's consent was sought, the farmer or land owner does not have the right to cut a tree on his land without permission from the owner of the said TUC. It need not be over-emphasized the fact that the exploitation of certain timber tree is prohibited and therefore cannot be harvested for one's personal use. Such species are exempted from the discussion herein.

The gravamen of this point is that the source of the timber whether from forest reserves, admitted farms within forest reserves or community forest is not relevant in the interpretation of the L.I. The main issue is whether or not the lumber sawn with a registered chain saw is for sale, exchange or for commercial purpose. If the answer is yes, then it is illegal, but if no, then it may be allowed provided it does not violate other regulations.

4.4.4 Transporting chainsaw lumber and the law

Again the legal position in regulation 32 has been strengthen and supported by Regulation 24(2) which states that 'no Conveyance Certificate shall be issued for any lumber produced by chain saw'.

Regulation 24—Conveyance Certificate —

- (1) No timber shall be transferred or moved from any forest area unless there is carried with it a timber conveyance certificate.
- (2) No Conveyance certificate shall be issued for any lumber produced by chain saw.
- (3) A timber Conveyance certificate is issuable only by an officer of the Forestry Department not below the rank of a Senior Technical Officer and may only be issued on an application from the contractor.

This really means that for lumber produced which requires carriage from one locality to another it must be given a Conveyance Certificate but same should not be given if it is produced using chainsaw. This also does not mean that carrying lumber for example manually without the use of vehicles by persons makes it legal if such is for sale, exchange or commercial purpose since it will result in a breach of regulation 32 of LI 1649.

There seems to be a lacuna created when the law on the one hand seems to allow lumbering with a registered chain saw for domestic purposes but on the other hand does not allow the transportation of same unless covered by conveyance certificate. Because the law prohibits in a blanket for the transportation of chain sawn lumber even for domestic use, the results has been to the effect that some District Managers of the Forestry Services issue waybills for such lumber to be transported. One needs to find out whether or not the intention of the framers of the LI is for chain sawn lumber to be used within the same locality where the timber is found. It seems in our opinion that it is so otherwise individuals will abuse the system under the guise of using the lumber for their domestic needs which in actual fact may not be so. The issuance of all forms of permits by District Managers to transport chainsaw lumber is a practice which must be condemned. The law as it stands must be amended if its intendment is not to restrict the usage of chain sawn lumber to the locality in which the lumber is found. If it is so then it must also define and determine the meaning and extent of locality.

What about those who buy chainsaw lumber from the timber market and get apprehended? Have they sinned against the law?

It is also important to caution persons who have something to do with lumber to take a cue from the LI and obtain their supplies of lumber from trade-registered saw millers in the country. This position has been canvassed by section 17 of the Timber Resources Management Act 1997, Act 547, which provides as follows: any tool, equipment and machinery including vehicle used in committing forestry offences shall be confiscated and sold.

Section 17—Offences.

- (1) Any person charged with the management or protection of a forest resource by virtue of his employment in any institution of government who—
- (a) By any act or omission in the performance of his duties facilitates the breach of any provision of this Act; or
- (b) condones or connives with any other person in breach of a provision of this Act, commits an offence and is liable on summary conviction to a term of imprisonment of not less than 6 months and not exceeding two years without the option of a fine.
- (2) Any person who—
- (a) harvests timber to which this Act applies without a valid timber utilization contract; or
- (b) operates or causes to be operated a vehicle to carry, haul, evacuate or transport timber harvested in contravention of this Act; or
- (c) offers for sale, sells or buys timber harvested in contravention of this Act; or
- (d) stocks timber harvested in contravention of this Act; or
- (e) carries, hauls or evacuates by non-mechanical means any timber harvested in contravention of this Act, commits an offence and is liable on summary conviction to imprisonment for a term of not less than 6 months and not exceeding 2 years.
- (3) Where a person is convicted under subsection (2) the court shall order the confiscation to the State of any tool, equipment and machinery involved in the commission of the offence; and the court shall order to be confiscated and sold any timber harvested in the commission of the offence.
- (4) Notwithstanding the right of the court to sentence a person convicted under subsection (2) of this section to imprisonment, the court may in lieu of sentence of imprisonment impose in respect of the offences specified in—
- (a) subsection (2)(a)or(b), a penalty in the sum of 1000% of the market value of the timber involved in the commission of the offence; or
- (b) subsection (2)(c)or(d), a penalty in the sum of 500% of the market value of the timber involved in the commission of the offence; or
- (c) subsection (2)(e), a penalty in the sum of 100% of the market value of the timber involved in the commission of the offence.

4.5 Conclusion and Recommendations

The Timber Resources Management Regulations, 1998 (as amended) (LI 1649), makes the conversion of timber whether with chainsaw which is registered or unregistered illegal once such lumber is for sale, exchange or for commercial purposes. However if the timber is for indigenous people for their own use then it falls outside the ambit of the LI but the chain saw for such conversion must be registered. Whether or not the timber is coming from a forest reserve or outside forest reserve or whether or not it is from a privately established plantation or from a private farm is immaterial. Any lumber for sale, exchange or for commercial purposes which has been produced by the use of chain saw is illegal and the law must be made to operate in any such regard.

The law that prohibits the issuance of a Conveyance Certificate for all lumber sawn with a chainsaw needs review in the sense that the same law seems to permit the use of a registered chain saw to convert timber into lumber if the intended use is not for sale, exchange or for commercial purpose but has failed to take care of such lumber if it needs to be transported.

There is the need to review the Logging Manual to take care of procedures of individual harvesting of timber for domestic use to address the petty issues of access and conveyance of timber raised in the discussions.

Chapter 5

THE SOCIAL AND POLITICAL ENVIRONMENT FOR THE ENFORCEMENT OF THE CHAINSAW MILLING BAN

Emmanuel Marfo and Eric Nutakor⁹

5.1 Introduction

Several recent studies (Marfo, 2004; Odoom, 2005; Adam et al. 2007) have pointed out that the enforcement of the law banning chainsaw milling in Ghana is ineffective and this was a conclusion drawn at a national expert consultation meeting in 2004 (see Nketiah et al. 2004). This observation is problematic because without effective enforcement, chainsaw milling will continue till its operation will pose real threat to the sustainability of forest resources. As an officially labelled illegal activity, it is difficult to control and bring its negative impacts down without effective enforcement. Without a clearer understanding of why enforcement has been ineffective, it is difficult to inform the policy dialogue on the subject and innovations in developing alternative options.

Therefore, the objective of the study was to identify and explain why the enforcement of the chainsaw ban has been ineffective and how this can inform the search for innovative policy options.

Building on the leads provided by Adam et al. (2007b), the following questions are formulated in order to gain more empirical insights into explaining the situation:

- What is the level of acceptance among stakeholders about the positive aspects of CSM?
- Why has the enforcement been ineffective?
- What are the social and political forces influencing smooth enforcement of the ban?
- What lessons can be learned to inform on-going policy discourse on CSM in Ghana?

5.2 Methodology

In order to understand the factors contributing to the current situation, an exploratory study was conducted focusing mainly on District and community-level stakeholders who did not get the chance to participate in the national expert meeting where the industry and national stakeholders were conspicuously present. Table 5.1 summarises the number and type of stakeholders from the 8 studied districts who responded to the interview.

Table 5.1 number and categories of stakeholder interviewed Category of stakeholder interviewed Number

District officials (DCE, judicial service, 64 NADMO, Fire service, military, police, District environmental officers,)

⁹ CSIR-Forestry Research Institute of Ghana

District Forest Managers	8
Community durbar (chiefs, Assemblymen	n, 148
farmers etc)	
Chainsaw operators	50
Timber retailers and wood workers	42 +

In addition to stakeholder assessment study at the 8 project forest districts, a supplementary national survey targeting all the 36 District Forest offices in the High Forest Zone of Ghana was conducted. This was done in collaboration with the office of the Operations Director of the FSD in order to have a national overview of the chainsaw situation. 22 District offices responded to the survey giving a 60% response rate.

Table 5. 2 summary of number of Forest Districts in the various regions that responded to the survey

Region	Frequency
Central	4
Western	4
Ashanti	1
Volta	2
Eastern	3
Greater Accra	2
Brong Ahafo	6
Total	22

Data was collected using two main questionnaires, one for the all the stakeholders in the 8 project areas (annex 14) and one for District Managers in the national FSD survey (annex17). The data was analysed using SPSS and results presented in pure narratives, tables and graphs.

5.3 Results and Discussion

5.3.1 Stakeholder acceptability

Respondents were asked about the extent to which they agree that chainsaw lumbering should be accepted and regularized, contrary to its current criminal legal status. Figure 5.1 presents the general responses of stakeholders. It shows that over 50% of stakeholders strongly share the opinion that chainsaw milling in Ghana needs to be regularized. Figure 1 presents a more detailed picture as it captures the responses of the various stakeholders

Should SCM be reguralized? (overall views)

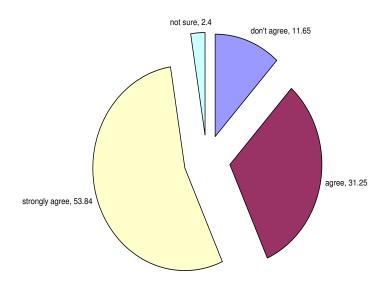


Figure 5.1 respondents opinion about regularizing chainsaw operations

In the survey forest managers, operators, farmers and the general public including political leaders, chiefs and opinion leaders share this opinion and agree that the business should be regularized (Figure 5.3). In this study 80% of stakeholders agree that CSM should be regularised. The opinions of other stakeholders do not seem to differ significantly from that of the management officials on the issue; over 50% of the managers actually agree that the business should be regularized.

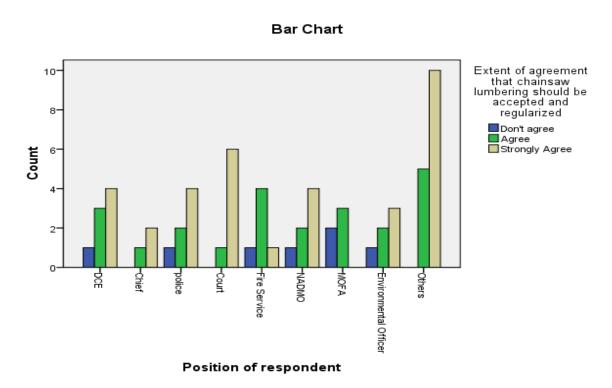


Figure 5.2: A graph showing the responses of key stakeholders on the extent to which they agree CSM should be regularized.

Compared to the national FSD survey (figure 5.3), at least 70% of FSD District Managers agreed that chainsaw milling should be regularised.

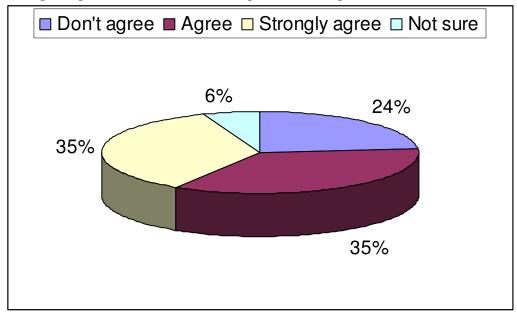


Figure 5.3: A graph showing the responses of District Forest Managers about the extent to which they agree that chainsaw milling should be regularised (data source: FSD national survey, 2008)

This observation is very important as the officials on the ground can be argued to have a better feel of the problems involved with enforcement. This seems to contradict official national policy discourse on the subject which mainly focuses on enforcement.

5.3.2 Assessment of reasons for ineffective enforcement

Asked to use a scale of 1, 2, 3 etc to rank in order of importance the factors they think have contributed to the ineffectiveness of the enforcement of the ban, table 5.3 present a summary of the result. The percentage proportion of responses is shown in figure 5.4.

The most important factors identified by stakeholders were corruption on the part of district forestry officials, pressure of rural unemployment, corruption on the part of law enforcement agencies, lack of political will, relatively low price of chainsaw lumber and lack of extensive consultation before instituting the ban.

Table 5.3: First factor that has contributed to the ineffectiveness of the ban of chainsaw operation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Corruption by FSD official	91	29.5	29.5	29.5
	Other reasons	9	2.9	2.9	32.5
	Corruption by law enforcement agencies	44	14.3	14.3	46.8
	Low capacity of FSD to mobilize evidence in court	6	1.9	1.9	48.7
	Ineffectiveness of the court	7	2.3	2.3	51.0
	Lack of political will	26	8.4	8.4	59.4
	Unemployment	76	24.7	24.7	84.1
	Lack of extensive consultation	22	7.1	7.1	91.2
	Lack of authorization of chiefs	6	1.9	1.9	93.2
	Competitive price of chainsaw lumber	21	6.8	6.8	100.0
	Total	308	100.0	100.0	

Since chainsaw milling is banned, there is no reason to believe that those involved in the enforcement of the ban (FSD, police, CEPS, joint FSD-military Task Force) cannot be implicated once almost all timber markets are flooded with chainsaw lumber. Two specific studies have elaborated this connivance (Marfo, 2004 and Adam et al. 2007b) and given specific empirical evidences of corrupt behaviour among forestry officials, the police and the Task Force in particular. About 4% of the chainsaw operators for example reported that they make payments to law enforcement officers, 10% said to chiefs and community leaders and 4% said to other personalities in the districts. Even though not directly reported, the fact that about 96% of operators claimed that they pay monies to farmers for felling trees, this contributes to the corruption aspect as trees are not supposed to be sold by farmers.

1st factor that has contributed to the ineffectiveness of the ban of chainsaw operation

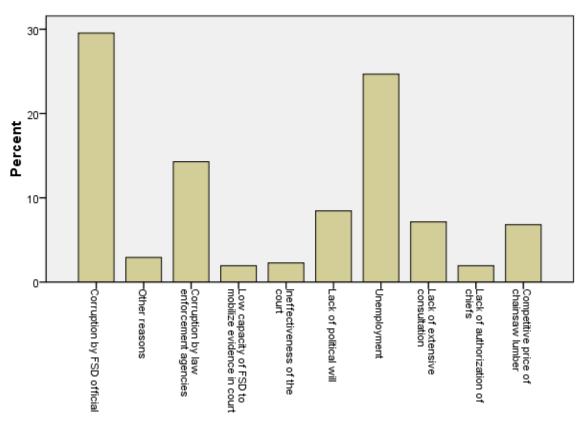


Figure 5.4: A chart showing the percentage proportion of stakeholders' perception about the most important fact accounting for the ineffective enforcement of the chainsaw ban (N=308)

Unemployment is also cited as a major reason for the activity being perpetrated by the operators. Despite the illegality of the CSM the forest stakeholders interviewed generally agree that the business serves as the major source of lumber supply to the domestic market. This is also reported by Sarfo-Mensah (2005) and Adam et al. (2007a) and Marfo and Acheampong (this report) have also confirmed that chainsaw operations provided nearly 100,000 jobs in 2007.

Compared to reasons that came up in the national expert consultation, the ones that are surprising are the lack of consultation with stakeholders prior to the ban and lack of involvement of chiefs. District-level stakeholders maintained that the policy was short-sighted and if effective consultation had been carried out, it would have been clearer that it was going to be extremely difficult to stop chainsaw milling in the communities. Moreover, it was pointed out, especially at community durbars, that it is surprising for anyone to think that chainsaw milling can be controlled without the involvement of chiefs. Chiefs continued to insist that the enforcement effort has alienated them even though they have access to important information on what goes on in their communities and if the necessary recognition and incentives (such as those provided for Task Forces) had been given to them, the enforcement would have been better.

It was also noted that it is difficult for both traders and buyers of timber to comprehend that chainsaw milling is a criminal activity since there are open timber markets flooded with chainsaw lumber and indeed many ones coming up along major streets in the glare of government. A practical approach will be for government to close down these 'illegal' markets but no government has the political will to do that. Therefore, it is difficult for any ordinary citizen to comprehend that the goods sold in such open markets are illegal. In any case, it was reported that government projects at the Districts have also benefited from the sales of chainsaw lumber in some of these markets.

In order to test whether stakeholder groups differ in their perception about the most important factor influencing the ineffectiveness of the ban, a chi-square ¹⁰ test was conducted using cross tabulation of the variables stakeholder category and rankings of most important fact with the of SPSS. The output (table 5.4) shows that there is no significant difference among stakeholder types with respect to their rankings of the most important factor contributing to ineffective enforcement of the ban since the Pearson chi-square value is greater than the significance value.

Table 5.4: Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.252E2 ^a	45	.000
Likelihood Ratio	111.634	45	.000
No. of Valid Cases	308		

45 cells (75.0%) have expected count less than 5. The minimum expected count is .16.

Thus, we can safely conclude that stakeholders perceive that corruption by the FSD and law enforcement agencies, high rate of rural unemployment, domestic market demand for wood and lack of political will are the most important underlying factors mitigating effective enforcement. In conclusion, the factors identified in this study support the conclusions by Odoom (2005) that the decline of rural economy, inadequate supply of timber to the domestic market by licensed operators and weak law and governance mechanisms account for the policy failure that has resulted in the proliferation of the chainsaw lumber trade.

5.3.3 FSD assessments of the social and political aspects of the enforcement of the chainsaw ban

5.3.3.1 Recorded chainsaw offences

According to the reported District FSD records, the number of chainsaw offences recorded in 2008 in a three range category is shown in figure 5.5. Only 18% (4 out of the 22 reported Districts) indicated that they keep verifiable records of chainsaw

¹⁰ Since the variable 'factor' was categorical and the nature of test was non-parametric, the data type was unrelated and the comparison groups were more than two, Bryman and Cramer (1999) recommends a chi-square test to ascertain statistical significance of differences. Bryaman, A. and D. Cramer. 1999. Quantitative Data Analysis with SPSS Release 8 for windows. A guide for social scientists. Routledge, London

offences. It is not surprising that it took over three weeks for most of them to respond to the survey even when the directive came from the FSD head office.

□ 0-15 **□** 16-30 **□** 31-45

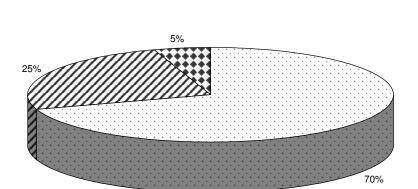


Figure 5.5 the percentage proportion of the number of recorded chainsaw offences in the three frequency range categories in 2007/2008 (N=22).

On the average about 2 and 5 cases of chainsaw offences are reported to the District offices per week and month respectively.

The total annual volume (2007/2008) of confiscated timber reported by the 22 Districts was 7,837.39 m³. On the average, the number of trucks confiscated per District was about 4 and ranges from 3 to 48.65% of cases did not involve any truck confiscation. On the average, a total of 116 trucks were confiscated in the reported districts between 2007 and 2008.

5.3.3.2 FSD enforcement of the chainsaw law

Out of the reported number of chainsaw offences at the District offices, 15% of them were not reported to the police, suggesting that in 85% of the cases, the offence was reported to the police¹¹.

Table 5.5: The number of chainsaw offences/cases reported to the police by the district office

	_	Frequency	Valid Percent	Cumulative Percent
Valid	0	3	15.0	15.0
	1	1	5.0	20.0
	2	2	10.0	30.0
	3	3	15.0	45.0
	4	1	5.0	50.0
	5	2	10.0	60.0
	6	2	10.0	70.0
	7	2	10.0	80.0

¹¹ The study did not verify this from District police records

-

8	l 1	5.0	85.0
10	1		90.0
	1		
11			95.0
12	1	5.0	100.0
Total	20	100.0	

Table 5.6 summarises cases that were prosecuted in court. In 45% of the cases, there was no court prosecution, suggesting that 55% of reported offences actually got prosecuted.

Table 5.6: The number of chainsaw offences/cases prosecuted at the court

	<u>-</u>	Frequency	Valid Percent	Cumulative Percent
Valid	0	9	45.0	45.0
	1	3	15.0	60.0
	2	5	25.0	85.0
	3	1	5.0	90.0
	4	1	5.0	95.0
	6	1	5.0	100.0
	Total	20	100.0	

Thus, on the bases of results in table 5.5 and 5.6, it seems that while there is a high offence reporting rate from FSD to the police, there does not seem to be a corresponding high rate of prosecution by the police.

5.3.3.3 Chainsaw offences in the courts

From table 5.7, it can be inferred that 55% of District Managers have at least one court case still pending.

Table 5.7: The number chainsaw offences/cases still pending in court

		Frequency	Valid Percent	Cumulative Percent
Valid	0	9	45.0	45.0
	1	7	35.0	80.0
	2	3	15.0	95.0
	6	1	5.0	100.0
	Total	20	100.0	

The survey data suggests that on the average FSD officials spend almost 2 hours in court per each sitting day. With respect to other time-related issues on FSD chainsaw court cases, table 5.8 gives a summary.

Table 5.8: Statistical summary on prosecuted cases and time taken for cases to last

		The number of		
		-	*	The average days taken for
				prosecuted chainsaw cases
		FSD	favour of the 'culprits'	to last in court
N	Valid	22	22	22
	Missing	0	0	0
Mean		.59	.14	61.36

The results in table 5.8 show that there is a significant time cost to the FSD as, on the average, it spends about two months for court cases to come to an end. Atta Owusu (2004) has also reported about the time cost of court cases to the FSD stating that from July –October 2003 about 24 cases had been prosecuted in court and in one particular instance the case was adjourned 19 times. In terms of the successfulness of the FSD in the courts, it can be inferred that FSD on the average wins 4 cases against 1 case won by prosecuted 'culprits'. Thus, the study has confirmed the observation made by other studies (Inkoom, 1999; Nketiah et al. 2004) that the slow pace by which the courts deal with chainsaw offences has not provided incentive for the FSD to enforce the ban using the court.

5.3.3.4 Political interference and the enforcement of the ban

In at least 50% of the reported cases, District Managers indicated that they had experienced external interventions in chainsaw offences. From table 5.9, it can be observed that in situations of interventions, about 70% of the parties involved were chiefs (9 out of 12) and the rest were DCEs and Assemblymen.

Table 5.9 summary of responses on most prominent external parties intervening in chainsaw offences

	-	Frequency	Valid Percent	Cumulative Percent
Valid	DCE	2	9.1	9.1
	Assembly man	1	4.5	13.6
	Chiefs	9	40.9	54.5
	Not Applicable	10	45.5	100.0
	Total	22	100.0	

In 50%, 40% and 20% of the cases, chiefs, local politicians and national politicians respectively got involved in chainsaw offences at the Districts. In 10% of the cases, other actors got intervened in the offence. Thus, the study corroborates the claim that political interference is a significant driving force behind chainsaw milling in Ghana (see Nketiah et al. 2004; Adam et al. 2007b).

5.3.3.5 FSD staff involvement in offences

The results show that at least in 2 Districts, about 4 FSD staff had been involved in chainsaw related offence (table 5.10). Even though this does not suggest high rate of official involvement, compared to claims in chainsaw discourse (see www.myspacefm.co./20newssaug8.html, 4/11/03; Ghanaian chronicle, 1/9/03; Adam et al. 2007b; Project district stakeholder meeting reports 2008;), the point that will be emphasised here is that at least there is an official admittance of cases of staff involvement.

Table 5.10: Number of times FSD staffs found to be involved in chainsaw offences

	-	Frequency	Valid Percent	Cumulative Percent
Valid	0	20	90.9	90.9
	1	1	4.5	95.5
	3	1	4.5	100.0
	Total	22	100.0	

5.3.3.6 The way forward: FSD perspective

In order to give a direct indication of the views of District Managers when asked to comment on the chainsaw situation and recommend the way forward, this section presents some responses; the identity of the officials is kept anonymous.

Case 1:

"Since the ban on chainsaw lumber, there have been no reduction in the production but rather production is on the increase and the lumber produced used for both government and non-government projects. Again sawmills are not able to meet the domestic use of lumber. Revenue is also lost to government. **Chainsaw lumbering should therefore be regularized but** the policies are made in such a way that would not be detrimental to the state-some examples are formation of associations, involving chainsaw association in plantation development etc".

Case 2:

"The policy document itself, I believe is quite good but the implementation process is where the problem lies. If we could have a critical look at the policy actions, it is obviously clear, and there is a problem with the implementation of most of the policy actions. Below are some instances.

- 1. Flooding sawmill-lumber in the timber markets could not materialize as envisaged and therefore, at the various timber markets, chainsaw lumber accounts for 90%. Price of sawmill lumber are also very expensive for the ordinary persons to patronise.
- 2. The law enforcement agencies have not played their parts well enough to guarantee the security of the resource and the staff protecting it. Chainsaw operators therefore have the chance to assault FSD staff and informants.
- 3. Livelihood alternatives for the chainsaw operators and those involved in the chain of work in the various communities have not been adequate and sustained making it disincentive for them to move away outright from chainsaw activities.
- 4. Inadequate public education, limited staff and resources (logistics) to work with and others.

These have created a misunderstanding and rivalry between FSD staff on one hand the rest of the public on the other hand considering the strength of these two factions, FSD is obviously deemed to be the loser.

There is therefore the need for a second look at the policy either to maintain the ban address the implementation lapses or review the entire policy document and regularise the chainsaw activities."

Case 3:

"Chainsaw operators should form cooperative, then government would give them credit faculty such as wood mizer and also given permit by FC in order to regularise their operations."

Case 4:

I suggest that chainsaw milling should be regularized in order to given permit on quota basis at Districts. This is because in rural areas on sawmill is located there but roofing of buildings and furniture activities have been going on. However, if we prefer to maintain the present statue that no chainsaw should be used to saw timber into lumber then we have to modify the law on chainsaw.

L.I.1649. Timber resources Management Regulations 1998 Section 32 (1) stated; "No person shall use a chainsaw whether registered or unregistered, to convert timber into lumber or other forest product <u>for sale</u>, exchange or any commercial purpose."

This is ambiguous and gives room for other interpretations. For example some people when confronted argue that they are not using chainsaw lumber for sale, exchange or commercial purpose but for domestic purpose such as personal buildings or community projects such as schools and market structures.

To be effective and clear, this section should read; "No person shall use a chainsaw whether registered or unregistered, to convert timber into lumber or other forest products <u>for any purpose."</u>

Similarly, Section 41 (1) subsection "e" says, any person who uses a chainsaw not registered with the District forest officer to fell any tree or saw any timber contrary to regulation 29 (1) commits an offence.

L I 1649 section (1 refers to felling of the trees with a registered chainsaw only and not with sawing as well. This gives room for people to argue that once they have registered chainsaw, they can use it to saw timber.

To remove this source of ambiguity, section 41 (1) 'e' should read; any person who, uses a chainsaw not registered with the District Forestry Officer to fell any tree or uses a chainsaw to any such timber contrary to 29 (1).

Also LI 1649 41 (1) 'h' says; any person who being a land owner permits an unregistered chainsaw to be used on his lead for felling trees or sawing timbers contrary to regulation 34 commits an offence.

This section should read:

"Any person who being a land owner permits an unregistered chainsaw to be used on his land for felling trees or chainsaw to be used in sawing timber contrary to regulation 34."

In the same vein, LI1649 41 (2) says; when a person fells any tree or saws any timber with an unregistered chainsaw the court shall in addition to the punishment imposed under sub-regulation (1).

This should read;

Where a person fells any tree with any an unregistered chainsaw or saws any such timber with a chainsaw, the court shall in addition to the punishment

Case 5

"I have observed that:

1. LAWS

The laws on chainsaw activities in the country appear to have some loop holes when dealing with chainsaw cases at law court, hence ineffective an on enforcement and contradictory in the process.

2. COMMODITY SUPPLY

- (i) The contract on the local Timber Merchants/Concessionaires to supply 20% of their lumber produce for local market has completely failed due to several factors in the market.
- (ii) It appears that chainsaw lumber for community projects in the rural areas have come to stay because of its accessibility and quick supply.

I there recommend that Management/Government should re-examine the situation and group the chainsaw activities under the small scale unit in the timber operations to avoid destruction and loss of revenue to stake holders."

Case 6

Timber merchants at the timber markets should be organized into cooperatives of 50 members

- 1. The cooperatives if informed should be registered with the Registrar General's department, the TIDD and the FSD
- 2. They should be given concessions to operate
- 3. They should be advised to purchase small Forest Mills, as well as larger controlled milling machines to mill the lumber
- 4. The timber merchants should be given three months grace period after the start of the logging and milling to stop the sale of chainsaw lumber
- 5. The merchants of the timber markets should sign a MOU with the FC that four months after the start of the programme, the security personnel and the Forestry Commission have the mandate to enter the markets to confiscate all available chainsaw lumber
- 6. If the policy on the release of a percentage of lumber produced by large and medium scale sawmills is still in force, the FC should purchase them and resell to the public. This is because the saw mills are not willing to release the lumber to the timber merchants, hence the proliferation of chainsaw lumber."

5.3.3.7 Community demands for timber

In 15% of the cases reported by 20 Forest Districts, the FSD indicated that no request had been made for felling timber on individual lands. In the 85% of the cases that such requests were made (which amount to a total of 480), it was observed that the number ranged from 2 to 144 per year giving an annual average of 23 requests.

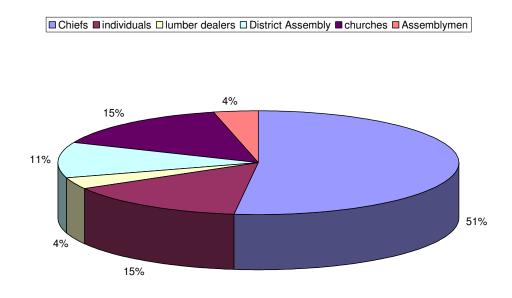


Figure 5.6 a chart showing the category of local people involved in requests for harvesting trees on their farm/land from the district forestry office

It can be observed from figure 5.6 that chiefs dominate the category of people who go to District office to request for felling of trees for some 'domestic' purpose. This is followed by churches/towns (15% of cases) and individual farmers (15% of cases). Lumber dealers and Assemblymen form the least group of individuals who approach the FSD for assessing timber on their land. The result is not surprising; especially for the high involvement of chiefs (as landowners) and farmers as these two actors are more related to trees in off-reserve areas, in terms of claims to some tenure rights. While chiefs are traditionally recognised as landowners, farmers, de facto, have often claim ownership to trees on their farms and in fact exercise discretion as to what trees to maintain or cut during farming (see Amanor, 1996; Ardayfio-Schandorf, 2007).

5.4 Conclusion and recommendations

The observations made from the national FSD survey have suggested that the enforcement of the chainsaw ban at the operational level has not been easy and that several social and political interferences come into play.

Chiefs and local elites do not seem to give FSD official free space to enforce the ban and this is not an issue that can easily be overlooked. Chief in particular weird substantial influence in the Ghanaian society and managing their interference is not an easy task for district-level officials. Therefore, to the extent that chiefly and other elite interference has become part of resource governance, enforcing the chainsaw ban is

practically a difficult task. The study has also observed the courts have not been very useful to the FSD in enforcing the ban due to delays in passing judgement on cases, adjournments and long period of stay at the courts. In any case, most cases do not even end up in the courts, a situation that undermines the enforcement of the chainsaw ban law. Therefore, in so far as chainsaw milling remains illegal, it is crucial to deal with the issue of speedy trial of court cases. In this respect, the proposal by the Forestry Commission to the Attorney General to allow FSD to directly prosecute their cases is supported by this study.

Third, the issue of community assess to timber within the broad framework of the criminalisation of chainsaw milling and availability of legal timber in the domestic market must be seriously addressed. It is particularly important to clarify the legality of using registered chainsaw to mill timber on farms/communal lands for domestic use, especially for people who have some landownership or tenure right to the land as they seem to dominate those who make official requests for trees.

Fourth, though not observed as a significant factor, official FSD staff involvement in chainsaw offences is a reality and measures to improve internal controls of staff activity should be developed and monitored.

Fifth, there seems to be a high level of acceptance about the need to regularise the ban, even among FSD managers and the any policy dialogue process (such as the MSD) should pay attention to recommendations on other options. District Managers have suggested the need to take a second look at the ban, the need revise the law to clear ambiguities and the need to experiment integration of chainsaw operators in the formal system to regulate their activities. These suggestions can also be taken up by the multi-stakeholder dialogue process.

Chapter 6

MARKET AND FINANCIAL ENVIRONMENT OF CHAINSAW MILLING IN GHANA

Beatrice Darko Obiri & Lawrence Damnyag¹²

6.1 Introduction

Since the ban on chainsaw milling came into effect in the late 1990s in Ghana, illegal chainsaw activities have been on the ascendancy. Timber cut by chainsaw operators is freely sold throughout the country, although it is illegal under the Timber Resources Management Regulations of 1998 (Kyeretwe, 2006). It has been recorded that about 34% of logs taken from the forest are harvested illegally, and out of this number chainsaw operators fell 20% (Owusu, 2003). Birikorang (2001) also estimated that 46% of total timber harvest used by the wood industry in Ghana was harvested by illegal small-scale chainsaw operators. Chainsaw lumber constitutes over 70% lumber retailed locally (Odoom, 2005).

Several reasons have been assigned to the increasing chainsaw exploitation and lumber supply to the domestic market. One principal economic driver has been an inadequate supply of legal lumber from processing mills to the local market. Supplies from these mills in the country have failed to keep up with the large demand, which is almost three million cubic meters for the domestic market (Agyeman *et al.*, 2003). These mills rather prefer to export to foreign markets due to the high opportunity cost of selling locally to the lower priced domestic market. Further, supplies from these mills although are of lower grade (grade 3), are unreliable. Indeed, chainsaw lumber is reported to be readily available (Odoom, 2005), cheaper and more suitable for local application than sawmill lumber (Sarfo-Mensah, 2005). Thus the demand for this type of lumber continues to grow in Ghana. Easy or quick access to capital to finance operations (usually provided by market lumber dealers/brokers) is also believed to contribute to the upsurge in chainsaw activities. However, little has been done to estimate the magnitude or extent to which these economic factors or divers influence chainsaw milling in the country.

This chapter seeks to assess the financial and markets factors that promote chainsaw lumbering in Ghana focusing on lumber prices, financing of the chainsaw milling operations and other market incentives. The study also examines the relationship between emerging community enterprises and chainsaw lumbering as well as stakeholder perceptions of changes in policy direction that will encourage the production of adequate legal lumber for domestic consumption. Specifically, the study addresses the following research questions:

- To what extent is the price of lumber causing a shift in the supply and demand for sawmill and chainsaw lumber?
- What are the other determinants of the supply and demand of chainsaw or sawmill lumber on the local market?

¹² CSIR-Forestry Research Institute of Ghana

- What are the sources of funding for the chainsaw milling enterprise?
- Are the main actors in the CSM ready to adjust with policy changes and in which direction of change?
- What will be the expectations of CSM financiers in a regularized state of operations (Payment of stumpage, SRA, taxes) as against status-quo?
- What incentives can lure the conventional saw millers to increase supply to the local market?
- Has the illegal chainsaw contributed to the emergence of other community based enterprises?
- What is the relationship between chainsaw milling and other community based enterprises? Are these enterprises likely to suffer if chainsaw milling is eradicated?

6.2 Methodology

Reconnaissance visits were made to the study forest districts for informal consultations with a pre-determined list of chainsaw stakeholders to identify economic and other factors promoting chainsaw lumbering. Contacts with the stakeholders were made through the district level platform for ainstitutionalized by the EU-Chainsaw Project with the aid of the project frontline staff of the FSD. A coded structured questionnaire (annex 5.1) was then designed from issues arising from discussions with the range of stakeholders. The questionnaire was pretested and administered on 102 chainsaw lumber stakeholders in the 8 forest districts of the project. The questionnaire was designed to cover various themes including drivers of chainsaw lumber mainly, financial and other factors promoting chainsaw lumber production, emergence of community based enterprises and perceived effects of a total eradication of chainsaw on these enterprises. Other issues included stakeholder perceptions of the responsibilities of the chainsaw operator and financier in a regularized state of operations as well as incentives that need to be considered to encourage regular sawmills to increase lumber supplies to the domestic market.

The data was collected through face-to-face interview of these stakeholders. The respondents were purposively sampled. They were categorized to cover the major primary chainsaw stakeholders and identifiable groups in the chainsaw lumbering commodity chain (Sarfo-Mensah, 2005; Adam *et al.*, 2007 and Hansen *et al.*, 2008). These included chainsaw lumber sponsors, chainsaw machine owners, chainsaw operators, lumber carriers/head porters; transporters of chainsaw lumber, small scale saw millers, village/community chiefs, unit committee members and lumber dealers. They were interviewed based on their availability and willingness to grant audience for interviewing. Table 6.1 shows the distribution of chainsaw lumber stakeholders surveyed across the 8 study forest districts.

Table 6.1: Distribution of the respondents across the 8 forest districts in the project area

Category of Respondents	Forest Distr	rict and nun	nber of resp	ondents					
	Assin Fosu	Begoro	Sunyani	Goaso	Kade	Oda	Juaso	Nkawie	Total
Chainsaw operator	3	8	5	4	2	2	0	2	26
chainsaw owner	0	7	2	4	2	1	5	3	24
Lumber carriers/head porters Small scale saw	3	2	3	1	1	7	0	3	20
miller	0	1	1	3	0	1	1	0	7
Lumber dealer	0	0	1	1	1	3	1	0	7
Transport owner/drivers Chainsaw lumber	1	0	2	0	0	2	0	0	5
sponsor	0	0	0	3	0	0	1	1	5
Carpenters	0	0	0	1	0	2	0	0	3
Unit committee member	0	0	0	0	2	0	0	0	2
Farmer	0	1	1	0	0	0	0	0	2
Chief	0	0	0	0	0	1	0	0	1
Total	7	19	15	17	8	19	8	9	102

Source: Survey data, 2008

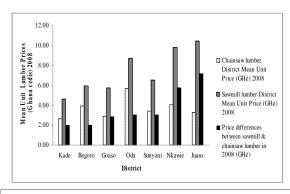
The data was analysed with Microsoft SPSS software and summarized into frequencies, percentages, graphs. The student t test has been performed to compare and assess the significance of the disparity between sawmill and chainsaw lumber prices.

6.3 Results and Discussion

6.3.1 Market and financial drivers of chainsaw lumber production

6.3.1.1 Domestic price of chainsaw lumber

Ninety-eight percent of the 102 stakeholders surveyed, estimate chainsaw lumber to be significantly cheaper than similar dimensions and species of sawmill lumber. As a result, almost all of them believe that price is among the main reasons why many people in Ghana seem to prefer chainsaw lumber to the sawmill ones. Supporting this point with empirical lumber prices for 27 tree species of the two production systems in the study forest districts, the price of sawmill lumber is observed to be higher than chainsaw lumber for all species and the different lumber dimensions as indicated in Appendix 5.2. Sawmill lumber is most expensive in the Juaso district while chainsaw lumber is most expensive in the Oda district (Figure 5.1).



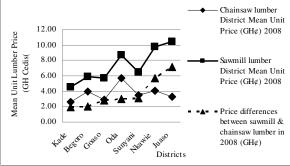


Figure 6.1: Comparative mean prices by districts of chainsaw and sawmill lumber in 2008

The relative difference in lumber prices between sawmill and chainsaw production ranges from 10% for ofram of 2x6x14 dimension at Begoro to 83% for wawa of 1x12x14 at Nkawie. However, at the district level the % mean difference in prices ranges from 32% in Begoro in the Eastern region to 58% in Juaso in the Ashanti region with an overall mean of 45% (Table 6.2 and Figure 6.2). This implies that generally sawmill lumber could be more expensive than chainsaw lumber by at least 45% irrespective of species, dimension and location. In other words, the price of chainsaw lumber is on the average about 45% of that of lumber from sawmills. This approximates to TIDD (2005) estimates of 40% difference in price between sawmill and chainsaw lumber (Odoom, 2005).

Table 6.2: Comparative mean price between sawmill and chainsaw lumber in study districts in 2008

District	Chainsaw lumber District Mean Unit Price (GH¢) 2008	Sawmill lumber District Mean Unit Price (GH¢) 2008	Price difference between sawmill & chainsaw lumber (GH¢) 2008	% Price difference in 2008
Begoro	3.9	6.0	2.0	32
Goaso	2.9	5.7	2.8	48
Juaso	3.3	10.5	7.1	59
Kade	2.6	4.6	2.0	44
Nkawie	4.1	9.8	5.7	56
Oda	5.7	8.7	3.0	38
Sunyani	3.5	6.5	3.1	47
Overall mean	4.0	7.5	3.5	45

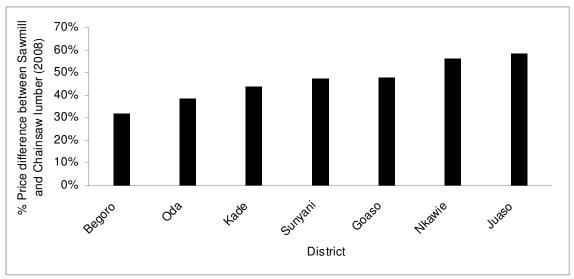


Figure 6.2: Percent difference in prices by districts between sawmill and chainsaw lumber in 2008

Generally, a wide variation in sizes/dimensions and prices across study districts is observed (Appendix 6.2). This may be attributed to several reasons including lack of standard dimensions and prices due to the uncoordinated manner in which operations

and transactions are done. Pricing may depend on species type, species availability, dimension, location, operator's cost of production including bribes that have to be paid for passage to the market and the bargaining power of the operator. The general comparative mean lumber prices by species in the two production systems for some common species across the study districts is presented in Figure 6.2. It is observed that although, lumber prices differ with species, that for sawmill lumber is consistently higher than for chainsaw lumber. T-test comparing the significance of the disparity in mean values of the two streams of prices is 8.3 ($t_{critical}$ at p = 0.05 = 1.7). This implies that the mean difference in price between sawmill and chainsaw lumber is significant, i.e. sawmill lumber is significantly more expensive than chainsaw lumber on the average.

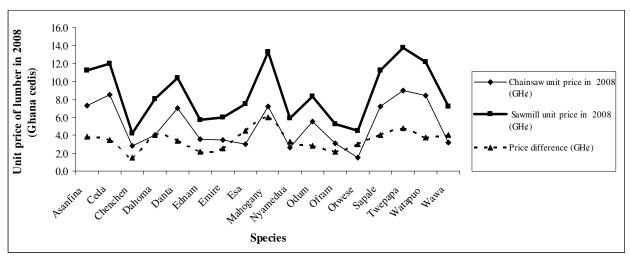


Figure 6.2: Comparative mean prices by species for chainsaw and sawmill lumber in 2008

It reported that illegal chainsaw usually provides the only affordable timber for local communities and is also widely used in government construction projects in Ghana (Opoku, 2006). It must be noted that felling trees and milling by freehand with chainsaw is generally less capital intensive. Moreover, operators and their financiers evade payment of official royalties, taxes and other fees since operations are illegal, although sweeteners may be paid to rent-seeking officials. Also, since operations are illegal and may be pre-financed, producers are often in haste to sell off or deliver their supplies at low prices or do not have adequate bargaining powers for securing better prices. Consequently, chainsaw lumber is supplied and sold at relatively lower prices on the market.

6.3.1.2 Finance for chainsaw operations

Chainsaw operations are financed through a variety of sources (Table 6.2). Operators usually have multiple sources of funding to produce lumber for sale, indicated by the total percentage being over 100%. Over 28% of the 90 chainsaw operators interviewed across the 8 forest districts funded their production activities with proceeds from chainsaw operations. This implies that chainsaw lumber production is self-financing as operators usually plough back profits from their operations to sustain production. Other key sources of funds for chainsaw operation include money earned from farming activities, loans from banks and pre-financing by lumber dealers. This finding is contrary to the general notion that chainsaw operators are mostly financed

by chainsaw lumber dealers or merchants and sponsors (private individuals who investment their surplus funds in chainsaw operations).

Table 6.2: Sources of funding for chainsaw operations

Sources of funding	Responses	Percent of total respondents
Chainsaw operation	26	28.9
Farming	21	23.3
Banks	19	21.1
Customers/lumber dealer	18	20.0
Personal fund	15	16.7
Sponsor	11	12.2
Relative/family member	4	4.4
Money lenders	3	3.3
Petty trading	2	2.2
Total	119	132.2

Sources: Survey data 2008

6.3.1.3 Other market drivers of chainsaw lumber production

The other factors promoting the continuous supply of chainsaw lumber in the domestic market apart from the low prices compared to the sawmill lumber are the high demand for wood in Ghana, and the fact that sawmill lumber is scarcely available in the local markets in terms of quantity and preferred species (Table 6.4).

The domestic demand for wood, particularly for the construction, furniture and joinery industries has grown consistently over the years (Sarfo-Mensah, 2005). The lumber demand of these sectors is estimated to be more than 95% of local lumber demand (Odoom, 2005). Two major interventions have been made to increase lumber supply to the local market. Firstly designated timber utilization contract (TUC) holders were directed to supply the domestic market with timber products of specified volume, dimensions and species (Timber Resources Management Regulations, 1998; LI 1649). Further, each processing mill in the non-designated category was to supply a minimum of 20% of its total lumber production to the domestic market. These directives could not fulfil the demand/requirements of lumber on the domestic market. TIDD estimates the total domestic market demand for lumber to be 456,417 m³.

Table 6.4: Number of respondents indicating other market factors promoting the continuous provision of chainsaw lumber in the local markets

Factors promoting continuous supply of chainsaw lumber	N	Number of respondents in the respective forest districts							
	Assin Fosu	Begoro	Sunyani	Goaso	Kade	Oda	Juaso	Nkawie	Total
High demand for wood	6	9	13	17	1	15	7	0	68
Sawmill lumber is not available at all	0	5	1	0	5	2	0	7	20
Sawmill lumber is not available in the preferred species	0	2	0	0	3	1	0	4	10
Sawmill lumber are expensive	0	3	1	0	2	2	1	0	9

Sawmill lumber is available but not in sufficient quantity	0	4	0	0	1	0	0	1	6
Total number of respondents	6	19	14	17	8	19	8	9	100

Source: Survey data

In 2002 the designated mills supplied an estimated 20,098 m³ and the non-designated mills supplied 82,265 m³ making a total of 102,363 m³. A demand deficit of approximately 350,000 m³, representing 78% of the total domestic demand exists which is being filled by chainsaw lumber. Chainsaw has been identified as the predominant source of supply of lumber to the domestic market (Odoom, 2005; Sarfo-Mensah, 2005 and Obiri *et al.*, 2007).

A wide range of species of all categories including lesser used species are supplied to the domestic market. Lumber from 27 species were supplied to the domestic market with ofram, wawa and dahoma being the dominant species supplied (Figure 6.4). Particular species may be supplied on demand but supply may also be subject to availability.

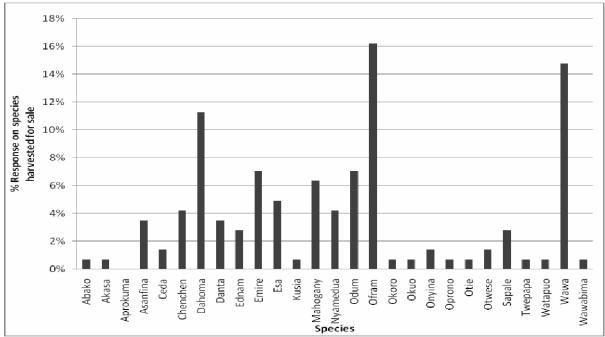


Figure 6.4: Timber species chainsaw operators supply to the domestic market in Ghana

Obviously chainsaw operators harvest timber species from multiple sources including farms, fallows, and community lands in the off-reserve as well as government forest reserves. They usually cream trees in these areas, some of which may be under concession. The portability of the chainsaw machine and free hand milling techniques permit easy access to spotted trees and their conversion to lumber even on difficult terrains. Thus operators are able to supply a variety of economic species as opposed to regular sawmills whose production is often oriented to the foreign market, hence, tend to concentrate on processing specific prime species for their clients, sometimes processing other species only when a suitable market has been found (Odoom, 2005).

6.3.2 Chainsaw lumber production and the emergence of community businesses

6.3.2.1 Emerging community based enterprises

Rural economies in Ghana are usually characterized by a number of small businesses or enterprises that generate income to supplement income from agriculture, the major occupation and source of livelihood. Usually, carpentry, masonry, painting, tailoring, transport services, agro-processing, wood curving and trading in both agricultural and non-agricultural commodities and goods prevail. Businesses that may be directly linked with chainsaw lumber production are obviously carpentry, lumber trading and possibly wood curving which may utilize off cuts from specific tree species for a variety of artifacts and household utensils.

Respondents indicated that some businesses or enterprises have emerged in their communities in recent times. The major business that has emerged is carpentry, reported by 63% of the respondents. Trade in lumber has also increased (Tables 6.5).

Table 6.5: Distribution of respondents across the forest district indicating the emerging businesses in their communities

Emerging business	Fo	Forest districts and number of respondents (n=59)								Percent of total
	Assin Fosu	Begoro	Sunyani	Goaso	Kade	Oda	Juaso	Nkawie	Total	
Carpentry										_
shops/business	4	9	3	2	4	9	2	4	37	63
Increase lumber										
trade	1	1	0	4	4	3	2	1	16	27
Backyard										
gardening	1	0	2	0	1	0	0	0	4	7
Stone quarry	0	0	0	2	0	0	0	0	2	3
Total	5	10	3	7	8	12	3	4	59	100

Table 6.6 describes the different businesses emerging in the various communities in the study forest districts. Carpentry shops seem to be the businesses that are being established in most of the communities, followed by trading and constructional work.

Table 6.6: Number of individual respondents indicating the different businesses being established in their respective communities in the study forest districts

Emerging	Forest districts and number of respondents								
businesses in communities	Assin Fosu	Begoro	Sunyani	Goaso	Kade	Oda	Juaso	Nkawie	Total
Carpentry shops/business	4	9	3	2	4	9	2	4	37

Trading	2	2	1	5	1	3	3	0	17
Construction									
work	0	4	0	1	2	8	0	2	17
Expansion of									
timber market	1	1	0	4	4	3	2	1	16
Farming	0	2	3	5	1	5	0	0	16
Chainsaw									
operation	0	0	8	4	0	1	0	0	13
Small scale									
sawmilling	1	0	0	3	0	1	0	0	5
Backyard									
gardening	1	0	2	0	1	0	0	0	4
Hair	_	_	_		_	_		_	
dresser/seamstress	2	0	0	1	0	0	1	0	4
Stone quarry	0	0	0	2	0	0	0	0	2
Total number of respondents									
- respondents	6	16	10	17	8	16	7	4	54

Chainsaw lumber production contributes to the emergence of these businesses in the communities. The contribution is through the provision of lumber at relatively cheaper prices for these businesses, especially the various people that have established lumber selling stands in the various lumber markets. Others are the supply of sawdust, availability of off cuts of wood for charcoal production, and employment.

Certainly, another driver of chainsaw lumber production is the fact that it offers a range of supplementary income opportunities to the rural economy. Apart from making wood available for other businesses, extra income earned from chainsaw operations by operators, machine owners, and head porters as well as farmers and some traditional authorities encourages wide spread incidence of the practice in forest areas. This has lead to the evolution of sophisticated strategies for operations which together with ineffective law enforcement facilitates swift supply to the market.

6.3.2.2 Effects of eradication of chainsaw lumber production on emerging business in communities

The difficulties some businesses in the study forest districts are likely to encounter if chainsaw lumber production is abolished or eradicated include mainly inability of the businesses to obtain lumber and at relatively cheaper prices and also to obtain saw dust and wood for charcoal production (Table 2.7). Unemployment, insufficient income and high prices of wood products are the other outcomes that are likely to constrain these rural economies where chainsaw lumbering has become a livelihood option. According to HYDRA (2006), chainsaw milling generally provides increased livelihood opportunities for the rural poor and increased wood availability especially in agricultural areas.

Table 6.7: Difficulties rural businesses will encounter on eradication of chainsaw lumber production in study forest district

production in study forest district			
Difficulties	Frequency	Percent	
Inability obtain lumber for their business	21	66	
Inability to obtain charcoal/ firewood	5	16	
Inability to obtain sawdust for their work	2	6	

Unemployment	2	6
Insufficient income	1	3
High price of products	1	3
Total	32	100

6.3.3 Addressing the lumber supply deficit

The demand for lumber on the domestic market in Ghana generally outstrips supply. Supply of legal wood from regular mills is rarely available on local wood markets. Although production from chainsaw milling is believed to be addressing this deficit, quantities supplied from this source are insufficient to cater for domestic consumption. The supply chain is typically risky as operations from the production point to the market are illegal. Hence, usually, free hand milling is hastily done which may lead to poor recovery. Further, the operator or his financiers require considerable financial capital to pay their way through to the market. It is reported that the major factor determining the quantity of lumber supplied to the domestic market is the level of the capital base of lumber dealer or seller/financier. The higher the wood seller's/financiers capital base, the better his ability to pay through to the market and the higher the quantities of wood he is able to stock (Obiri *et al.*, 2007). This goes to confirm the fact that weak law enforcement and governance structures is also contributing to the upsurge in chainsaw lumber supply to the domestic market in the country (Odoom, 2005).

Market wood dealers interviewed in the Obiri et al., (2007) study indicated that criminalizing chainsaw lumber is leading to impoundments of goods either in transit or on the market by forestry staff, task force and police officials. Huge sums of money are also paid as bribes or sweeteners to allow passage. These do not only reduce the capital base for trading and lowers stocking potentials of wood dealers but also leads to loss of revenue to the state, since this is currently the most reliable source of supply of lumber for domestic consumption. Some proposals have been made to deal with the chainsaw menace in the country. These include strengthening law enforcement and governance structures and improving the supply of legal wood to the domestic market (Odoom, 2005). Other school of thoughts include decriminalizing chainsaw lumbering to make it a viable option for processing legal wood for the market while ensuring the sustenance of rural livelihoods (Adam et al., 2006; HYDRA, 2006). domestic market wood dealers are generally calling for regularization of the practice with operations under licence and strict regulations or controls by the Forest Services Division (Obiri et al., 2007). Respondents in this study suggest the integration of the chainsaw practice into the legal lumber production system. Their perceptions on pertinent measures that will ensure successful regularization of the chainsaw practice are reported in the sections that follow.

6.3.3.1 Regularization of the chainsaw enterprise

Respondents are generally not in favour of the current legislation that bans the production and transport of chainsaw lumber for commercial purposes and 24% of them suggest the practice should be legalized (Table 6.8). Another key measure recommended by the majority (38%) of the respondents if chainsaw lumbering is to be regularized is that, operators should be allowed to work outside forest reserves on

the basis of permits issued by the Forestry Commission to ensure more effective regulation of tree harvesting. However, 14% of them are of the opinion that these permits could be issued by the landowners or farmers whereas 6% and 4% propose issuance of permits by chiefs and the District Assemblies. Another consideration may be for the FC to issue legal permits for chainsaw lumbering on-reserves. It must be noted that issuance of permits by farmers/landowners may be difficult to administer since there are large numbers of them in forest areas.

Table 6.8: Number of respondents indicating important changes that need to be made on the current legislation banning the use chainsaw to produce lumber for commercial purposes

Changes that need to be made on the	Name of d	istricts/numl	ber of resp	ondents	Total	
current legislation banning the use of Chainsaw to produce lumber for commercial purposes	Begoro	Kade	Oda	Nkawie		%
Chainsaw operators should be allowed to work off-reserves on the basis of permits issued by the FC	10	5	1	3	19	38
Chainsaw lumber production should be legalized	2	3	1	6	12	24
Chainsaw operators should be allowed to work off-reserves on the basis of permits issued by individual farmers/land-owners	3	3	1	0	7	14
Chainsaw operators should be allowed to work on reserves on the basis of permits issued by the FC	0	0	0	7	7	14
Chainsaw operators should be allowed to work off-reserves on the basis of permits issued by local chiefs	0	2	1	0	3	6
Chainsaw operators should be allowed to work off-reserves on the basis of permits issued by District Assemblies	2	0	0	0	2	4
Total number of respondents	12	8	3	9	50	100

Source: Survey data 2008

Having been granted with permits or licences to access timber trees and process lumber legally with chainsaws in the off-reserve, operators and/or financiers will have to be mandated to fulfil certain obligations to the state, landowners/farmers and communities to ensure benefit flows to resource managers and owners as well as contribute to revenue generation for national development.

Responsibilities of the chainsaw operator and financier to the state

Should chainsaw lumbering be regularized, i.e. the ban llifted and permit issued to operators, respondents are of the opinion that, the prime rresponsibility of chainsaw operators and financiers to the state should be to pay taxes and conveyance fees to the responsible agency (Table 6.9). Other obligations will be to provide employment to rural people to diversify sources of income in the rural economy.

Table 6.9: Responsibility of the chainsaw operator/financiers to the state (N = 86).

Responsibility of operator/financier to the state	No. of Responses	*Percent of total respondents
Taxes	79	91.9
Employment	15	17.4
Payment of inspection/conveyance fee	4	4.7

Total 98 114.0

Responsibility of chainsaw operators and financier to the land owners

When chainsaw lumber production is regularized, 99% of respondents are of the view that operators and/or financiers should be mandated to make monetary payments to land owners or farmers on whose lands trees for which legal permits will be issued are harvested. Payments should be in the form of royalties that can serve as sources of income to the landowner/famer and compensation for any damages that may caused to crops planted on farms (Table 6.10). The landowner/farmer must also be provided with a share of some quantity of lumber for housing or roofing. Since cocoa is one of the key crops for the national economy, regulations controlling chainsaw lumbering in the off reserve areas should allow harvesting of trees only when the cocoa is matured and does not require too much shade to protect growing cocoa trees from sun scorch and declined productivity.

Table 6.10: Responsibility of the chainsaw operator/financiers to the land owners (n=74)

Responsibility of operator/financier to land owners	No. of Responses	*Percent of total respondents	
Source of income to the land owner/farmer	40	54.1	
Compensation	33	44.6	
Lumber for housing/roofing	13	17.6	
Allow cocoa trees to grow	2	2.7	
Total	88	118.9	

^{*}Multiple responses

Responsibility of chainsaw operators and financier to the communities

With respect to communities, respondents are of the view that when chainsaw lumbering is legalized, operators and financiers should be directed to allocate some proportion of lumber from trees processed in their licensed operation areas for community development (Table 6.11). It should also be mandatory for local people in the resource areas to be involved in lumber production activities to generate employment and non-agricultural income. Some monetary payments in the form taxes, royalties and fees must also be paid to communities and traditional authorities.

Table 6.11: Responsibility of the chainsaw operator/financiers to the communities (n=91)

Responsibility of operator/financier to communities	No. of Responses	*Percent of total respondents
Lumber for community development	67	73.6
Employment	21	23.1
Taxes	16	17.6
Royalty payment to the community/chief	7	7.7
Pay some amount to the unit committee/community members	4	4.4
Total	115	126.4

^{*}Multiple responses

^{*}Multiple responses

6.3.3.2 Incentives to encourage increased lumber supply from sawmills

It is acknowledged that sawmill lumber is rare on the domestic wood market although some policies have been instituted to ensure supply from mills to these markets. Reports indicate that designated mills mandated to supply lumber for local consumption have failed to do so (Odoom, 2005; Obiri et al., 2007). A survey of some of these mills indicated that concessions issued under the Timber Utilization Permits (TUPs) were poorly stocked and moreover permits or licenses were not renewed after they expired. Consequently, these mills resorted to acquiring logs from other sources which were processed for export for higher revenue. Generally for these firms and the regular mills (supply 20% to local market) including those operating in the free-zone (supply 10-30% to local market), production cost was reported to be high rendering price per unit lumber expensive for sale on the domestic market (Obiri et al., 2007). Furthermore, local lumber dimensions are not standardized. Usually, dimensions local clients request are quite divergent. 25 different dimensions were recorded for lumber across the forest districts in this study with the most popular dimensions being 1x12x14 and 2x6x14 (Figure 2.5). Thus mass production utilizing economies of scale to reduce production cost in sawmill processing; thereby making lumber relatively cheaper for the domestic market is impossible (Odoom, 2005).

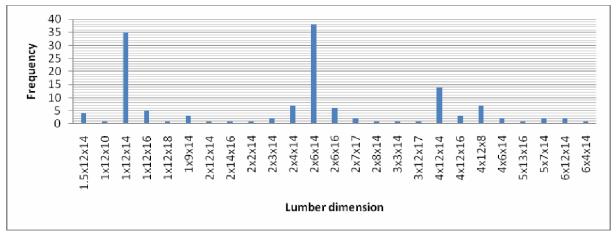


Figure 6.5: Lumber dimesions recorded in the study districts

Forty-nine percent (49%) of the respondents are of the view that the government needs to pursue other options to encourage saw millers to increase the supply of legal lumber on the domestic market (Table 6.12). The most important strategy or incentive to entice legal saw millers increase supply of lumber to the domestic market will be to reduce their tax obligations to the state and at the same time strictly enforce the law that stipulates they supply 20% of their production to the domestic market (Table 6.13).

Table 6.12: Possibility of encouraging sawmills to increase their supplies of lumber to the domestic market

Perception of respondents	Frequency	Percent
Yes	16	48.5
No	17	51.5
Total	33	100.0

Table 6.13: Strategies to encourage sawmills to increase supply of lumber to the domestic market

Strategies	Frequency	Percent
Tax reduction for saw millers	52	72.2
Strict enforcement of the law that stipulates 20% of the production for domestic market	14	19.4
Stop them from exporting	2	2.8
Others	4	5.6
Total	72	100.0

6.4 Conclusions and Recommendations

From the foregoing, it is evident that multiple factors account for the upsurge in the production and trade in chainsaw lumber. Price, demand, inadequate supply of lumber from sawmills to the domestic market, availability of finance and availability of a wide range of species and dimensions to suit consumer preferences are some of the key economic factors sustaining chainsaw lumbering in the country. Chainsaw lumbering also supports the rural economy by supplying lumber for some businesses and providing direct supplementary income sources for forest communities. The discussion also indicates that socio-political factors including weak law enforcement and forest governance and livelihood issues are other contributing factors.

The fact that chainsaw lumber is cheaper, costing 45% cheaper than the price of sawmill lumber and readily available in a range of sizes and dimensions, obviously suggest that it would be highly patronized. This is especially so, when no pragmatic measures are in place to ensure the supply of adequate legal wood at competitively lower prices to the domestic market. Respondents suggested the following:

- Government to lift the ban on chainsaw lumber production, issue permit to operators and pursue strict monitoring
- Government to reduce tax obligations of regular mills to reduce per unit cost
 of lumber as an incentive to increase the supply of sawmill lumber to the
 domestic market. For this to be effective, there would be need to strictly
 enforce the regulation mandating sawmills to supply 20% of their output to the
 domestic market.

Indeed, the drivers of chainsaw milling in the country are multifaceted and are social, political and economic in nature. These are interrelated. Hence, regulating the practice would require decisions or interventions that will address these multiple factors concurrently to satisfy the needs of key stakeholders. In this regard, the critical issues that have emerged from this study to guide policy decisions and stakeholder dialoguing are that:

- 1. Lumber on the domestic market must be cheaper, available in sufficient quantities, variable species and dimensions
- 2. Livelihoods of chainsaw operators and other related entrepreneurs in the rural economy and that of lumber dealers in the urban centres must be guaranteed
- 3. The sustainability of the forest resource base must be guaranteed to support increased production

4. Government and forest fringe communities must gain from royalties and taxes from forest resources for national and community development.

A review of available information indicates that even if chainsaw lumbering is legalized, domestic demand will not be satisfied. Only 22% of the domestic demand is being supplied despite the ascendency in chainsaw operations. The 78% demand deficit of about 350,000 m³ certainly needs to be met while not compromising the sustainability of the resource base. Consequently, it is imperative to increase the supply of legal lumber to the domestic market. One feasible option in the short to medium term will be to consider tax incentives for regular mills to reduce their production costs and ensure strict adherence to the regulation to supply 20% of their lumber output to the domestic market. A visit to some lager mills in the country operating logging concessions revealed large piles or stocks of logs awaiting foreign processing orders. These logs sometimes go to waste when the foreign orders are not acquired. With tax relief for domestic production, these could be processed for domestic consumption. Secondly, it is also feasible to produce cheaper and quality lumber from variable species with variable dimensions or specifications to satisfy local market preferences from bush mills using improved less expensive machinery such as the logosol and chainsaw with attachments. This may make chainsaw lumber less competitive on the market and possibly reduce the widespread incidence of the practice, while offering employment and wood from off-cuts to support livelihoods and businesses in forest areas.

Chapter 7

FOREST AND TREE TENURE, ACCESS TO TIMBER AND THEIR IMPACT ON CHAINSAW OPERATIONS IN GHANA

E. Acheampong¹³ and E.Marfo¹⁴

7.1. Introduction

Forest resources contribute greatly to rural livelihoods and to the rural economy of Ghana and are vital for the country's development and future prosperity. The Forestry Sector contributes about 6% of the country's gross domestic product (GDP), employs about 100,000 people and provides direct and indirect livelihood to about 2.5 million people in the country (DFID, 2007; Forestry Commission, 2003; MLF, 1997/9, cited in Brown, 1999; Asiseh et al, 1996; TEDB, 1995). However, the rainforest in Ghana has experienced rapid depletion due to various human activities such as logging, 'illegal' Chainsawing, charcoal burning, farming, bush fires, surface mining and urbanization (Kusimi, 2008; Forestry Commission, 2003). The Forestry Commission asserts that, during the last century, the area of high forest dwindled from 8.2 million hectares to about 1.6 million hectares with an average annual deforestation rate of 65, 000 hectares (Forestry Commission, 2003; see also DFID, 2007). The impact of deforestation in Ghana is widespread, affecting the livelihoods of local people and disrupting the tropical ecosystem. There is a serious concern about climatic change. soil erosion, siltation of rivers and loss of biodiversity, which has an adverse impact on traditional medicinal plants of the local people (Kusimi, 2008).

Among the causes of forest loss listed above, the one cause that has generated protracted public debate, and which has been pervasive and contested in the forest governance discourse in Ghana is 'illegal' chainsaw lumbering and milling. Agyeman (2004) reported that 'illegal' chainsaw operation is one of the major factors contributing to the rapid decline of forest resources in Ghana. According to Marfo (2004), to those who perceive 'illegal' chainsawing as threatening sustainable forest management from the perspective of their own interest, they call it a 'problem', but to those who see it as a continuous struggle and competition over access to scarce natural resources, they call it a 'conflict'. Whether a problem or conflict, the main option for dealing with the issue has been to ban and criminalize the activity. However, the implementation of the law has been very difficult and largely unsuccessful. The ban on chainsaw milling and its associated lumber trade have been ineffective to date.

One of the several reasons¹⁵ that have been identified to explain the continuation and expansion of 'illegal' chainsaw milling in Ghana is the lack of clarity over forest and

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¹⁵ Other reasons include corrupt practices within various institutions entrusted with the management of forests and control of timber harvesting (Adam et al. 2007a), the deficit of saw mill timber for local markets and the low price of chainsaw lumber relative to sawmill lumber produced for local markets

tree tenure, particularly tenure of trees on farms (Odoom, 2005; Marfo 2004; Agyeman, 2003; 2004). This has resulted in strong support of some local communities for 'illegal' chainsaw operations. For example, reviewing underlying causes of 'illegal' chainsaw operations, Agyeman and Kyereh (2004) noted the strong support of some local communities for 'illegal' operators as a significant reason. Indeed, there is increasing evidence that farmers continue to play significant role in this illegality by conniving with chainsaw operators (Lambini *et al.*, 2005). Odoom (2005) also asserts that the alienation of traditional authorities and tree-tenure insecurity on the part of farmers have promoted their connivance with and participation in the chainsaw lumber trade. It has been identified that such cooperation with 'illegal' chainsaw operators offers better economic incentive to farmers than official logging arrangements (Marfo, 2004).

Forest and tree ownership rights and other tenure issues, to a large extent, determine ease of access of trees for chainsaw operations. Moreover, the extent of availability of timber resources, especially in off-reserve areas where most of chainsaw operations take place, will influence access to timber. Notwithstanding these pointers, very little empirical studies attempt to unearth the linkages between forest and tree tenure and 'illegal' chainsaw milling. This study sought to understand the extent to which tree tenure systems and resource availability and their distribution impact or influence chainsaw milling.

In particular, the study attempted to answer the following research questions:

- What is the extent of timber resources and their availability to chainsaw operators now and in the near future?
- How is the current system of tree tenure influencing accessibility to timber by chainsaw operators?
- What strategies do chainsaw operators use to access timber and how do they get accepted in the communities?
- What factors seem to determine the selection of site of operations by chainsaw operators?
- To what extent are the activities of chainsaw operators impacting on the interest of other land uses/resource?

This introductory section is followed by a discussion on natural resource tenure, use rights and sustainable resource management, which sets the scene for the study. This leads to a review of the existing forest and tree tenure arrangements in Ghana. The subsequent section provides a description of the methodology used for data collection and analysis. This is followed by the presentation and discussion of the results. In the conclusion section, the main findings of the study are highlighted and their implications for the management of forest and timber resources considered.

(Adam *et al.* 2007b), and the lack of employment opportunities in villages in rural areas (Afranie, 2003). Also see Marfo and Nutakor (this volume)

7.2 Natural resource tenure, use rights and sustainable resource management

Security of tenure of natural resources is an important issue if local communities are to use the natural resources in their localities sustainably. Natural resources tenure simply refers to the terms and conditions on which natural resources are held and used. Thus forest and tree tenure refers to the terms and conditions on which forests and trees are held and used (Bruce, 1986). It includes questions of both ownership and access or use rights. The set of rights that a person or some private entity holds to forests or trees may include the right to own, to inherit, to plant, to dispose of and to prevent others from using trees and tree products (Fortmann, 1985). Hackett (2001) also describes five rights that, when combined, form the bundle of rights usually referred to as ownership. These are (a) Access - the right to use (but not harvest) a resource; (b) Withdrawal - the right to both access a resource and withdraw resource units (harvest); (c) Management - the right to manage the use, maintenance, and monitoring of a resource; (d) Exclusion - the right to determine the rules governing who can and cannot use the resource; and (e) Alienation - the right to sell the resource. Tenure is not a matter of man's relationship to natural resources such as forests and trees. It is a matter of relationships between individuals and groups of individuals in which rights and obligations with respect to control and use of natural resources are defined. It is thus a social institution (Birgegard, 1993).

Access to and use of natural resources is the key to survival for a majority of people in the developing world. The control and use of land and other natural resources have been the way to sustain the family or the household (Birgegard, 1993; Lawry, 1990). One of the factors that affect the level and type of consumptive utilisation of forests in many settings is the security of tenure that local residents possess in relation to forests. Individuals who lack secure rights are strongly tempted to use up these resources before they are lost to the harvesting efforts of others (Banana and Gomya-Ssembajjwe, 1998). Similarly, where forest habitats have little economic value to local people because of restrictive access rules, sustainable local management institutions are unlikely to emerge (Lawry, 1990). Tenure therefore determines, in large part, whether local people are willing to participate in the management and protection of forest and tree resources.

7.2.1. Existing forest and tree tenure arrangements in Ghana

Forest and tree tenure arrangements and timber logging rights in Ghana, especially in the off-reserve areas of the high forest zone (HFZ), is highly complex. Depending on whether trees are planted or are naturally occurring and whether they occur on family, communal or rented land, several usufruct rights exist. Thus, tree tenure systems operating in forest reserves are different from those outside reserves. In off-reserve areas, tree tenures are also different for planted trees compared to those growing naturally, and for timber trees compared with non-timber species (Marfo, 2006; Acheampong, 2003; Agyeman, 1993; Asare, 1986). These differences are considered below.

7.2.1.1. Rights to planted trees outside reserves

In a study of indigenous tenures relating to trees and forests, Asare (1986) observed that, in most parts of the HFZ, any individual (man or woman) who has the right to use a piece of land in perpetuity also has the right to plant any species of trees, and such trees are vested in the planter/cultivator. People who have the right to use a piece of land in perpetuity are individual members of the land-owning group who have acquired land through inheritance, gift or allocation. Strangers who have acquired long-term title or right to the use of land through some form of agreement (such as granting on leasehold basis) also have the right to plant and use any species of tree. However, strangers with temporary use of land do not have the right to plant permanent trees on those lands.

Although customary laws do not prevent tenants from planting trees, landowners do not encourage this because most people believe that the long production period and the lack of appropriate documentation of land ownership increases the security of the tenant to land rights when trees are planted. Thus, an attempt by a tenant to plant trees is regarded as an attempt to acquire permanent ownership of land. This appears to be a common practice throughout much of Africa (Arnold and Bird, 1999; Warner, 1993; Agyeman, 1993).

In a study of the extent and manner in which forest-based resources form part of livelihood structures of forest fringe communities in the Asankrangwa Forest District, Acheampong (2003) noted that people generally have more secure rights to planted trees than those occurring naturally. The planter can will trees planted on privately acquired land to anyone he likes. However, trees that are planted on family or lineage lands can only be inherited by members of the lineage group. Apart from the use of small portions for medicinal purposes, no one has the right to any other use of planted trees and their products without permission from the planter (including even fruits that are found under the trees). Persons with temporary rights who cultivate sites planted with trees enjoy only subsistence rights; they can pluck fruits or any other produce for their personal use but not in commercial quantities (Asare, 1986). According to Agyeman (1993), trees that have been planted on communally owned land cannot be harvested by individuals without the approval of the Chief or Town Development Committee.

7.2.1.2. Rights to naturally-occurring trees outside reserves

Rights to naturally-occurring trees outside reserves vary between timber and non-timber species. In the case of non-timber trees (such as kola, oil palm, raphia palm, bamboo, etc.), the rights also depend on whether the tree has some commercial value or it is for subsistence use only (Acheampong, 2003; Asare 1986). Rights to naturally-occurring non-timber trees that have some commercial value, such as kola, oil palm, raphia palm, etc. are restricted and are vested in the landowner. For example, only landowners or people who have perpetual use of land on which kola or oil palm trees occur can harvest the fruits. Members of the community can, however, pick fruits that have fallen on the ground. Any other use of such commercially valued non-timber trees will have to be agreed by the landowner. For example, permission has to be

obtained from the landowner before naturally-occurring oil palm or raphia palm can be tapped for palm wine (Acheampong 2003; cf. Asare 1986)

The right to naturally-occurring non-timber trees that are only of subsistence value is very much more relaxed. For example, bamboo and fruit trees (such as pawpaw, *Dacryodes klaineana, Chrysophyllum albidum, Spondias monbin*, etc.) can be collected from anywhere without permission from the landowner provided crops are not damaged (Asare, 1986). In general, naturally-occurring non-timber trees on communal land belong to the whole community and anyone can harvest products from them (Agyemang, 1993).

All naturally-occurring timber trees - whether on private or on communal land, or even on private farms - however, 'belong' to the government. The use of such trees is controlled by legislation and it is an offence for an individual or community to cut or sell timber or merchantable tree species without permission from the appropriate government institution. The right to control and manage tree resources, including allocation of logging rights, is vested in the state (cf. Matose, 2002). Farmers have no legal rights, either to harvest timber trees they maintain on their farms, or to any of the revenue accruing to timber extraction, though they continue to exercise judgement over which trees to maintain on their farms during clearing for cultivation (Amanor, 1999, cited in Marfo, 2006). The revenue accruing to timber sales, irrespective of source of timber, is shared among the District Assembly, landowners (Chiefs), Administrator of stool lands (public agency) and the Forestry Commission (Marfo, 2006). Farmers therefore do not benefit directly from timber trees they protect on their farms, which is a strong disincentive to farmer tree management and protection (Ardayfio-Schandorf et al., 2007). This appears to be the result of British colonial forest policy; virtually all ex-British forestry departments regulate local people's access to forest and tree products (cf. Bradley, 1992; Cline-Cole, 2000).

Even though farmers' right of consultation before timber harvesting operations has been admitted by law¹⁶, loggers rarely consult them when timber trees on their farms are felled and are rarely compensated for damage to food and cash crops resulting from logging operations on their land (Marfo *et al.*, 2006). This, in addition to frustrations in claims processes, and the fact that farmers do not benefit from timber trees they protect on their farms, has resulted in some farmers selling trees to 'illegal' chainsaw operators and illegally destroying valuable tree species on their farms before concessionaires can gain access to them. The frequency of such conflicts casts doubt on the effectiveness of forest and tree tenure systems in Ghana regarding adoption and implementation of sustainable forestry practices (Owubah *et al.*, 2001).

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¹⁶ First, the Forestry Department (now Forest Services Division) instituted some Interim Measures in 1995 to guarantee farmer consultation and compensation payment. This was given additional administrative force by enshrining the provision in the FSD's Manual of Procedures for controlled timber production in off-reserve areas (Section F). These regulations were given full legal force with the promulgation of the Timber Resource Management Act, 1998 (Act 547) which admitted the right of farmers/owners for consultation and authorisation prior to the granting of any timber right (Section 4.2).

7.2.1.3. Rights to trees and other products in forest reserves

In pre-colonial Ghana (then called the Gold Coast), forests were owned in common by communities (families, clans and 'stools'¹⁷). However, the country's Forest Ordinance of 1927 gave authority to the colonial government to reserve parts of the country's forests. Although the bill did not alter ownership of the forest reserves, it vested control of them in the government of Ghana and prescribed that they should be held in trust for the communities. Thus, all forest products within forest reserves, including both timber and non-timber tree species and even NTFPs are vested in the government (Owubah *et al.* 2001).

Although, in theory, the ownership of land and forests did not alter at the time of reservation, in practice, the traditional owners have no right of access to the trees or land in the reserve, except on permit from the competent government authority, the Forest Services Division (FSD). The management of trees, the right to own, plant, use and dispose of trees within the forest reserves is controlled by the state, through the Forest Protection Decree of 1974 (or National Redemption Council Decree (NRCD) 243). This decree has, from the beginning, created a feeling of animosity between local communities and the FSD (Agyeman, 1993).

Under the working plans of all forest reserves, the following communal rights are usually admitted in forest reserves on permit: communal rights to hunting, fishing, collecting of fuelwood, snails, medicine, etc.; and farming rights to admitted or allowed farms. These communal rights, admitted in forest reserves only on permit, have been the subject of several disputes between the FSD and local communities (Agyeman, 1993). Communities want less restricted access to forests. Indeed, in a study of the contribution of forests to livelihoods in the Asankrangwa Forest District, several households complained that the procedure for acquiring a permit is cumbersome and that the FSD does not readily give permits for the collection of certain forest products (Acheampong, 2003). While the FSD claims that subsistence uses of NTFPs, such as snails, mushrooms, fruits, etc. from forest reserves is allowed, local communities report that this is rarely the case. The problem therefore seems to be one of distinguishing between what constitutes subsistence use and commercial use. Local people resent this form of exclusion and see the permit as too expensive and complicated for obtaining items for personal or domestic use (Acheampong, 2003). Most admitted that they sometimes sneak into the reserved forests to hunt game and collect other forest products. This raises questions about the effectiveness of the permit system itself.

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¹⁷ A 'stool' refers to a community governance or administrative structure similar to dynasties (Kasanga *et al.*, 1996, cited in Owubah *et al.* 2001).

7.3. Data and Methods

Based on expert advice from the Forest Research Institute of Ghana (FORIG) and the regional office of the FSD, the study was conducted in three of the project Forest Districts (Nkawie, Juaso, and Goaso) due to their vast areas of off-reserve logging operations and their reputation of persistent 'illegal' chainsaw operations. Five communities were visited in the three districts: Juaso and Obogu in the Juaso Forest District; Goaso and Akrodie in the Goaso Forest District; and Akota in the Nkawie Forest District. A total of 50 chainsaw operators were drawn from the five communities for the study. The selection of operators was purposive, considering only those that are actively involved in chainsaw milling.

Because of the illegality of the chainsaw milling business, contact with the operators was negotiated with the assistance of facilitators who are field staff of the FC and have been involved with the control or assessment of chainsawing in the past. The facilitators contacted the relevant respondents to arrange a date and time for the fieldwork. After contact with the operators,, semi-structured questionnaires were used for data collection (see annex 7.1). The questionnaires were designed to obtain data on chainsaw operators' perception on the availability of timber resources; their most important source of timber and reasons behind this; effect of the current system of tree tenure on access to timber by chainsaw operators; strategies adopted by operators to gain access to timber and the communities they operate; factors that determine the selection of site of operations by chainsaw operators; and the impact of the activities of chainsaw operators on the interest of other land uses. To complement data obtained through the questionnaires, a desk study was undertaken to review existing information on forest and tree tenure in Ghana and to understand the connections between tenure and sustainable resource management.

Responses obtained through the questionnaire administration were assigned numerical codes and SPSS was used to summarise and analyse the data. Simple descriptive statistics and frequencies were generated. Cross tabulations of relevant variables were also done to reveal patterns and relationships.

7.4 Results and Discussion

7.4.1. Extent of timber resources and their availability to chainsaw operators

Changes in the meanings and perception of forests over the years have suggested that there is a dynamic relationship between humankind and forests. In the past, forests were generally viewed as obstacles to agricultural growth and development. Later, forests were viewed as a means of timber production to support increased demand for wood products (Owubah *et al.*, 2001). However, the advent of environmentalism in developed countries, coupled with changing social values, and increased scientific understanding of human impacts on forest ecosystems has altered this perception dramatically. Today, forests are seen by some as objects to view and use nonconsumptively while others see forests as a linkage with gods and spiritual powers (Yaffee, 1994; Schmithüsen, 1995, in Owubah *et al.*, 2001).

These latter perceptions and views have influenced forest management to the extent that even those who believe in the productive aspects of forests do not accept the massive clear cutting that characterised forest management decades ago (Owubah *et al.* 2001). An important question to ask is whether perceptions and values of forests among forest-dependent communities, including chainsaw millers, have also changed. Perceptions of forests and of the availability of timber resources are critical factors that influence access to timber and the harvesting efforts applied by operators. Thus, an understanding of how local people view and value forests and timber resources and how these perceptions are changing is essential for the long term planning and management of forests.

7.4.1.1 Chainsaw operators' perceptions of the availability of timber resources To explore the pattern of change in the availability of timber resources, the operators were asked to indicate whether the availability of timber has changed since they entered the chainsaw milling enterprise. The majority of respondents (90%) reported that timber resources are less available today. Only 6% indicated that timber resources are more available (Table 7.1).

Table 7.1 Availability of timber resources since operator entered the chainsaw enterprise

Availability of timber	Number of	Percent of
	respondents	respondents
Timber resources are less available today	45	90.0
Timber resources are more available today	3	6.0
No change in availability	2	4.0
Total	50	100

The respondents gave several reasons to explain the declining availability of timber resources, including uncontrolled harvesting by chainsawyers, over-harvesting of forest resources by timber companies, destructive harvesting practices, forest fires, clearance of forest areas for farming, and increase in human population (Table 7.2).

Table 7.2 Reasons for the decline in availability of timber resources

Reasons	Number of* respondents	Percentage of* respondents	Total number
Uncontrolled harvesting by chain sawyers	36	72	50
Over-harvesting of forest resources by			
timber companies	36	72	50
Destructive harvesting practices	17	34	50
Forest fires	28	56	50
Clearance of forest areas for farming	15	30	50
Increase in human population	2	4	50

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses

In most rural communities in Ghana, attitudes and perceptions towards forests are inextricably linked to the bundle of rights governing the use and management of such forests (Falconer, 1992; Owubah *et al.*, 2001). For example, in a study to assess the contribution of forest resources to the livelihoods of rural communities, Acheampong (2003) found forest and tree access restriction as one of the reasons for the reduction in availability of forest products. Falconer (1992) also reported that views and attitudes towards different areas of forest vegetation vary considerably. She asserts that, in general, local communities view government-managed forest reserves differently from forests on stool lands outside the reserves.

7.4.1.2. Sources of timber for chainsaw operators

To understand the relative importance of sources of timber for chainsaw operations, the operators were asked to state their most important source of timber (Table 7.3). Most of the respondents (76%) named the farm as their most important source of timber. This is followed by forest reserves (12%), fallow areas (10%) and water courses (2%).

Table 7.3 Relative importance of sources of timber for chainsaw operations

Source	Number of respondents	Percentage of respondents
Forest reserves	6	12
Fallow areas	5	10
Farms	38	76
Water courses	1	2
Total	50	100

The respondents gave several reasons for considering these areas their most important source of timber. For example, out of the 38 respondents who considered the farm as their most important source of timber, 16% mentioned availability of timber as their reason for sourcing timber from this area, 26% mentioned easy access to timber, 13% indicated that they are less likely to be arrested when they harvest from the farm, while another 26% maintained that they source timber from farms in order to open up the farms and encourage crops to grow well. Nearly 11% of the respondents mentioned availability of good and quality timber as their reason for sourcing timber from the farm while 2% each mentioned invitation by farmers to harvest from their land and the ban on access to forest reserves (Table 7.4). The few (2%) who stated that the farm is their most important source of timber because harvesting from the farm does not destroy crops is misleading. This is because there is very little or nothing one can do to reduce damage to crops if the tree being harvested is standing in a crop farm (Adam *et al.*, 2007b).

These findings emphasize the strong support of some local communities for 'illegal' chainsaw operations. There is increasing evidence that farmers continue to play significant role in this illegality by conniving with chainsaw operators (Lambini *et al.*, 2005; Marfo and Nutakor, this volume). With majority of operators reporting that the farm is their most important source of timber tress, and citing easy access to trees on

farm and opening up of farms to help crops grow well as their most important reasons, the farmer plays a pivotal role in facilitating access to timber trees by 'illegal' chainsaw operators.

Table 7.4 Operators' reasons for considering certain areas their most important source of timber

	Most important source of timber (% of respondents)			
	Forest Fallow Farms Wa			Water
Reasons	reserves	areas		courses
Availability of timber resources in the area	50	60	15.8	0
Help open up farms and also help crops to grow well	0	0	26.3	0
Harvesting in this area does not destroy farm crops	0	40	2.6	0
Less likely to be arrested	0	0	13.2	0
Availability of good and quality timber	50	0	10.5	0
Easy access to trees/timber	0	0	26.3	0
Farmers invite me to harvest from their land	0	0	2.6	100
Because of the ban on reserves	0	0	2.6	0
Total number of respondents	6	5	38	1

To confirm the relative importance of the different sources of timber for chainsaw operators, the respondents were further asked to indicate the proportion of trees milled over a year that come from the various source areas. The responses given by the operators confirm that farming areas are the most important source of timber for chainsaw millers. For example, 70% of the respondents indicated that at least three quarters (75-100%) of the timber trees they mill in a year come from farmlands. 16% of them mentioned that between half and three quarters (50-75%) come from farms. Only 4% reported that none of the trees they mill come from farmlands. By contrast, 72% of the respondents claimed that none of the trees they mill come from forest reserves even about 10% reported that they get at most half of the trees they mill from forest reserves. Only 2% indicated that they obtain at least 75 percent of their trees from reserves (Table 7.5).

Table 7.5 Proportion of trees milled over a year that come from various sources

Proportion of timber milled over a year (% of respondents)						Total number
Source of	None	10 -24	25 – 49	<i>50 – 74</i>	75 – 100	of
timber		Percent	Percent	Percent	Percent	respondents
Plantations	86	2	10	2	0	50
Forest						
reserves	72	8	10	8	2	50
Farmlands	4	0	10	16	70	50
Other areas (e.g. fallows)	54	4	34	8	0	50

7.4.1.3. Difficulty in accessing timber trees from source areas

To assess the extent of, and ease of access to, timber resources, the operators were asked to indicate how difficult it is for them to access timber from the areas they consider their most important source of timber. The majority of them (52%) claimed that it is difficult to access timber from these areas, 10% said it is very difficult, 22% stated that it is not difficult while 16% maintained that accessing timber from these areas is very easy (Figure 7.1). All the operators who reported that it is very easy to access timber indicated that their most important source of timber is the farm and fallow areas. This confirms the connivance of farmers with 'illegal' chainsaw operators in chainsaw lumbering.

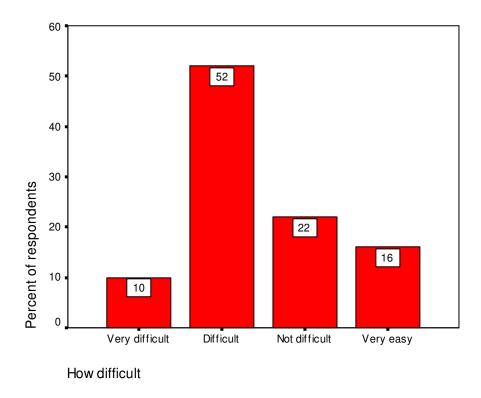


Figure 7.1: Operators' assessment of the ease with which timber resources is accessed (N =50)

Following their opinion about how difficult it is to access timber resources from the source areas, the operators were also asked whether they subscribe to the assertion that timber resources are difficult to come by or have become scarce. The majority of them (48%) reported that they strongly agree, 44% said they agree while only 8% indicated that they do not agree (Figure 7.2).

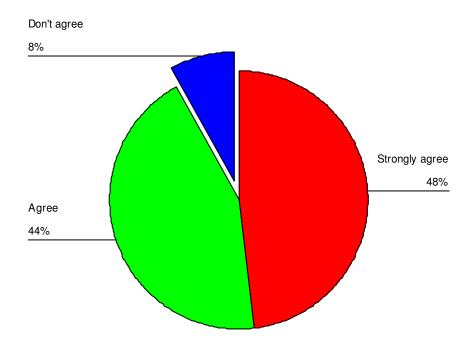
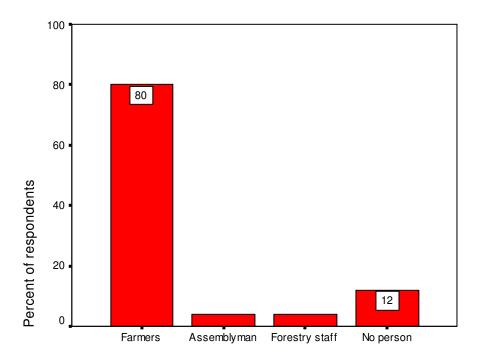


Figure 7.2: response on the extent to which chainsaw operators agree that timber resources have become scarce (N = 50)

7.4.2. Tree tenure and accessibility to timber by chainsaw operators

7.4.2.1 Community contacts for access to timber resources

Exploring issues of tenure and access rights and how they influence the accessibility of chainsaw millers to timber, the respondents were asked to mention the categories of people they normally contact to gain access to trees for their milling operations. The majority of the respondents (80%) mentioned the farmer while 2% each said that they normally contact either the Assemblyman or Forestry Staff. Twelve percent of the respondents, however, indicated that they do not contact any person to gain access to trees (Figure 7.3). This observation is important as it further confirms the role of farmers in chainsaw milling.



Persons chainsaw operators contact to get access to trees

Figure 7.3 Persons chainsaw operators indicated they contact to get access to trees for milling (N= 50)

Several reasons were given to explain why they contact such people. For example, 85% of the 40 respondents who said they normally contact the farmer indicated that they do so because the farmer is the landowner and can give them access to the land and trees. A little over 12% of them were of the view that they contact the farmer because the farmer is the one they can bargain or negotiate with, while about 2% reported that they contact the farmer because they do not need permit to harvest from the farm – they just have to 'see' the farmer. One of the two people who said they normally contact the Assemblyman reported that he does so because the Assemblymen are close to the operators and so they are able to negotiate with them, while the other person maintained that he contacts the Assemblymen because they harass the operators if they do not contact them. Even though this observation might seem insignificant, it does suggest that local political leaders can have some role to play in forest management. All the respondents that said they normally contact forestry staff indicated that they do so because the foresters are the people who manage the forest (Table 7.6).

Table 7.6 Persons chainsaw operators contact to get access to trees and the reasons for contacting such persons

		access			
Reasons for contacting such	Farme	Assemblyma	Forestry	No	Total
persons	r	n	staff	person	percentage
Because the farmer is the landowner and can give me access to the land and trees	85	0	0	0	68
Because the farmer is the person I can bargain with	12.5	0	0	0	10
Because I don't need permit to harvest from the farm, I just have to see the farmer	2.5	0	0	0	2
Because I know chainsaw lumbering is illegal	0	0	0	83.3	10
They are close to us so we are able to negotiate with them	0	50	0	0	2
Because they manage/protect the forest	0	0	100	0	4
Because I normally harvest trees from forest reserves	0	0	0	16.7	2
Because they harass you if you don't contact them	0	50	0	0	2
Total number of respondents	40	2	2	6	50 (100%)

7.4.2.2. Chainsaw operators' views on their right to harvest timber

In order to understand the views and perceptions of 'illegal' chainsaw millers on timber harvesting rights, they were asked whether they have ever been arrested by the FSD for harvesting timber, and whether they think they have the right to harvest timber from their own farms or land. The vast majority (98%) reported that they have been arrested before. The fact that they are still in business goes to confirm that enforcement has not been effective and punishments not sufficiently punitive. Only 2% said they have never been arrested. On their right to harvest timber, 12% insisted that they have the right to harvest timber from their own land while the majority (88%) accepted that they do not have the right to harvest timber from their own farms. Thus, to a large extent, we can argue that chainsaw milling is more of a defiance due to economic necessity rather than defence of any tenure right over forests or trees. It also contests the opinion that people are involved in chainsaw milling because they do not know that their actions are illegal. Since ignorance does not seem to be a root problem, advocating for more education may not be an effective strategy.

They gave several reasons to explain why they think they have or do not have the right to harvest timber trees from their own land. Of the 44 respondents who indicated that they do not have the right, about 61% said this is because timber trees belong to the government or state, 32% maintained that it is against the law to do so, while a few (7%) said that they do not have the right because they need to get permit from the

FSD before they can harvest. The majority (83%) of those that claimed they have the right to harvest timber trees from their land said this is because the land belongs to them and so they should have access to the land and trees on the land. The remaining 17% maintained that they have the right to harvest timber trees from their land because they have easy access to the trees (Table 7.7). thus their claim of right is based more on natural justice and morality rather than in reference to any specific customary or statutory law in force.

Table 7.7 Reasons for chainsaw operators' views on their right to harvest timber from their own farm or land

	Right to harv from own far respo		
Reasons	Yes, I have the right	No, I don't have the right	Total percentage
Because timber trees belong to the state/government	0	61.4	54
Because the land belongs to me and so I should have access to the land and trees	83.3	0	10
Because I have to get permit from forestry before I harvest /I have no permit	0	6.8	6
Because it is against the law to do so and you can be arrested	0	31.8	28
Because the tree is on my land and I have easy access to it	16.7	0	2
Total number of respondents	6	44	50 (100%)

With these divergent views about the right of local people to harvest timber from their own land, it is not surprising that the implementation of the ban on 'illegal' chainsaw lumbering has largely been unsuccessful. Rather than promoting the value of the forest to those living near it, the ban discourages people from having anything to do with the forest resources. This policy of exclusion alienates and it is a strong disincentive to local management and protection of forests (Ardayfio-Schandorf *et al.*, 2007; Cline-Cole, 2000; Bradley, 1992). The value of forests for people living near them therefore needs to be sustained, promoted and developed. The type of system needed is one which helps to promote more active involvement in sustained management. In other words, what is needed is a system which helps to build on or foster people's concern for the future of the resource, and their long term 'economic' interest in the resource and its management. It is only when the forests have a real value to the local people that their co-operation and energy can be gained for forest protection and management. Without co-operation, the future of the forests of Ghana cannot be guaranteed.

7.4.2.3. Awareness of the need to obtain permit to fell trees

Despite some of the respondents claiming the right to timber trees on their land, surprisingly, all of them reported that they are aware of the need to obtain permit to fell any tree no matter where it occurs. They gave several reasons to explain why they operate without license. The majority (56%) of them indicated that even though they are aware of the restrictions on timber harvesting and the need to obtain permit to harvest, they harvest without permit because they still need the trees for their business or to remain in employment. 26% of the respondents reported that they harvest without permit because of the cumbersome and bureaucratic processes, and difficulties involved in securing harvesting permits, while 16% maintained that they do not have money to purchase permit (Table 7.8).

Table 7.8 Reasons for operating without a license

	Number of	Percent of
Reasons	respondents	respondents
Because I still need trees for my business (employment)	28	56
Because I was requested to do it	1	2
Do not have money for permit/TUC	8	16
Difficult to get harvesting permit	13	26
Total number of respondents	50	100.0

7.4.2.4. Factors that limit the accessibility of chainsaw operators to timber trees

The operators complained that a number of factors limit their accessibility to timber trees for their milling operations. Most of the respondents (86%) mentioned increased enforcement of the ban on chainsaw lumber production and sale as the major setback to their operations. A significant number of the respondents (44%) also maintained that the restrictive forest and tree tenure arrangement in the country is thwarting their activities. Other factors reported are competition from conventional sawmill activities (20% of respondents), travelling long distances to get timber to mill (40%), depletion or reduced availability of timber resources (24%) and increased number of operators involved in chainsaw lumbering (6% of respondents) (Table 7.9). even though enforcement of the ban has been observed to be largely ineffective, it is still reported by most operators as a limiting factor. Reconciling the various observations made in the various studies, it is more likely that the informal payments to FSD and law enforcement agencies are the root factors bothering operators. The last factor seems to confirm that chainsaw operators are increasing in number (see Marfo and Acheampong, this volume).

Table 7.9 Factors that limit the accessibility of operators to timber trees

Factors that limit accessibility	Number of respondents*	Percentage of respondents*	Total number of respondents
Competition from conventional sawmill activities	10	20	50
Increased enforcement of the ban on chainsaw operations	43	86	50
Restrictive forest and tree tenure arrangements	22	44	50
Depletion of timber resources	12	24	50
Increased number of operators involved in chainsaw lumbering	3	6	50
Travelling long distances to get timber due to scarcity	20	40	50
Cost involved in the operation	2	4	50

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses.

The mention of restrictive forest and tree tenure arrangements and ban on chainsaw milling as limiting access to timber trees is particularly challenging. Despite this ban, chainsaw lumbering operations continue and are currently reported by the FSD to be on the increase (Odoom, 2005). As has already been discussed, the continuation and expansion of 'illegal' chainsaw milling in Ghana is, in part, due to the lack of clarity over forest and tree tenure, particularly tenure of trees on farms (Odoom, 2005; Marfo 2004; Agyeman, 2004). This is because the potential of forest and tree resources to continually support the livelihoods of the rural poor depends on the security of tenure that local residents possess related to forests, their perceptions and attitudes towards the resource, and how they manage it. People who lack secure rights to the continued use of forests often show little sense of custodianship or stewardship towards the resource and may not have any sense of responsibility towards sustainable management of the resource (Banana and Gomya-Ssembajjwe, 1998; Byron and Arnold 1997).

Rather than fostering a responsible attitude towards forest resources, the forest and tree tenure arrangement in Ghana does just the reverse. It creates a sense of alienation, which is a strong disincentive to local management of forests. For example, it has meant people adopting destructive harvesting practices (Townson, 1995; Falconer1992). Local communities want less restricted access to forests and resent this form of exclusion.

7.4.2.5. Rights that will encourage chainsaw operators to stop chainsaw milling

Guided by the five rights described by Hackett (2001) as constituting the bundle of rights usually referred to as ownership, the respondents were asked to choose the rights which, when conferred on them or the local community, will encourage them to stop chainsaw operations. The five rights were defined as follows:

• Right of access: the right to use (but not harvest) forest resources;

- Right of withdrawal: the right to both access forest resources and withdraw resource units (harvest);
- Right of management: the right to manage the use, maintenance, and monitoring of forest resources;
- Right of exclusion: the right to determine the rules governing who can and cannot use forest resources; and
- Right of alienation: the right to sell or transfer timber trees and other forest products to other people.

Even though the respondents had the opportunity to choose all the rights, none of them selected this option (see Table 7.10). For the majority of the operators (54%), right of withdrawal was enough to encourage them to put a stop to chainsaw activities. 48% of them mentioned right of management while 4% maintained that they need the right of alienation. One person, however, was not sure about the type of right that will inspire him to do away with chainsaw milling

Table 7.10: Chainsaw operators' views about rights that will encourage them to stop chainsaw activities

Types of rights	Number of respondents	Percentage of respondents
Right of withdrawal	27	54
Right of management	20	40
Right of alienation	2	4
Not sure	1	2
Total number of respondents	50	100

Indeed, the majority of respondents (80%) reported that they would like to see a change in the way timber trees and forests are currently owned and managed in Ghana. They proposed several changes and modifications to the existing forest and tree tenure system and gave reasons for their views. Tables 7.11 and 7.12 summarize these views and the reasons behind them.

Table 7.11 Chainsaw Operators views on how timber trees and forests should be owned and managed

Direction of change	Number of respondents	Percentage of respondents
Ownership and management rights should be given to the Assemblymen	6	15
Ownership and management rights should be given to Chiefs	12	30
Forests should be owned/managed by the government, but we should have easy access to permit to harvest timber	11	27.5
Chiefs and the FSD should manage the forest	1	2.5
We should be allowed to fell timber trees	1	2.5
Forests should be managed by the FSD	2	5

Total number of respondents	40	100
Cannot describe the direction of change	2	5
Forests and trees should be managed by Chainsaw operators	2	5
Forest and trees should be owned and managed by community members	2	5
Forests and trees should be managed by Chiefs and the Assemblymen	1	2.5

Majority (30%) of the 40 operators who proposed changes to the existing forest and tree tenure arrangements were of the view that ownership and management rights of forests and timber trees should be given to Chiefs because they are the custodians of the land and have authority to either allow or disallow people access to the forest. Some people also believed that given ownership of forests to Chiefs will grant them easy access to timber trees.

Other respondents (about 28%) asserted that the government should continue to own and manage forests and timber resources but they should have easy access to permit to harvest timber. They believed that having easy access to timber harvesting permit will grant them easy access to timber trees for their milling operations and also allow them to operate freely and avoid arrest by the FSD. Some also reported that having easy access to timber permit will help avoid conflict between TUC holders and chainsaw operators.

Some of the operators (15%) also maintained that forest and timber ownership and management rights should be given to the Assemblymen. They explained that they feel more comfortable working under the Assemblymen. They also trusted that given ownership rights to Assemblymen will secure them easy access to timber trees

Table 7.12 Reasons behind the views on how timber trees and forests should be owned and managed

Direction of change	Reasons given by operators
Ownership and management rights should be given to the Assemblymen	For easy access to timber trees
	We feel more comfortable working under the Assemblyman
Ownership and management rights should be	For easy access to timber trees
given to chiefs	Because the chief has authority to allow people access or not
	Because they are the custodians of the land
Forests should be owned/managed by the	For easy access to timber trees
government, but we should have easy access to permit to harvest timber	• So that we can operate freely and avoid arrest by the FSD
	To avoid conflict between TUC holders and
	Chainsaw operators
Chiefs and the FSD should manage the forest	Could not provide any reason
We should be allowed to fell trees	Could not provide any reason
Forests should be managed by the FSD	Could not provide any reason

Forests and trees should be managed by Chiefs and Assemblymen	Could not provide any reason
Forest and trees should be owned and managed by community members	 Forest and trees would be properly managed since we know that the trees belong to us
Forests and trees should be managed by Chainsaw operators	• Forest and trees would be properly managed since we will know that the trees belong to us

7.4.2.6. Willingness to pay to harvest timber

The willingness of chainsaw millers to pay to harvest timber trees is a critical factor to consider in any attempt to legalize or regularize the activity. This is especially so when all indications seem to favour legalization and regularization as the viable option for dealing with the chainsaw issue due to the gross failure of the ban on chainsaw lumber production. To this end, the operators were asked whether they are willing to pay for timber should chainsaw lumbering be legalized. They were also asked to indicate the form in which the payment should take, how much they are willing to pay (per tree) for different species of timber of harvestable size, and the type of timber harvest right or permit they prefer.

All the respondents maintained that they are willing to pay to harvest timber if the activity is regularized. Majority (50%) of the respondents reported that the payment should take the form of a tax on each timber tree harvested (product tax), 34% mentioned monthly or annual fee for the number of trees allocated to them, while 14% said that the payment should take the form of a tax on income accrued from chainsaw lumbering (income tax). Only one of the respondents was willing to pay all the fees that licensed loggers pay (Table 7.13).

Table 7.13 Views on the form in which timber harvesting payments should take

Form of payment (Tax)	Number of respondents	Percentage of respondents
All payments that licensed loggers pay	1	2
Only Tax on income accrued from chainsaw lumbering (income tax)	7	14
Only Tax on each timber tree harvested (product tax)	25	50
Monthly or annual fee for the number of trees allocated	17	34
Total	50	100

To get a rough idea of how much the operators are willing to pay for timber trees, they were asked to estimate the amount they are prepared to pay for high quality trees (such as Odum), medium quality trees (such as Wawa and Dahoma), and low quality trees (such as Ceiba). Even though the amounts elicited were not based on actual volume of timber, they give an indication of the value chainsaw operators place on different species of timber (based on quality) and the seriousness they attach to timber

harvesting fees or payments. Table 7.14 presents the descriptive statistics of the amounts they provided while Table 7.15 gives the number and percentages of respondents that stated the various amounts. To avoid concealing the fine details of actual amounts stated by the respondents, no attempt has been made in Table 7.15 to recode or regroup them into categories.

The minimum and maximum amounts offered for high quality trees were $Gh\phi$ 5 and $Gh\phi$ 300 respectively, with a mean amount of $Gh\phi$ 33.90 (USD 24). Similarly, the average amount the operators were willing to pay for medium quality trees was $Gh\phi$ 17.72 (USD 12.7), with a minimum and maximum amounts of $Gh\phi$ 4 and $Gh\phi$ 150 respectively. For low quality trees, the minimum and maximum amounts offered were $Gh\phi$ 2 and $Gh\phi$ 50, with a mean of $Gh\phi$ 9.43 (USD 6.7)

Table 7.14 Descriptive statistics of the amount chainsaw operators are willing to pay for high, medium, and low quality trees

			Minimum	Maximum	Mean	Std. Error	
Type of tree (in terms of			amount	amount (Gh	amount	of the	Std.
quality)	N	Range	(Gh¢)	¢)	(Gh ¢)	mean	Deviation
High quality species (e.g. Odum)	41	295	5	300	33.90	7.29	46.684
Medium quality species (e.g. Wawa and Dahoma)	43	146	4	150	17.72	3.47	22.742
Low quality species (e.g. Ceiba)	34	48	2	50	9.43	1.56	9.097

For high quality trees, 26% of the respondents were willing to pay $Gh \not \in 20$, 16% were willing to pay $Gh \not \in 10$, 14% offered $Gh \not \in 50$, while 2% offered $Gh \not \in 300$. Eighteen percent of the respondents were not sure and so could not elicit any amount. Likewise, for medium quality trees, 24% of the respondents stated $Gh \not \in 10$, 18% offered $Gh \not \in 20$, while 14% could not state any amount. For low quality trees, 18% of the respondents stated $Gh \not \in 10$, another 18% offered $Gh \not \in 5$, while as much as 32% indicated that they were not sure (Table 7.15).

Table 7.15: Proportion of operators and the indicated amounts (per tree) they are willing to pay for high, medium and low quality trees

Amount	High quality trees like Odum		Medium quality trees like se Odum Wawa and Dahoma		Low quality trees like Ceiba		
willing to pay	No. of	% of	No. of	% of	No. of	% of	
(Gh ¢)	respondents	respondents	respondents	respondents	respondents	respondents	
2.00	0	0	0	0	3	6	
3.00	0	0	0	0	4	8	
4.00	0	0	1	2	2	4	
5.00	3	6	8	16	9	18	
6.00	0	0	1	2	0	0	
7.00	0	0	1	2	0	0	
10.00	8	16	12	24	9	18	
15.00	1	2	4	8	2	4	
20.00	13	26	9	18	4	8	
25.00	0	0	1	2	0	0	

30.00	1	2	4	8	0	0
40.00	6	12	0	0	0	0
50.00	7	14	1	2	1	2
100.00	1	2	0	0	0	0
150.00	0	0	1	2	0	0
300.00	1	2	0	0	0	0
Not sure	9	18	7	14	16	32
Total	50	100	50	100	50	100

The respondents identified several forms in which the timber harvest right/licence/permit could take should their activities be regularized. The majority (74%) reported that they prefer concessions for registered groups of operators, 18% were in favour of individual permits to harvest individual trees (permit per tree harvest), while 6% preferred small concessions for individual operators. One of them was of the view that chainsaw operators should be attached to existing TUC holders (Table 7.16).

Table 7.16: Forms of timber harvest right/license/permit identified by chainsaw operators

Form of timber harvest right/permit	Number of respondents	Percentage of respondents
Chainsaw operators should be attached to an existing TUC holder	1	2
Small concessions for individual operators	3	6
Concessions for registered groups of operators	37	74
Individual permits to harvest individual trees (permit per tree harvest)	9	18
Total	50	100

7.4.3. Strategies adopted by chainsaw operators to get accepted in the communities they operate and to get access timber

7.4.3.1 Strategies for community acceptance

In order to understand how chainsaw operators manage to carry on with an activity that has been banned and criminalized for several years, they were asked to explain the strategies they use to get accepted in the communities they operate and how they manage to spot timber trees in their areas of operation. They enumerated several strategies they use to get accepted in their communities of operation (see Table 7.17). Most of the respondents (98%) reported that the communities in which they operate accept them because they provide them with cheap source of wood, 88% claimed that they involve some members of the communities in their operations, while 54% mentioned prompt payment of benefits to landowners and community members. 34% of the respondents explained that they get accepted in the communities because they observe customs and traditions in the local communities, such as paying "drink money" to chiefs, 18% revealed that they connive with law enforcement agencies to get access to the communities, while 4% said that they connive with chiefs. One person indicated that community resentment of the current system of timber tree tenure is also a factor that facilitates their acceptance in the communities they operate.

Table 7.17: Strategies used by chainsaw operators to get accepted in the communities they operate

Strategies adopted by operators	Number of respondents*	Percentage of respondents*	Total number of respondents (N)
Some community members are involved in chainsaw lumbering	44	88	50
Prompt payment of benefits to landowners and forest fringe communities.	27	54	50
Provide cheap source of wood for local communities.	49	98	50
Because of current system of timber tree tenure in the communities.	1	2	50
Connive with law enforcement agencies.	9	18	50
Connive with chiefs.	2	4	50
Observe customs in the local communities (e.g. pay "drink money" to chiefs)	17	34	50
Chainsaw operators help community development	2	4	50

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses.

On strategies they use to spot timber trees in their areas of operation, 88% of the operators reported that they are normally invited by community members to harvest trees, 86% indicated that they personally scout for trees, while 34% maintained they use community members to scout for timber (Table 7.18). These findings confirm the assertion that local communities support, condone and connive with chainsaw operators in illegal timber harvesting (Lambini *et al.*, 2005; Odoom 2005; Agyeman and Kyereh 2004).

Table 7.18 Strategies used by chainsaw operators to spot timber trees in their areas of operation

Strategies	Number of respondents*	Percentage of respondents*	Total number of respondents
Operator personally scout for trees	43	86	50
Use community members to scout for timber	17	34	50
On invitation by community members	44	88	50

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses.

To explore further the involvement of local community members in chainsaw activities, the respondents were asked to indicate how often they use them when operating in an area and the specific roles they play in chainsaw activities. Forty-eight percent of the respondents reported that they almost always use community members when engaging in chainsaw milling while 46% indicated that they sometimes use community members (Figure 7.4).

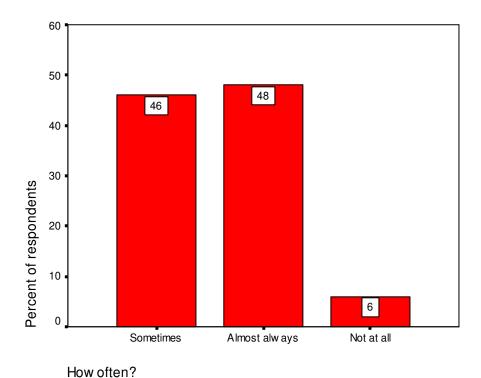


Figure 7.4: a graph showing the number of times chainsaw operators indicated their use of community members during chainsaw operations (N=50)

The respondents identified five main roles community members play during chainsaw operations. These included assisting bush milling (reported by 74% of respondents), carrying boards from the bush (88% of respondents), loading boards to vehicles (76% of respondents), transporting boards to towns (2% of respondents) and scouting for timber or tree hunting, as they put it (2% of respondents)

These observations corroborate the findings of some studies (see Odoom,2005 and Darko-Obiri and Damnyag, this volume) which indicate that most of the benefits from chainsaw lumbering go to the chainsaw lumber dealers, with the local communities serving mainly as carriers of lumber and chainsawing equipment to and from the stump to the nearest roadside.

7.4.3.2 Categories of people that normally invite chainsaw operators to cut trees for them

Apart from the people operators contact to gain access to timber trees in their areas of operations, other people also normally invite chainsaw operators to cut timber trees or supply them with chainsawn lumber. The respondents mentioned several categories of people that do invite them to do this (see Table 7.19). Majority (60%) of the operators

made reference to farmers, 28% cited individual builders, 26% pointed to timber dealers, 24% mentioned carpenters, while 20% referred to charcoal burners . again, there is increasing emphasis of the role of farmers in chainsaw operations.

Table 7.19 Categories of people that normally invite operators to cut trees for them

Impact	Number of respondents*	Percentage of respondents*	Total number of respondents
Farmers	30	60	50
Charcoal burners	10	20	50
Chiefs	2	4	50
Timber dealers	13	26	50
Building contractors	6	12	50
Individual builders	14	28	50
Carpenters	12	24	50

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses.

This clearly shows that chainsaw operators are normally invited or requested by certain categories of people, a significant number of them being urban dwellers, to harvest and supply timber. Although the ban on chainsaw lumbering prohibits the acquisition and use of illegally produced lumber, the implementation has typically focussed on the supply side of chainsaw activities and has largely ignored the demand side. Thus, the procurement and use of chainsaw lumber have not received the same criminal connotation as that given to the production and sale of the product. To be effective, the implementation of the ban on chainsaw lumbering must have given equal attention to the production as well as the use of illegally produced lumber. The development of a comprehensive timber procurement policy to guide individuals and organizations in sourcing legal timber is therefore imperative.

7.4.4. Factors influencing the selection of site of operations by chainsaw operators

Several factors influence the choice of site of operations by chainsaw operators. The operators were asked to reveal these factors and indicate which of them they always consider as first priority in their harvesting decisions. Here, the respondents were given the opportunity to select only one factor from the ones already mentioned. Table 7.21 summarises their responses.

The majority of respondents (66% each) mentioned the type of tree species available at the site and nearness of the site to the road as some of the factors they consider when selecting sites for their operations. Other factors they disclosed include ease of access to site (52% of respondents), sizes of trees available at site of operation (52% of respondents), the cost involved in accessing the site (38% of respondents), quality of stem, in terms of form and length of the bole (24% of respondents), and trees located on farmland (20% of respondents). A few mentioned number of trees

available for harvesting (12 % of respondents) and trees located off-reserve (6% of respondents).

Table 7.21 Factors that influence the choice of site of operations by chainsaw operators

Factors	Number of respondents*	Percentage of respondents*	Total number of respondents
Accessibility to site in terms of terrain(ease of access to site)	26	52	50
Type of tree species available at site	33	66	50
Nearness of site to the road	33	66	50
Size of trees available at site of operation (diameter)	26	52	50
Number of trees available for harvesting	6	12	50
Cost involved in accessing the site	19	38	50
Sites where there will be less crop damage	9	18	50
Quality of stem (bole length or form)	12	24	50
Trees located on farmland	10	20	50
Trees located off-reserve	3	6	50

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses.

Considering priority of the factors table 7.22 shows that the majority of respondents (42%) considered accessibility to site in terms of terrain as their first priority when selecting sites of operation. 20% mentioned size of trees available at site of operation, 16% selected nearness of site to road, 8% mentioned type of tree species available at site, while 6% said where there will be less crop damage during harvesting. Two of the operators mentioned trees located on farmland as their first priority possibly because farmers invite them to harvest from their farms or they consider the farmer as the person with whom they can negotiate access to the trees or who they can bargain with.

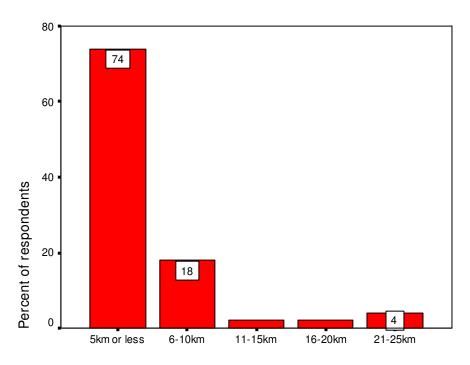
Table 7.22 Factor(s) considered as first priority in selecting sites of operations

Factors	Number of respondents	Percentage of respondents
Size of trees available at site of operation (diameter)	10	20
Type of tree species available at site	4	8
Sites where there will be less crop damage	3	6
Nearness of site to the road	8	16
Accessibility to the site in terms of terrain (ease of access)	21	42

Total	50	100.0
Quality of stem (Bole length or form)	1	2
Trees located on farmland	2	4
Number of trees available for harvesting	1	2

A similar study by Adam *et al.*, (2007b) revealed that chainsaw operators consider several factors when choosing trees to fell. However, contrary to the findings of the current study, their study concluded that sites where there will be less damage to crops may not be an important factor to chainsaw operators in their tree selection as none of their respondents considered this as an important factor. Again, their study did not identify cost involved in accessing the site as a factor chainsaw operators consider when selecting sites of operations.

To explore the operators' assertion that nearness of site to the road is a factor that influence their choice of site of operations, they were asked to indicate how far from main roads they concentrate their operations. The majority of respondents (74%) reported that they normally operate within 5km from main roads and 18% mentioned 6 to 10km (Figure 7.5).



Distance from main roads

Figure 7.5: respondents' assessment of proximity of site of their from main roads (N = 50)

7.4.5. Impact of the activities of chainsaw operators on other land uses

As has already been discussed, the majority of chainsaw operators revealed that they source their timber trees from farms. Therefore to understand the impact of chainsaw operations on farming activities, the operators were asked to explain how their activities affect this land use option. Some of the impacts they mentioned were negative while others were positive. For example, the majority of them (76%) indicated that their activities cause damage to crops on farm, while 68% maintained that their operations encourage farming activities by opening up the forest. Another 68% claimed that they give farmers money which could be invested in their farm business. Forty percent of the respondents also reported that their operations remove shade trees from farms thereby improving crop yield while a few of them revealed that chainsaw operators sometimes harvest farmers' crops while engaging in milling (Table 7.23).

Ninety two percent of the 50 operators admitted that they have damaged farm crops in the process of harvesting timber before, but 80.4% of this reported that they paid compensation to the farmers for damaging their crops. All of them, however, asserted that they consulted the farmers before harvesting.

Table 7.23 Impact of chainsaw operations on farming activities

Impact	Number of respondents*	Percentage of respondents*	Total number of respondents
Damage to crops on farm	38	76	50
Encourage farming activities by opening up the forest	34	68	50
Remove shade trees from farms thereby improving crop yield	20	40	50
Give farmers money which could be invested in their farm business	34	68	50
Chainsaw operators harvest farmers' crops while engaging in milling	3	6	50

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses.

Out of the 46 operators who admitted that they have caused damage to farm crops before, 61% reported that they cause damage to farm crops occasionally, 22% said they often damage farm crops, 13% maintained that they cause damage to farm crops very often, while a few (4%) claimed that they seldom cause damage to farm crops (Figure 7.6).

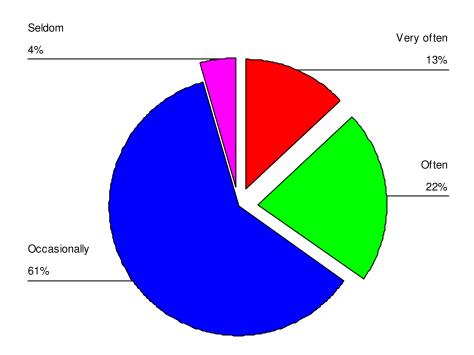


Figure 7.6: operators' response of frequency of damage to farm crops through chainsaw milling activities (N=46)

7.4.6. Constraints to chainsaw lumbering/milling

The respondents mentioned several factors that impede their engagement in chainsaw lumbering activities (table 7.24). Majority (92%) of the operators mentioned arrest by the FSD, 90% cited the ban on chainsaw lumbering, while 74% referred to confiscation of their lumber by the FSD. Others include the payment of bribes in order to access timber (reported by 48% of respondents), weather conditions (42%), declining stock of preferred species (16%), and reporting of chainsaw activities by members of communities (12%).

Table 7.24 Constraints facing chainsaw operations or chainsaw lumbering

Constraints	Number of respondents*	Percentage of respondents*	Total number of respondents
Enforcement of the law on ban of Chainsaw lumbering	45	90	50
Weather conditions	21	42	50
	21	42	30
Declining stock of preferred species in the forests	8	16	50
Arrest by the FSD	46	92	50
Confiscation of lumber by the FSD	37	74	50
Payment of bribes in order to access timber (to Assemblymen, FSD			
Officials, etc)	24	48	50

12

50

7.5 Conclusions and Policy implications

7.5.1 General conclusions

The study has revealed in detail some relevant issues pertaining to forest and tree tenure, timber resource availability and their impact on 'illegal' chainsaw lumber production. Majority of operators recognize that the availability of timber resources has reduced drastically since they entered the chainsaw business. Most of them attribute this decline to over-harvesting of forest resources. The farm is an important source of timber for illegal chainsaw operators as most operators source their timber trees from farming areas. Indeed, majority of chainsaw operators do contact farmers to gain access to timber trees for their operations since they believe that the farmer is the landowner and can give them access to the land and trees. Odoom (2005) reports that trees on farms form a significant source of raw material for the production of chainsawn lumber in particular and the wood industry in general. Hence, an understanding of the farmer–landowner–tree interaction is important with regard to how such trees are accessed and the value that the farmer places on them.

Even though most operators accept that they do not have the right to harvest timber trees without permit, many reported that they do harvest without permit because they still need the trees for their business in order to remain in employment. Thus, the lack of employment opportunities and alternative livelihood activities in rural areas contribute to the increasing involvement of local people in 'illegal' chainsawing. The cumbersome and bureaucratic processes, and difficulties involved in securing harvesting permits also contribute to this illegality.

Enforcement of the ban on chainsaw lumber production and sale and the restrictive forest and tree tenure arrangement in Ghana are major factors that limit the accessibility of chainsaw operators to timber trees. Most operators reported that they need the right of withdrawal (the right to both access forest resources and withdraw resource units, i.e. harvest) to encourage them to do away with 'illegal' chainsaw activities. Majority of them would like to see a change in the way timber trees and forests are currently owned and managed in Ghana. A greater percentage claim that forest ownership and management rights should be given to Chiefs since the chiefs are the custodians of the land and have authority to allow or disallow people access to timber resources.

All the chainsaw operators, however, reported that they are willing to pay to harvest timber if the activity is regularized. Most indicated that they prefer a tax on each timber tree harvested (product tax). Majority maintained that the timber harvest right should take the form of concessions for registered groups of operators should their activities be regularized.

^{*}Number and percentage of respondents do not add up to 50 and 100 respectively because of multiple responses.

The study has shown that chainsaw operators employ several strategies to get accepted in the communities they operate. Prominent among these are provision of cheaper lumber or wood for rural communities, involvement of some members of the communities in their operations, and prompt payment of benefits to famers, landowners and community members. In addition, community resentment of the current system of timber tree tenure is a factor that facilitates the acceptance of chainsaw operators in the communities they operate.

The operators agreed that their operations impact farming activities. Most of them indicated that their activities cause damage to crops on farm. Some were of the view that their operations encourage farming activities by opening up the forest, while others claimed that they give farmers money which could be invested in their farm business. Some reported that their operations remove shade trees from farms thereby improving crop yield while a few revealed that chainsaw operators sometimes harvest farmers' crops while engaging in milling. The chainsawyers mentioned several constraints to their engagement in chainsaw lumbering activities. They maintained that arrest and confiscation of their lumber by the FSD and the ban on chainsaw lumbering are the major challenges they face.

7.5.2 Implications for the management of forest resources

The results of this study indicate that forests and timber resources are critical to the livelihoods of people in Ghana. However, the way forests and timber resources are presently managed poses a threat to both rural livelihoods and the sustainability of the forest resources, which support these livelihoods. The potential of forest products to continue to support rural livelihoods in Ghana can only be realised by an increase in the stream of forest benefits to local people. Forest management systems, which are deliberately designed to sustain and develop the value of forests for people living near them, will gain support for long-term, sustainable management. This will require security of access to forest resources, local incentives to protect the forest and its timber resources, a review of the ban on chainsaw milling, and the involvement of local communities in forest management. These are discussed in turn.

7.5.2.1. Secure access to forest and timber resources

In situations where forest products have important livelihood functions, users need security of access to the resource. Indeed, meeting the needs of local forest users on a sustainable basis should be the principal objective of forest management, and this should be reflected in control and tenure arrangements (Peluso and Padoch, 1996). Security of access to natural resources is an important issue if local communities are to use their local resources sustainably. Those who lack secure rights to the continued use of forests and timber resources often show little sense of custodianship or stewardship, with little sense of responsibility towards sustainable resource management (Banana and Gomya-Ssembajjwe, 1998; Byron and Arnold 1997).

Insecurity of tenure often encourages short-term exploitation, such as destructive harvesting practices that assure more certain though (over time) lower returns than might otherwise be obtained. More often, people living in forest margins in Ghana see themselves as 'aliens' in their own land. Their lands have been taken away from them

and turned into reserves with accessibility often non-existent. Traditional councils and stools, through their specific customary laws, have landholding authority. They hold allodial title to land on behalf of their communities. The communities in turn draw usufruct rights from the stool chiefs (IIED, 1994). With the forests vested in the traditional chiefs and stools, managed by the Government, and logged by private contractors a complex system of resource rights and utilisation ensues, which does not lend itself to simple regulation as is currently the case (Bird *et al.*, 2006). Under these complex forest and timber resource rights, landowners, forest fringe communities and farmers alike find no incentive in cooperating with the FC and instead connive with or participate in unsustainable illegal forest activities including chainsawing.

The value of forests and timber resources for local communities therefore needs to be promoted and developed. Indeed, indigenous rights to products in both reserve and off-reserve areas need to be recognised to enable local people take responsibility for the resource. In this regard, the Government has a role to play in reviewing the present ban on chainsaw milling to ensure that local people have fair and equitable access and entitlements to timber resources, and to promote their active involvement in the management of the resource. The Kwapanin Village in southern Ghana case where the FSD conferred most of the responsibility for monitoring *Marantaceae* leaf gathering onto village institutions offers a good example of how small efforts to modify forest management system at the local level could benefit both the FSD and local communities. This programme generated interest among the villagers in protecting forest reserves and improved relations between the FSD and the villagers (Agyemang, 1996).

It is important to note that sustaining rural livelihoods requires putting people at the centre of development, thereby increasing the effectiveness of support aimed at alleviating poverty and sustaining the environment. Access to assets is a critical factor in strengthening poor people's livelihoods. Indeed, tackling inequitable and insecure access to forest goods and services is one of the most important actions needed to improve forest-dependent livelihoods and enhance forest condition.

7.5.1.2. Local incentives for protecting forest and timber resources

Current statutes in Ghana provide little or no incentives for farmers to engage in sustainable forest management or to plant and preserve timber trees on their farms. As a former chief of Kofikrom, a village in the Sefwi Wiaso District of southern Ghana reported:

"Government does not reward any farmer who conserves his forest; rather it promotes forest destruction through the National Best Farmer Award, because the underlying criterion for the award is the extent of one's cultivated farm. Why can't there be an award for farmers who are conservation-minded, or at least incorporate conservation into the criteria for the National Best Farmer Award?" (Owubah, *et al.* 2001: 254).

This quotation suggests that there are no incentives for farmers to conserve forests in Ghana. Yet, the importance of incentives to the adoption of sustainable practices has been underscored in many studies. For example, market incentives have been shown to increase adoption of agroforestry practices in Kenya (Scherr, 1995).

The case of timber resources is particularly disturbing. Within Ghana's forest zone few natural forests exist outside forest reserves. The landscape is largely made up of orchard crops, with cocoa dominating, along with fallow and food plots (Amanor, 2000). However, significant timber resources continue to exist in these off-reserve areas. The FSD estimates that 80 per cent of logged timber comes from outside forest reserves (Richards and Asare, 1999). Thus maintenance of the off-reserve (particularly farmland) timber supply is critical for sustainable on-reserve forest management.

This observation highlights the potential for developing farming areas as sites of integrated agricultural and timber production, and for the formulation of policies which encourage closer cooperative links between farmers and foresters. Yet there is a strong feeling that the Ghanaian FSD appears to respond only to the narrow concerns of the timber industry, and the preoccupations of people who influence policy-making in international timber circles. Local farmers are marginalised in the process, and any opportunity for building on their knowledge of integrating trees and crops is lost (Amanor, 2000). Currently there is no incentive for farmers to tend or preserve timber trees on their land since they have no timber tenure rights. Indeed, farmers have no share in the value of timber trees they maintain on their land, and have rarely been compensated adequately for damage to crops during timber logging. Many farmers therefore destroy valuable timber trees on their land or sell them to 'illegal' chainsawyers to avoid the risk of uncompensated damage. Although one can argue that the stools obtain part of timber royalties, little, if anything filters down to the local farmers who protect the trees.

In order to encourage farmers to protect or preserve timber trees, they should benefit directly from timber trees harvested from their farms/land. Thus, the sharing of timber royalties should be reviewed to ensure that part of the benefit accrues directly to them. In a study of economic incentives, which encourage cocoa farmers to tend timber trees in Ghana, Richards and Asare (1999) estimated that the FSD should pay farmers 10 percent of the stumpage value of timber trees (although farmers demanded 33 per cent of the stumpage value). They noted that 10 per cent of the stumpage value as well as full compensation for damage to cocoa, including yield loss compensation, should be enough to encourage farmers to preserve timber species. Unless farmers receive a percentage of timber revenue, they are unlikely to preserve timber species and will probably continue to connive with chainsaw operators to harvest timber trees or destroy valuable timber species on their land.

7.5.1.3. Review of the ban on chainsaw milling

Chainsaw milling and its associated trade have been banned since 1998. Despite this ban, the forest sector in Ghana is bedevilled by a very high incidence of 'illegal' chainsawing. The ban has failed to resolve the chainsaw conflict and it has led to forest officials spending a greater part of their time dealing with chainsaw operators, sometimes in violent circumstances (see Marfo and Nutakor, this volume). Chainsaw lumbering operations continue and are currently reported by the FSD to be on the increase (Odoom, 2005). Much of the domestic supply of lumber is derived from 'illegal' chainsaw milling. For example, the Ghana wood industry and log ban export study (Birikorang *et al.*, 2001) estimated that in 1999 out of the 3.7 million m³ of timber harvested, illegal chainsaw activities accounted for 46 percent (1.7 million m³),

while illegal industrial logging accounted for a further 24 percent (0.9 million m³). The number of people indirectly involved in chainsaw milling is considerable. Adam *et al.* (2007b) assert that if described according to the various operational phases (stump site, highway transportation, re-processing and marketing) the chainsaw business provide employment to about 80,000 people. More recent estimates put the figure at about 1000,000 (see Marfo and Acheampong, this volume)

One reason for its extensive operation is that chainsaw milling has undoubtedly distributed benefits to the poor, though inequitably (see Darko-Obiri and Damnyag, this volume). For example, Bird *et al.* (2006) report that the transportation of lumber by headload fetches daily rates more than five times the daily minimum wage. Farmers often prefer instant payments for trees from illegal chain sawyers than promises from the forest sector institutions for benefits that are eventually distributed in a non-transparent way. Also, rural demand for wood has often only been met through strenuous access to distant markets, while the raw material has passed rural communities by. Above all, chiefs, as landowners, have been crowded out of decision making by the local government system and the FC's presence at the district level. Consequently, they have often turned a blind eye to illegal logging (Birikorang, *et al.*, 2001.).

Notwithstanding the fact that chainsaw milling still continues, the ban has had a tremendous impact on local communities and the resources on which their livelihoods depend since operators and their crew often work undercover and show little sense of responsibility and care towards the resource. The ban threatens rural livelihoods (Parren et al., 2007), undermines the sustainable management of forest and timber resources and is a strong disincentive to local management of forests. It stifles the evolution of local institutions that protect forest resources and promotes a feeling of animosity between local communities and the FSD as well as law enforcement agencies. Indeed, the ban has led to some operators losing their lives in the process of engaging in chainsaw lumbering. In addition, the ban heightens corruption in the forest sector (Adam et al., 2007a) and leads to loss of revenue to the government and all beneficiaries of timber royalties since operators pay no royalties or other official taxes or levies (Parren et al., 2007). It leads to the destruction of valuable ecosystems since it promotes "race to harvest", and as operators often engage in illicit and profligate harvesting of trees (see also Adam and Dua-Gyamfi, this volume). Indeed, Brown (1999) cautioned against the ban as far back as 1999 and reported that "the Forestry Department (now the FSD) is seeking to impose a complete ban on chainsaw logging in the informal sector, despite the effects that this is likely to have on rural livelihoods" (Brown 1999:15).

Weak governance structures and inimical laws alienate farmers and forest fringe communities while encouraging the illegalities to flourish. The control of illegal forest activities are to be enforced within a broader governance context. Weak and inappropriate governance structures that are evident in Ghana's forest sector and require to be addressed are (1) wide discretionary powers of government officials, (2) low accountability of government officials and politicians, (3) complex policy, legislative and regulatory frameworks, and (4) low probability of detection of corruption among government officials and other actors (Parren *et al.*, 2007). This can also be seen in the ineffective measures that have been instituted to combat chainsawing.

Several options have been proposed to deal with the 'illegal' chainsaw issue (see Adam *et al.* 2007b; Odoom, 2005). However, the findings of this study suggest that legalization and regularization of chainsaw milling activities will gain the support of local communities, chainsaw operators, farmers, timber dealers, carpenters, building contractors, individual builders, and a host of people who depend on chainsaw milling for lumber. Local communities demand the right to both access forests and to withdraw resource units or harvest timber and resent their exclusion from timber benefits. Chainsaw operators are willing to pay for timber should their activities be regularized. Thus, if pursued, the regularization of chainsaw milling will not only safeguard forests and timber resources but will also contribute to improving rural livelihoods and increase the stream of forest revenue to the FC.

7.5.1.4. Involvement of local communities in forest management schemes

In the area of co-management, the FSD has, since 1993, embarked upon an initiative to work collaboratively with local communities in the management of forests. The programme was initiated out of the recognition that "all segments of society" had to benefit from the nation's forest estate. The collaborative thrust is aimed at "increasing forest values to farmers, landowners and rural communities from both on- and off-farm resources" through the management of both timber and non-timber products (Mayers and Kotey, 1996). However, there has been no single legislative or tenurial change to fuel the process of community involvement in forest management (Brown, 1999). Reform has been piecemeal and the authorities are still reluctant to relinquish control over the management of forest resources.

Ghana might well look to joint management experiences from India, Nepal and elsewhere in Asia. Many foresters around the world have accumulated experience about joint forest management - in India and in community forestry in Nepal. In India, recognition by forestry officials in the 1970s and 80s that forest resources could not be protected effectively without the participation of local communities led to the formation of Forest Protection Committees in the three Indian States of West Bengal, Gujarat and Haryan. These committees were tasked with protecting degraded forest land from illegal activities in return for access to a wide range of forest products (Campbell, 1992, in Matose, 2002). By 1992, as many as nine states across India had passed regulations leading towards the development of partnerships with local communities as a result of the successes enjoyed by the pioneer states (Campbell, 1992, in Matose, 2002).

In Nepal, the trigger for the introduction of community forestry came in the late 1970s when serious flooding in Bangladesh resulted in rapid depletion and degradation of the forest resources in upstream Nepal. At the time, the Nepalese government recognised the Forestry Department's limited capacity to handle the problem alone and, in 1978, introduced a community forestry policy (Brown *et al.*, 2002). While the state maintained ownership of the land, local communities were given control over the biotic resources and the benefits flowing from them, providing that a percentage was used to improve the resource. By 2002, there were over 10,000 Forest User Groups (FUGs) in Nepal, each consisting of an average of around 100 households and managing an average of 50ha of forest (Brown *et al.*, 2002).

Among others, the main features of joint management as exemplified by the Indian and Nepalese experiences are:

- Recognition that forest dependent communities cannot be excluded from the care and control of forests that surround them, regardless of the legal ownership that may rest with the government.
- Development of partnerships that are based on evolving joint management objectives in which communities share responsibilities and proceeds with state forest departments.
- Passage of enabling legislation as a prerequisite to joint management initiatives.
- Fundamental changes of attitude amongst tradition-bound forest department officials and field staff, as well as among communities suppressed for many generations.
- Collaboration of various stakeholders including forest departments, local community members, NGOs, policy-makers and academic researchers, in the protection and management process (Matose, 2002).

In Ghana, the challenges for community involvement in forest management include tackling issues of forest and tree tenure, the passage of appropriate and realistic legislation to protect local communities' rights to forest resources, and placing much less restriction upon the kind of forests where community management may be applied. Forest managers have paid little attention to the fact that rural populations cannot adopt guardianship roles wholeheartedly without gaining an equivalent degree of jurisdiction over the resource. Indeed, addressing structural inequities and inequalities in the ownership and control of forests is a key challenge facing the FSD. Because local communities are primary users of forest products, and create rules that significantly affect forest condition, their inclusion in forestry management schemes is essential. It is only when they are involved in forest management that they will take responsibility for the resource, including helping to control illegal timber operations.

7.5.3 Concluding remarks

This study has shown that customary rights to forest products, promulgated at the time of reservation, have largely been eroded. While stools and local communities regard forests, especially forest reserves, as valuable legacy, there is growing local resentment at the low level of benefits that they receive. Indeed, local people are seeking better access and increased benefits from the forests. As policing and regulation are increasingly the only strategies used to maintain and protect forest resources, local communities feel increasingly alienated from forest management.

The question is, 'how is it that local communities in Ghana seem to have accepted state management of forests without some action to bend it to their own advantage? Does this suggest that community participation in forest management is not community-driven at all but government or state-driven? The answer to this seems to lie in the depth with which command and control norms over forests were entrenched over the 20th century (Wily, 2002). The influence of 'law' and what is 'lawful' cannot be underestimated in this context. As Wily (2002: 7) notes, "over three or more generations since the advent of introduced state paradigms of forest management, millions of rural dwellers appear to have been persuaded that it is not correct for them to own, control or manage significant forests themselves - or at least to tolerate and accept the laws which have dictated this". Indeed, throughout much of Africa,

community-initiated networks or lobbying associations do not yet characterise community participation in forest management in the way they do elsewhere (such as in Nepal where it is well developed) (Wily, 2002).

However, current indications in Ghana are that FSD-led regulatory systems on their own will not secure the resource. The challenge is to combine the FSD's systems of regulation and control with community-based activities, which enhance rather than antagonise forest management. The old paradigm of exclusion is no longer tenable. The knowledge, management systems and innovations of local people are crucial to the sustainability of the resource. Indeed, an equitable distribution of incentives, benefits and responsibilities associated with forest management - between the FSD, landowners, local communities, farmers, chainsaw operators and concessionaires, as well as other stakeholders seems to be the way to (re)gain the confidence and commitment of local authorities and communities for sustainable forest and timber management in Ghana. This might ensure that the forests are conserved whilst at the same time continuing to support rural livelihoods. This study therefore underscores the importance of forest and tree tenure in rural livelihoods and in forest resource management. It is only through secure rights to forest resources, and secure control over the benefits from it, that individuals and groups may be encouraged to undertake long-term investments in forest management or enrichment. In sum, the study highlights the need to strengthen local institutions that will respond to people's needs for livelihood security, and to strengthen local claims-making capacity in relation to the institutions of the State.

PART III

CHAINSAW MILLING COMPARED TO SAW MILLING

General Introuduction to chainsaw milling compared to sawmilling

Background

Technologies for converting timber into lumber in the so-called primary processing have evolved from the manual pitsawing to modern sawmills which used electric powered sawing machines. Today, the two sawing techniques that dominate primary processing of wood in Ghana are the electric-powered bandsaws used in conventional sawmills and portable chainsaws used by chainsaw operators. However, there is increasing promotion for using improved chainsaws with milling attachments and mobile mills.

Several issues emerge when one follows the chainsaw milling discourse, especially when it comes to the possibility of regularing chainsaw milling. Apart from the usual claim that chainsaw milling is destructive and wasteful, there have been some other arguments related to cost of investment, employment and profit flows, processing cost and efficiency and relevance with respect to supplying domestic market. These issues have become important, particularly to the policy discourse process, because propostions for regularizing chainsaw milling cannot stand without a firm understanding of how it compares with conventional mills in terms of some key issues. The gap analysis study preceeding the research identified these issues as cost of investment, benefit flows, contribution to the domestic market timber supply, employment and processing cost and efficiency.

Objectives and research questions

Even though much debate has ensued on the CSL issue, there is little empirical analysis of how these parameters stand comparing CSL to other improved techniques of milling. Consequently, some studies were dedicated to exploring these issues with a view to enlightening current understandings and the policy dialogue process in attempts to devising innovative mechanisms for dealing with uncontrolled CSL.

Specifically, the Terms of Reference required that the following questions should be answered

- What is the cost of investment and to what extent is it affordable? What are the returns on investments? How do these compare with other improved techniques of sawing?
- What is the recovery efficiency of chainsaw milling and how does it compare to other improved techniques including sawmills?
- Can the level of employment generated by CSL estimated by previous studies be confirmed and what factors will influence the sustainability of chainsawrelated employment?
- What is the pattern of supply of chainsaw lumber compared to sawmill?

Scope and organization of work

This component of the chainsaw project builds on earlier works that have been done on the above-mentioned issues. Particularly, the work builds on Adam et al (2007), ITTO project on processing and utilization of trees on farmlands and logging residues through collaboration with local communities (PD 431/06) and the Forestry

Commission (sawmill efficiency study. The empirical part of the work was carried out in the 8 project forest districts. Describe a bit of FC report here to give some context.

There are 4 research reports following this introductory chapter in this Part III of the research report. These are presented in chapters 8, 9 and 10. Chapter 8 presents the work done on processing efficiency using free hand chainsaw, chainsaw-with-milling attachment, Logosol, wood Mizer and industrial Band saw. Chapter 9 presents the work on investment cost and returns comparing chainsaw and improved M7 logosol machine. Chapter 10 presents the work on the supply of chainsaw lumber compared to sawmill. Chapter 11 looks at employment generated by chainsaw operation and attempt to estimate and validate other estimations made in recent works. It also analyses the sustainability of chainsaw-related jobs using a SWOT analysis.

Chapter 8

PROCESSING EFFICIENCY OF DIFFERENT MILLING TECHNIQUES: A COMPARATIVE ANALYSIS

Francis Wilson Owusu, Lawrence Damnyag, Kwame Appiah and Dominic Blay

8.1 Introduction

8.1.1 Background

The depletion of the tropical high forest of Ghana has been estimated to be 80% in the past 100 years. Among the factors that have contributed to this unfortunate situation is illegal harvesting and chain saw milling. The conversion of trees into lumber and or beams with chainsaws started when sawmills in Ghana began collapsing in the 1980's. At this period chainsaws had been in the system for over fifteen (15) years since its introduction. It has become a major source of lumber supply onto the Ghanaian timber market and beyond because the lumber produced are available, can easily be accessed, prices are comparatively lower and acts as a source of employment (see Marfo and Acheampong, this volume).

Notwithstanding this remarkable contribution, its activities are said to have serious environmental and economic effects among others. It has been indicated that out of 3.72 million cubic meters of the total annual timber that was harvested in 1999, illegal harvesting and chain saw milling contributed about one0.925 million cubic meters and about 1.71.696 million cubic meters respectively (Birikorang, 2001). Chain saw milling has been described to be a wasteful activity and environmentally unfriendly, hence needed to be banned. Despite some drastic measures that the government of Ghana continues to put in place in curbing the situation since it was outlawed in 1998, no better results have been achieved but continuous to flourish in the timber industry.

According to Otoo (2004), the chain saw operations under its present form could not be sustained or controlled within the limits of the Timber Resources Management Act, 1997 (Act 547) as amended by the Timber Resources (Amendment) Act 2002 (Act 617) and Timber Resources Management Regulations, 1998 (LI L1649). Therefore, the need to accommodate the chainsaw operators under the law to engage in alternative livelihood programmes was emphasized.

The conversion efficiencies of sawing/milling technologies are very important for the management, maintenance and optimum and sustained yield of production of timber resources in this contemporary world. The selection of milling machines for sawing of timber could be considered under efficiency and& productivity, mills availability, capital and, end products accessibility.

Some factors that are known to affect conversion efficiency of the various sawing technologies include: log shape and defects, log size, saw kerf, sawing for grade, sawing patterns, opening face (first saw line), dimensions of lumber, allowance for

shrinkage, operators' skills, machine settings, obsolete machine, maintenance and market demands (reference).

The chainsaw milling sector is said to operate under very low efficiency in terms of lumber recovery. However, in Ghana there is scanty statistical information on chainsaw milling especially on the negative impacts aspect of the operation. For example, Frimpong-Mensah (2004), established that the lumber conversion efficiencies for eleven Ghanaian timber species, using Sthil 070 chainsaw machine, ranged from 22% to 60% with a mean of 40%. Gyimah and Adu-Gyamfi (2008) after a pilot study on sawnwood conversion efficiency in selected sawmills in Ghana indicated that the mean recovery for small to large scale enterprises ranges from 28% to 63%. The above figures suggest that there is huge waste generation associated with both chainsaw and saw milling operations in Ghana, especially if compared with other countries. From the above waste generation is obvious. For example, Iin Malaysia, the lumber of commercial dimensions that were recovered in some sawmill is reported as 54.5% while that of Venezuela ranged between 60% and 70% (Gyimah and Adu-Gyamfi *et al*, 2008).

Following from these, the research questions to be addressed in order to improve lumber recoveries and the factors affecting it, and minimized cost involved in processing a unit volume of lumber in the chain saw sector are:

- What are the actual recovery estimates quoted for Ghana within the chainsaw and sawmill sectors?
- Are there adequate data to support these claims?
- What are the factors affecting recovery inefficiencies in the chainsaw sector?
- What other milling technologies could be introduced to improve upon the freehand chain sawing?
- What are the lumber production and consumption rates for both chainsaw and other improved milling technologies?
- What is the cost effectiveness of processing a unit volume of logs into lumber with the available milling technologies?

8.1.2 Objective

Forests are widely distributed, making wood abundant and accessible. Over exploitation of the commercial wood species has led to a fast decline or degradation of the tropical forest. It is expected that improving processing efficiency and minimizing residues in wood utilization would optimize the use of timber. This would improve sustainability of the tropical timber resources and reduce negative ecological impacts. This objective can be achieved if appropriate technologies for processing timber species are developed.

The specific objective of this study was to establish the efficiencies (Input output ratios of investment cost and lumber volume) of chain saw milling and other available

¹⁸ Conversion efficiency, which is the percentage lumber yield, is the ratio of the quantity of input and the output material through/during a transformation process.

small scale milling technologies in relation to resource utilization and their cost of production. The conversion efficiency, which is the percentage lumber yield, is the ratio of the quantity of input and the output material through/during a transformation process.

Over exploitation of the commercial wood species in Ghana has led to a fast decline or degradation of the tropical forest. It is expected that improving processing efficiency and minimizing residues in wood utilization would optimize the use of timber. This would improve sustainability of the tropical timber resources and reduce negative ecological impacts. This objective can be achieved if appropriate technologies for processing timber species are developed

8.1.3 Scope of the study

This study involved the processing of both forest and plantation trees using:

- a) Freehand with Stihl 070 and Husqvarna 395XP
- b) Husqvarna 395XP with frame attachment
- c) Stihl MS880 with Logosol attachment

and to determine the lumber recoveries, fuel consumption and production rates. The scope also covered the cost effectiveness analysis (economic analysis) of lumber production from some available timber milling technologies and review of the conversion efficiencies of sawmilling sector in Ghana.

8.2 Methodology

8.2.1 Selection of timber species and site

The selection of timber species for the study was based on a) commercially available timber species from both the forest and plantation b) most patronized timber species c) species being worked on currently with logosol milling machine under an ITTO/FORIG PD 431/06. The timber species selected and their densities are shown in Table 8.1. The site selection was based on the availability of all the species at one forest area. In this case a FORIG research plot located within thefor FORIG, Pra-Anum Forest Reserve, Reserve located at Amantia in the geographical area of the Eastern Region of Ghana was selected. Permission was sought from the Forestry Commission, which is the sole regulator of forest utilization in Ghana.

Table 8.1: Timber species selected for freehand chainsaw milling study

S/no.	Scientific name	Local name	Density	Source	No. of trees
			kg/m³		
1	Piptadeniastrum africanum	Dahoma	700	Forest	2
2	Nesogordonia papaverifera	Danta	750	Forest	2
3	Terminalia ivorensis	Emire	550	Forest	2
4	Terminalia ivorensis	Emire	550	Plantation	1
5	Tectona grandis	Teak	650	Plantation	1

Density is at 12-15% moisture content. Source: ?

To compare the freehand chainsaw milling with other milling technologies, some preliminary results from ITTO/FORIG project PD 431/06 "Processing and utilization of trees on farmlands and logging residues through collaboration with local communities" using logosol attachment was adopted. The results of the following species were considered.

Table 8.2: Timber species selected for Stihl MS880 with Logosol attachment milling study

S/no.	Scientific name	Local name	Density kg/m³	Source	No. of trees
1	Piptadeniastrum africanum	Dahoma	700	Farmlands	3
2	Mammea africana	Bompagya	800	Farmlands	2
3	Terminalia ivorensis	Emire	550	Farmlands	1
4	Tectona grandis	Teak	650	Plantation	3

Density is at 12-15% moisture content

8.2.2 Selection of sawing equipment

The sawing equipment selected was based on those that were available to the project team and whose adoption for use is under study. These included Stihl chainsaw (MS880) with logosol (Big mill Basic) attachment, Husqverna 395XP with frame attachment and Stihl 070 (chainsaw type mostly used for illegal chainsaw millingoperations in Ghana)

8.2.3 Timber Processing and Data Collection

At least one tree per timber species was processed using chainsaw with attachment and freehand technologies: a) freehand with Stihl 070 and Husqvarna 395XP b) Husqvarna 395XP with frame attachment c) Stihl MS880 with Logosol attachment. In situ processing was undertaken to minimize the destruction of the forest ecosystem and costs. Field measurements were undertaken. After each tree was felled, its butt and top diameters (two perpendicular measurements at each end) as well as the total length of the merchantable bole were taken to determine the volume of the useable portions. The timber was then cross-cut into lengths of 2.5 m ($8^{1}/_{6}$ feet), 366 m (12) feet), 4.27m (14 feet), 4.57m (15 feet) or and 4.88m (16 feet) depending upon the use and grade (quality) required. Monkey jack was used in turning the logs to any required side to facilitate processing. Other items used for the study included saw chains, starter plugs, files for sharpening saw chains, measuring tapes and brass screws used to fix a face-plate on the face of logs. Petrol and engine oil were used to run the engines of the chainsaw machines that were used. For every tree that was milled the quantities (in terms of volumes) of the fuel used were noted. A stop watch was used to time the operations (from the beginning to the end of every cut that was made). Lumber pieces were cut to dimensions (thicknesses and widths) that were available at the timber market. During processing the following parameters were noted and recorded for each tree: quantity of fuel used, total operational time and actual machine time. In addition the thicknesses and widths (at the two ends), length of each lumber were measured and recorded to compute for the volumes of lumber pieces generated.

8.2.4 Cost efficiency of using available technologies to produce lumber

Efficiency assessment involves going beyond knowledge (real or estimated) of programme impact or technology impact and attempting to determine how cost effective the technology is at what it does and how it compares (in efficiency) to other technologies, and then, given this knowledge, deciding whether the program is worth its costs and/or if the program should be replaced with another more efficient programme. The key background assumption in efficiency assessment is that we live in a world of limited resources and we must make decisions about how to use and those limited resources (http://www.southalabama.edu/coe/bset/johnson/660lectures/RLF11.doc). A full economic evaluation consists of identifying, measuring, valuing and comparing the costs and consequences of the alternatives being considered. There are three major analytic techniques available for measuring efficiency. These include costeffectiveness analysis (CEA), cost-utility analysis (CUA) and cost-benefit analysis In CEA, the costs measured in money terms, are compared to the consequences in the physical units of effectiveness that are natural to the programme; i in this case, the technologies used in processing logs of trees into lumber. The effect in this study is the volume of lumber to be produced from the different tree species and of the different diameters in the study area. The choice of cCost-effectiveness analysis over cost benefit analysis is that the outcome is kept in its natural form and not converted to money. In this case the lumber are kept in cubic meters and not turned into money. In this study the CEA is employed to assess the cost effectiveness of using four technologies in processing trees into lumber with the key objective to achieve maximum recovery rate. These technologies are Husqvarna freehand (A), Husqvarna with attachment (B), Stihl freehand (C) and Logosol (D) as described earlier.

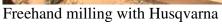
Cost data including fuel and engine oil used in the lumber production by each of the production technology was recorded per volume of lumber produced from a given tree species in the study sites. Other costs recorded include cost of machine repairs, purchase of spare parts such as saw chains, plugs, files and equipments including monkey jack, pinch bar and spinners, measuring tapes, brass screws. The wages paid for the services of the millers employed to process the logs into lumber using the various technologies were also recorded. For this, estimate of wages paid to personnel employed to process lumber for sale in the normal illegal chainsaw operations in Ghana were used with reference to (Damnyag et al. (2009). The wages paid to such chainsaw lumber production actors in the Kade forest district were used since this was the district the site for this study was chosen. This was done to ensure that labour cost employed in the estimation of the CEA in this study is comparable to that of the regular illegal chainsaw operation in this forest district. In the application of the stihl freehand and the Husqvarna freehand technologies, twenty working days was the period, for which labour was paid at the rate of GHC 11.85 Ghana cedis for a miller/master chainsaw operator and GHC 5.85 Ghana cedis ffor an assistant per day. In the application of Husqvarna with attachment 15 working days were used and labour paid accordingly using the same daily rate. As indicated the output from using these technologies for the processing was the lumber generated from the trees felled. The different dimensions of these lumber produced were recorded and their volumes estimated as the effect used in the calculation of the cost effectiveness ratios





Freehand milling with Stihl







Milling with logosol attachment



Milling with frame attachment (photo by Francis Wilson)





Measurements being taken by field staff (photo by Francis Wilson)

8.2.5 Data Analysis

The data collected was analyzed using Microsoft Excel for; a) the volumes of the mechantable boles, logs and lumber generated, b) mean, standard deviation and minimum and maximum values, c) the percentage log and lumber recoveries (yield or conversion efficiency), d) fuel consumption rate, and e) production rate. The following mathematical equations were used to determine volumes of the merchantable bole of the tree, cross-cut logs, sawnwood (lumber) and the green volume recovery.

a) For volumes (V) of the bole and cross-cut logs Hubers' logs Hubers' Volume Formula as expressed below was used.

$$V = 0.786 \text{ xX } D^2 \text{ xX } L \text{ (m}^3)$$
 ----- (1)

Where,

D is the average diameter of the end diameters (four measurements taken)

of the log, and L is the length of log.

b) Volume of sawnwood (lumber),

$$V = T \times W \times L \text{ (m}^3)$$
 -----(2)

Where,

T is the average thickness of lumber W is the average width of lumber L is the length of lumber

Therefore for n pieces of lumber, the total volume,

$$V_{1-n} = \sum (V_1 - ... V_n) () (m^3)$$

The percentage lumber recovery or yield, R_{lumber} , on volume basis at green is expressed as:

$$R_{lumber} = (V_{lumber} / V_{logs}) X 100$$
 ----- (3)

Where V_{lumber} and V_{logs} are total volume of lumber (output) and total volume of logs (input) respectfully.

c) Lumber production rate, P_{rate} , which is the volume of lumber produced within a given timeframe, is expressed as:

$$P_{\text{rate}} = V_L / (T_2 - T_1), m^3 / hr, ----- (4)$$

Where, V_L is the total volume of lumber produced

 T_1 and T_2 are the initial and final times respectively

d) Fuel consumption rate, C_F , is the fuel used in milling a unit volume of lumber. This is given as:

$$C_F = F / V_L$$
, litres/m³, ----- (5)

Where, F is the fuel used

V_L is the volume of lumber generated using fuel, F.

e) The following equation is the measure of efficiency using the CEA technique and considering only simple ratios without the inclusion of discounting factors

Cost/effect ratio =
$$\frac{COST}{EFFECT}$$
.....(6) &

Where

'Cost' is the cost of producing the outcome or output from a given programme or technology. Some examples of technology costs are personnel, facilities, and equipment and materials

Effect is the output or outcome in it natural form and not converted to money Cost effect ratio is the cost per unit of output

Comparing the efficiencies of two or more technologies, using the cost/effect ratio, the one with the smallest ratio is more efficient. In this study the efficiencies of producing lumber using the freehand with stihl, freehand with husqvarna, and husqvarna with attachment and Logosol technologies have been compared using the CEA. The cost effect data under each technology was fed into equation 1 and the corresponding cost effectiveness ratios obtained to determine the efficiency of the different technologies for producing lumber to support policy decision in chainsaw milling for improvement.

8.3 Results and Discussion

The results on freehand with Stihl 070, freehand with Husqvarna 395X, Husqvarna 395X with frame attachment and Stihl MS880 with logosol attachment milling technologies are presented indicating the mean diameters ,lengths & volumes of logs, the percentage yields of lumber & logs, lumber production and fuel consumption rates. These have been presented in tabular & graphical forms and discussed. The formulae 1 to 5 were used with Microsoft Excel in determining the volumes of merchantable boles, logs & lumber, lumber recovery, production rate and consumption rate while the excel alone was used to compute for the means of the needed parameters.

8.3.1. Freehand milling with chainsaw

Freehand with Stihl 070 chainsaw milling

Eight trees were felled for this study of which diameters ranged from 0.363 m (for Teak) to 0.803 m (for Dahoma) while that of the lengths varied from 14.46 m (for Teak) to 25.7 m (for Emire from the natural forest). Table 3 indicates the mean diameters, lengths and volumes of the logs after cross-cutting the trees into logs, which ranged between 0.353 - 0.755 m, 2.49 - 4.42 m, 0.243 - 1.915 respectively.

Table 8.3: Mean dimensions of logs milled with Stihl at freehand

_	Mean log	Mean log	Mean log	
Timber species	diameter	length (m)	volume	
_	(m)		(m^3)	
Piptadeniastrum africanum (Dahoma)	0.755	4.08	1.915	
Nesogordonia papaverifera (Danta)	0.521	3.96	0.896	
Terminalia ivorensis (Emire – Forest)	0.515	4.21	0.961	
Terminalia ivorensis (Emire – Plantation)	0.479	4.42	0.843	
Tectona grandis (Teak)	0.353	2.49	0.243	

Apart from the plantation trees (Teak and Emire), the rest of the species, Dahoma, Danta and Emire from the natural forest had their diameters bigger than the minimum felling diameter of the respective species (the Ghanaian timber tree species at exploitable sizes are above 50 cm diameter at breast height (dbh) or above buttress).

Figure 8.1 shows the average percentage log and lumber recoveries for each of the selected species. The percentage logs recovery for the trees of the various species felled ranged from 50.16% to about 865.67%. The logs recovery was higher for Emire (*Terminalia ivorensis*) from plantation (Emire P) had the highest log recovery while Teak had the lowest. This low value was due to the form of the trees as the stems had more branches and hence reduced the merchantable bole length as compared to that of Emire. Lumber recovery also varied from recovery also varied from about 36.17% to 53.89%. The lowest recovery of 36.17% was recorded for Teak and the highest (53.89%) by Emire from plantation. The log and lumber recoveries for Dahoma (*Piptadeniastrum africanum*) were 75.13% and 46.17% respectively. Danta and Emire (from forest) yielded 47.77% and 51.29% lumber recovery respectively while the log recoveries were 66.05% and 70.65% in that order. The mean percentage lumber recovery was estimated to be 47.1%. These lumber recovery values are comparable to those established by Frimpong-Mensah (2004) on freehand milling and Gyimah and Adu-Gyamfi*et al* (2009) on small to large scale enterprises.

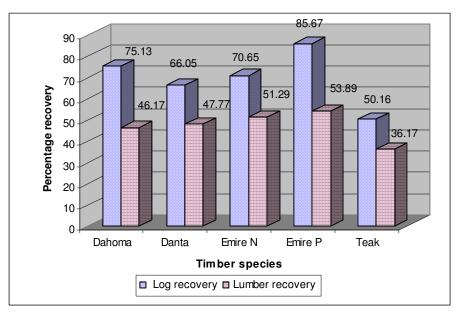


Figure 8.1: Logs and lumber recovery rates for five timber species milled with freehand

The volume of lumber generated per hour (rate of lumber production - m³/hr) for the five species ranged from 0.33 to 0.662 as shown in fig 8.2. Emire from plantation was the highest followed by Emire from the forest and then Dahoma and Danta. Therefore with the minimum rate of 0.33 m³/hr, the volume of teak that can be produced in a day by two operators, two assistants and using one machine (working for 8hrs) will be 2.64 m³. The mean average of the lumber production rate was 0.5217 m³/hr which translate into a production of 4.2 m³. per day. Thus the range of rate of production with freehand chainsaw milling is between 2.6 to 4.2 m³ per day.

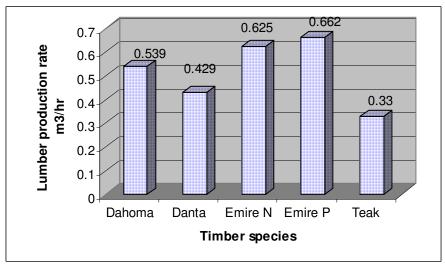


Figure 8.2: The rate of generating lumber with freehand milling

Fuel consumption rate, on the other hand, was highest for Danta (9.63 lit/ m³) and the lowest (5.67 lit/ m³) was forbeing Emire from the forest (see Fig. 8.3). Dahoma, had the second highest of fuel consumption rate of recorded 9.24 lit/ m³. Since the densities of Dahoma and Danta are 700 kg/ m³ and 750 kg/m³, their high fuel consumption rate is realistic. The second lowest consumption rate of 7.58 lit/ m³ was

for Emire from the forest while that of Emire from plantation was 7.82 lit/ m³. The two plantation species (Emire and Teak) recorded 7.82 lit/ m³ and 7.58 lit/ m³ respectively. With this technology the mean average fuel consumption rate was estimated as 7.985 lit/ m³.

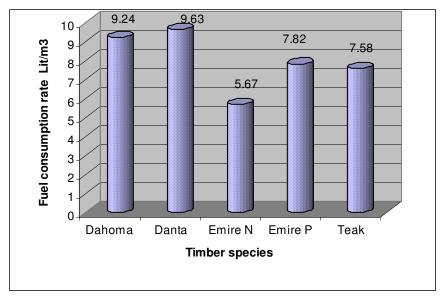


Figure 8.3: The rate of fuel consumption with freehand milling of some timber species

Freehand with Husqvarna 395X

A total of nine trees were used for the Husqvarna machine when it was operated at freehand. The mean log diameter, length and volume ranged between 0.329–0.755 m, 2.46-4.8 m, 0.215-2.225 m respectively (Table 8.4). The diameters were above the minimum felling limits in Ghana. The lengths of the logs were not uniform because of the shape and defects of the merchantable boles.

Table 8.4: Mean dimensions of logs milled with Husqvarna at freehand

-	Mean log	Mean log	Mean log	
Timber species	diameter	length (m)	volume	
	(m)		(m^3)	
Piptadeniastrum africanum (Dahoma)	0.663	3.39	1.368	
Nesogordonia papaverifera (Danta)	0.558	2.79	0.751	
Terminalia ivorensis (Emire – Forest)	0.755	4.8	2.225	
Terminalia ivorensis (Emire – Plantation)	0.475	4.34	0.796	
Tectona grandis (Teak)	0.329	2.46	0.215	

The percentage log and lumber recoveries for the five species are shown in Figure 8.4. For the log recovery Teak, Emire (from plantation) and Emire (from the forest) scored 94.41%, 86.76%, and 81.99% respectively which was followed by Dahoma (70.13%) and Danta (65.96%). With respect to the lumber recovery the minimum and maximum values recorded were 32.01% (for Dahoma) and 56.68% (Emire from the forest) respectively. The comparatively low recoveries of Dahoma and Danta were due to some defects as described in Appendix 8.1. For this technology even though the maximum value of about 57.68% is lower than those that have been established by

Frimpong-Mensah (2004) and Gyimah and Adu-Gyamfi (2009), its minimum value of 32.01% is quite higher than theirs. The mean percentage lumber recovery for the Husqvarna machine when operated at freehand was 42.3% whilst thoseat of Frimpong-Mensah and Gyimah and Adu-Gyamfi (2008) were 40% and 51% respectively¹⁹.

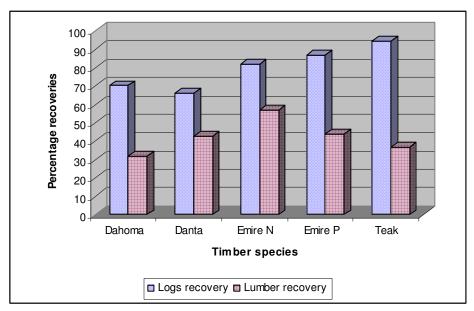


Figure 8.4: Log and lumber recoveries for five species milled Husqvarna 395XP

The production rates for the technology under discussion varied from $0.384 \text{ m}^3/\text{hr}$ (for Dahoma) to $0.756 \text{ m}^3/\text{hr}$ (for Emire from the forest) with a mean average rate of $0.534 \text{ m}^3/\text{hr}$ (see figure 8.5). This means that working for 8 hours in a day, two operators and two assistants with one Husqvarna chainsaw machine will produce a lumber volume of 4.27 m^3 of any of the five species being discussed and possibly other equivalent densities.

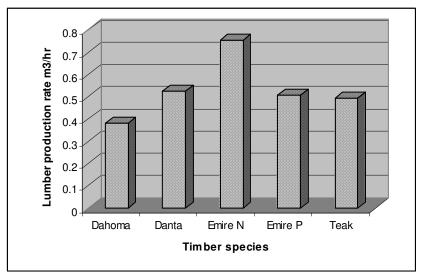


Figure. 8.5: Lumber production rate for freehand milling for five species with Husqvarna 395XP

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¹⁹ Note that the type of machine used for the milling was not stated in these studies

Fuel consumption on the other hand ranged from 6.78 lit/ m³ to 13.45 lit/ m³ for Emire from natural forest and Emire from plantation as indicated in figure 8.6. The difference might be due to the age and other characteristics of the species (Appendix 8.1). The fuel used in milling one cubic meter each of Dahoma and Danta were recorded as 9.58 lit/m³ and 9.28 lit/m³ respectively. The mean average fuel consumption rate for the five species was 9.56 lit/ m³.

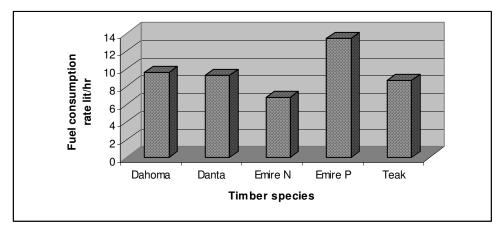


Figure 8.6: Fuel consumption rate for milling five species with Husqvarna 395XP

8.3.2 Milling with Attachments

Husqvarna 395X with frame attachment

Table 8.5 gives the mean diameters, length and volumes of the four species. The range of the mean diameters is from 0.333 m to 0.654 m. With the exception of teak, a plantation species, all the others exceeded the national felling limit at diameter at breast height (dbh). The mean length and volumes of the logs varied from 2.67 m (for Teak) -3.72 m (for Dahoma) and 0.229 m (for Teak) -0.991 m (for Danta).

Table 8.5: Mean dimensions of logs milled with Husqvarna chainsaw and frame attachment

	Mean log	Mean log	Mean log	
Timber species	diameter	length (m)	volume	
	(m)		(m^3)	
Piptadeniastrum africanum (Dahoma)	0.654	3.72	0.918	
Nesogordonia papaverifera (Danta)	0.616	3.28	0.991	
Terminalia ivorensis (Emire – Forest)	0.56	3.67	0.979	
Tectona grandis (Teak)	0.333	2.67	0.229	

The recoveries of logs and lumber from the four species range from 73.65% to 92.35 and 41.38% to 49.85% respectively (see Figure 8.7). The mean lumber recovery is 46.31%, which is above the 40% determined by Frimpong-Mensah (2004). On the other hand, it is lower than the 51% that estimated by Gyimah and Adu-Gyamfi (2009) during thefor sawmill recovery. studies (51%). tThe estimated 46.31%

recovery for the Husqvarna 393X with frame attachment is higher than the mean lumber recovery for small-scale sawmills of 39.72% reported by Gyimah and Adu-Gyamfi (2009). Even though operators were trained on the handling of this new machine alongside the study, the result isit is an improvement over the traditional freehand chainsaw milling.

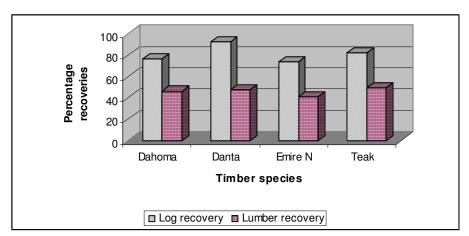


Figure 8.7: Logs and lumber recoveries for four species milled with Husqvarna 395XP and frame attachment

The rate at which lumber was generated from the four timber species varied from 0.348 m³/hr (Teak) to 0.481 m³/hr (Danta) with a mean rate of 0.434 m³/hr. From figure 8.8 the production rates for the species were very close except Teak. Again, with two operators, two assistants and one Husqvarna machine with a frame attachment, 2.78 m³ of teak and 3.85 m³ of Danta could be produced in 8 hours (one working day).

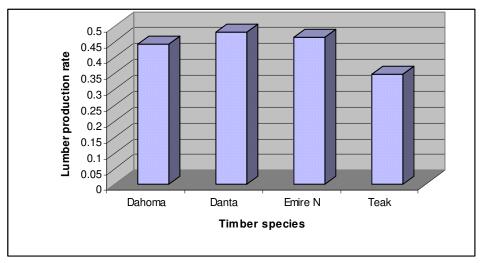


Figure 8.8: Lumber production rates for four species milled with Husqvarna and frame attachment

Figure 8.9 shows the fuel consumption rates for four commercial timber species. The fuel consumption rate for Dahoma (14.51 lit/ m³m3) was the highest followed by

Emire (from the forest) and Danta with rates 12.04 lit/m³ and 10.99 lit/m³ respectively whilst Teak trailed with 8.77 lit/m³. These indicate that lesser mixed fuel was used to generate a cubic meter of teak lumber than the rest of the species, especially Dahoma.

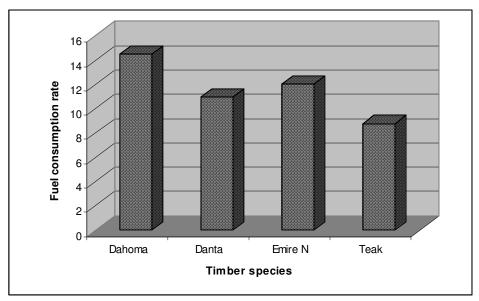


Figure 8.9: Fuel consumption rates for four species milled with Husqvarna and frame attachment

From the above discussion it can be deduced that freehand milling of Emire species is comparatively more efficient than the rest. Chainsaw lumbering of teak is less efficient. Generally the quality of lumber produced was assessed to be better as compared to those that are produced by those who undertake the activity illegally. This was based on direct expert observation of cutting smoothness.

Milling with logosol attachment

The lumber recovery, production rate and fuel consumption rate for four timber species that were milled using MS880 with logosol attachment have been indicated in table 8.6.

Table 8.6: Lumber production efficiency with logosol attachment

Species	Lumber recovery %	Production rate m3/hr	Fuel consumption rate Lit/m3
Dahoma	61.08	0.565	6.649
Bompagya	61.91	.697	7.795
Emire N	52.11	0.401	9.317
Teak	48.2	0.26	14.253

The percentage lumber recovery varied from 48.2% to 61.91%. In this case Bompagya and Dahoma had 61.91% and 61.08% lumber recoveries while Teak and Emire (from the forest) recorded 48.2% and 52.11% respectively (figure 8.10). These indicate a higher generation of lumber from Bompagya and Dahoma than Emire and Teak.). The mean average recoveryof was 55.8% recorded, which is higher than those established with freehand milling with Stihl 070 (40%) and from some sawmills in Ghana (51%) as reported by Gyimah and Adu-Gyamfi (2009)(51%). Meanwhile, as

indicated in figure 8.10, log recoveries were higher with Teak (74.83%) and Emire from the forest (70.92%) than Dahoma (70.56%) and Bompagya (55.37%).

The trend is the same with lumber production rate whereby Bompagya and Dahoma recorded 0.697 m³/hr and 0.565 m³/hr respectively while Emire and Teak had 0.401 m³/hr and 0.26 m³/hr in that order (see figure 8.11 and Table 8.6).

The rate at which fuel was used in generating a cubic meter of lumber was higher for Teak (14.25 lit/ m³) and lower for Dahoma (6.649 lit/ m³) as shown in figure 8.12. From the results, more fuel was used in milling Teak and Emire than it was used for Dahoma and Bompagya.

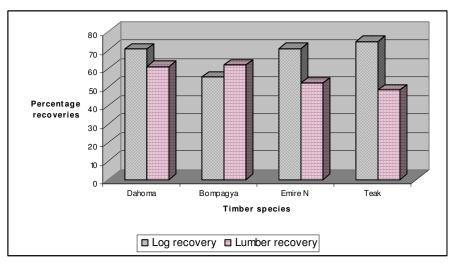


Figure 8.10: The logs and lumber recoveries for four species milled with Logosol and Stihl MS880

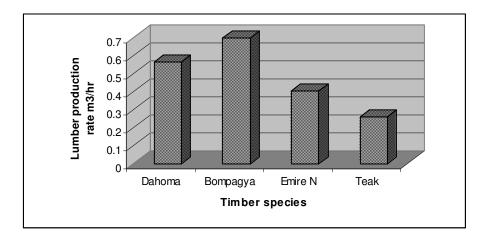


Figure 8.11: The lumber production rates for four species milled with Logosol and Stihl MS880

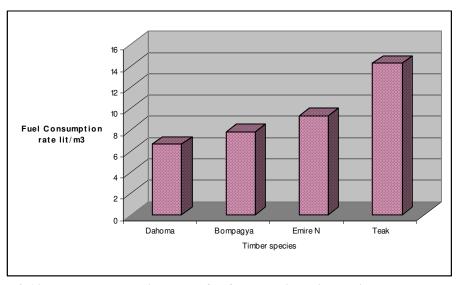


Figure 8.12: Fuel consumption rates for four species milled with Logosol and Stihl MS880

8.3.3 Comparison of the two Freehand- milling machines

In comparing Stihl 070 and Husqvarna 395X machines that were used for freehand milling of some timber species, table 8.7 provides the detail descriptions. The Stihl machine recorded higher recovery values for three of the five species (Dahoma, Danta and Emire (from plantation)) while Emire (from forest) and Teak were higher with Husqvarna 395XP (figure 8.13). Even though there is no particular trend it could be stated that freehand milling of Dahoma, Danta and Emire (from the forest) using Stihl will generate more lumber than Husqvarna machine. Again, with the average mean recovery values, Stihl recorded 47.06% and as against 42.32% for the Husqvarna machine. So generally Stihl machine had an advantage over the Husqvarna machine.

Table 8.7: Efficiency values for Stihl and Husqyarna machines

Timber species	% lumber		Lumber		Fuel	
	recovery		production rate		consumption	
					rate	
	Stihl	H.	Stihl	H.	Stihl	H.
		395X		395X		395X
Piptadeniastrum africanum (Dahoma)	46.17	32.01	0.539	0.384	9.237	9.58
Nesogordonia papaverifera (Danta)	47.77	42.65	0.429	0.526	9.629	9.28
Terminalia ivorensis (Emire – Forest)	51.29	56.68	0.625	0.756	5.666	6.78
Terminalia ivorensis (Emire – plantation)	53.89	43.6	0.662	0.506	7.815	13.45
Tectona grandis (Teak)	36.17	36.67	0.33	0.496	7.578	8.71
Mean	47.07	42.32	0.517	0.534	7.985	9.56

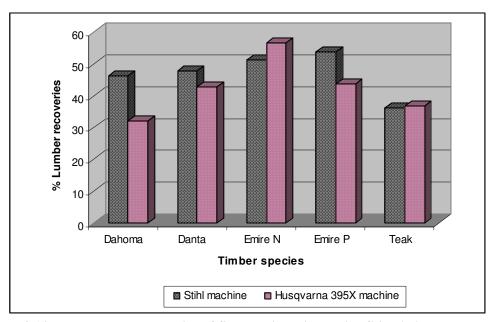


Figure. 8.13: The lumber recoveries of five species milled with Stihl 070 and Husqvarna 395XP

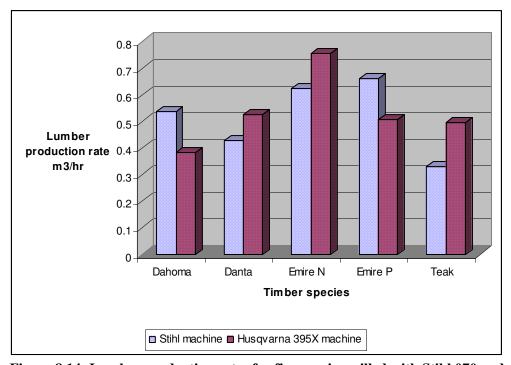


Figure 8.14: Lumber production rates for five species milled with Stihl 070 and Husqvarna 395XP

In terms of the lumber production rate, there is no consistent trend as seen from table 8.7 and figure 8.14, but the mean averages of Stihl and Husqvarna registered 0.517 m³/hr and 0.534 m³/hr respectively, hence the rate of producing lumber from the five species is higher with Husqvarna than with the Stihl.

With the fuel consumption rate, the values for the Stihl were lower with four of the species while Husqvarna was better with only Danta (Figure 8.15). Still the trend is

not clear but the mean averages indicate that the fuel consumption for the Husqvarna was higher (9.56 lit/ m³) than with Stihl 070 (7.99 lit/ m³).

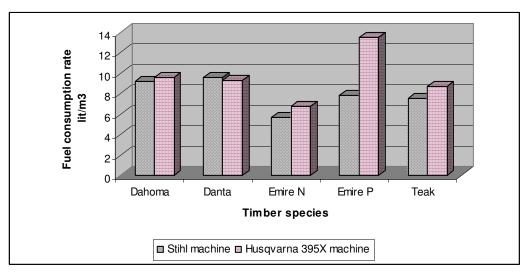


Figure 8.15: Fuel consumption rates for five species milled with Stihl 070 and Husqvarna 395XP

8.3.4 Comparison of the two Attachment milling machines

The means of the percentage lumber recovery, production rate and fuel consumption rate for three timber species milled using Stihl MS880 chainsaw with logosol rail attachment (Logosol) and Husqvarna 395XP chainsaw with frame attachment (HFA) are shown in table 8 and 8.8 and graphically in figures 8.16-8.18. From the table 8.8 and figure 8.16, the recoveries for Dahoma and Emire from the natural forest are higher with Logosol than with the Frame attachment. The mean averages for logosol and Frame attachment are 53.8% and 45.8% respectively, Logosol having an edge over the Frame attachment.

Table 8.8: Efficiency values for Stihl MS 880 with Logosol attachment and Husqvarna 395X with frame attachment

Timber species	% lumber recovery		Lumber production		Fuel consumption		
				rate		rate	
	Logosol	HFA	Logosol	HFA	Logosol	HFA	
Piptadeniastrum africanum	61.08	46.26	0.565	0.443	6.649	14.51	
(Dahoma)							
Terminalia ivorensis (Emire -	52.11	41.38	0.401	0.463	9.317	12.04	
Forest)							
Tectona grandis (Teak)	48.2	49.85	0.26	0.348	14.253	8.77	
Mean	53.8	45.8	0.409	0.418	10.07	11.77	

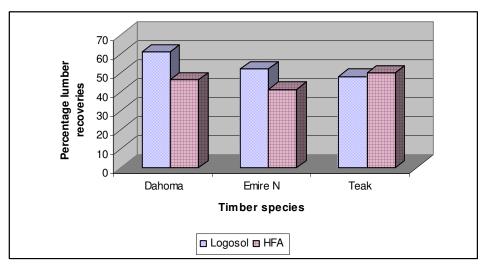


Figure 8.16: Lumber recoveries for three species milled with Logosol & Frame attachments

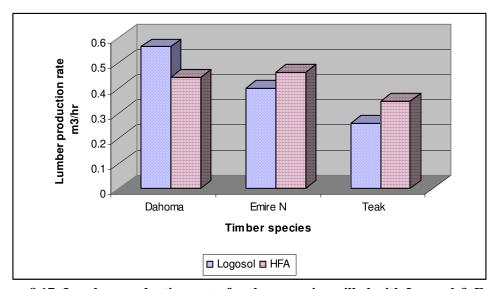


Figure 8.17: Lumber production rates for three species milled with Logosol & Frame attachments

With the lumber production rate, the Frame attachment recorded higher values for Emire (from the forest) and Teak than with the Logosol (Figure 8.17). Mean averages of 0.418 m³/hr and 0.409 m³/hr were obtained estimated for the Frame attachment and Logosol respectively. So the rate of producing lumber was higher with the Frame Attachment than with the Logosol. The fuel consumption rates were higher in milling Dahoma and Emire (from the forest) with the Frame attachment while Logosol was higher for milling Teak (Figure 8.18). In milling any of the species in question, mean average fuel consumption rates of 10.07 lit/ m³ and 11.77 lit/ m³ for Logosol and Frame attachment respectively are estimated, implying that Logosol consumed lesser fuel than the Frame attachment.

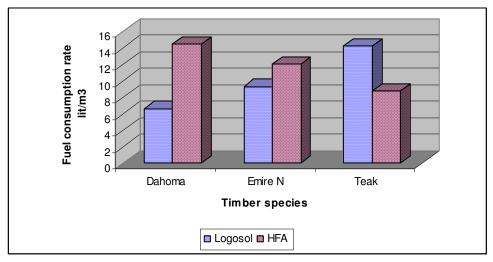


Figure 8.18: Fuel consumption rates for three species milled with Logosol & Frame attachments

8.3.5 Comparison of Freehand and Attachment milling machines

Table 8.9 and figures 8.19-8.21 show the means of the percentage lumber recovery, production rate and fuel consumption rate for four timber species that were milled with Freehand (Stihl 070 & Husqvarna 395XP) and Attachments (Stihl MS880 chainsaw with rail attachment (Logosol) and Husqvarna 395XP chainsaw with frame attachment). The lumber recoveries were better with the Attachment machines than with the Freehand milling machines. The range of values for the Attachment machines is 43.95% (for Emire from the forest) to 57.84% (for Dahoma) and 36.53% (for Teak) to 54.71% (for Emire from the forest) for freehand machines (figure 8.19). From the mean averages the Attachment milling machines had a higher percentage lumber recovery of 49.56% as against 43.49% for the Freehand milling machines. There is a clear indication that milling timber with attachment will increase the quantity of lumber in terms volume by 6.1%.

Table 8.9: Efficiency values for Freehand and Attachment milling machines.

Timber species	% lumber recovery		Lumber production		Fuel consumption	
			rat	rate		e
	FHM	AM	FHM	AM	FHM	AM
Piptadeniastrum africanum	36.86	57.84	0.461	0.539	9.379	8.023
(Dahoma)						
Nesogordonia papaverifera	45.81	47.84	0.478	0.482	9.435	10.971
(Danta)						
Terminalia ivorensis (Emire -	54.71	43.95	0.705	0.445	6.4	11.165
Forest)						
Tectona grandis (Teak)	36.53	48.59	0.433	0.273	8.371	13.195

Notes: FHM = Freehand milling machines AM = Attachment milling machines

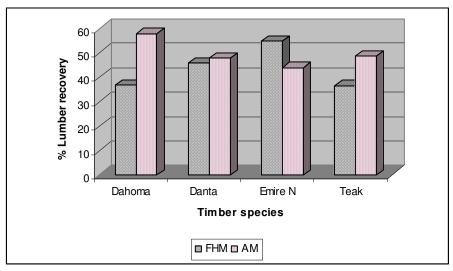


Figure 8.19: Lumber recoveries for four species milled with Freehand & Frame attachments

Milling with attachment generated higher lumber production rates for Dahoma and Danta while the freehand machines recorded better rates for Emire and Teak as shown in figure 20. The established production rates for the species varied from 0.433 m³/hr to 0.705 m³/hr for freehand milling machines and that for Attachment milling machines were from 0.273 m³/hr to 0.539 m³/hr (Table 8. 9). On the mean averages, freehand milling recorded 0.519 m³/hr while Attachment machines registered 0.435 m³/hr. This means that generally more lumber were produced from these species with freehand milling per given time than with the Attachment machines.

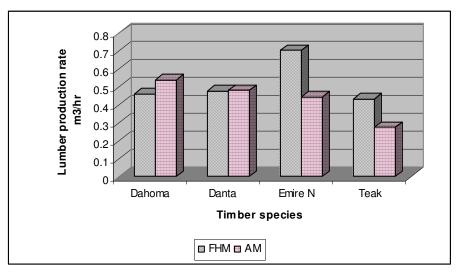


Figure 8.20: Lumber production rates for four species milled with Freehand & Frame attachments

For the fuel consumption rates, freehand milling consumed comparatively lesser quantities of mixed-fuel mixed for Danta and, Emire (from the forest) than was used with the Attachment machines as shown in table 8.9 and figure 8.21. The minimum and maximum consumption rates for both the Freehand and Attachment were 6.4 lit/ m³ & 9.4 lit/ m³ and 8.0 lit/ m³ and 13.2 lit/ m³ respectively. On the whole, the fuel

consumption from the mean averages was lower with the Freehand machines (8.4 lit/ m³) than with the Attachment machines (10.84 lit/ m³).

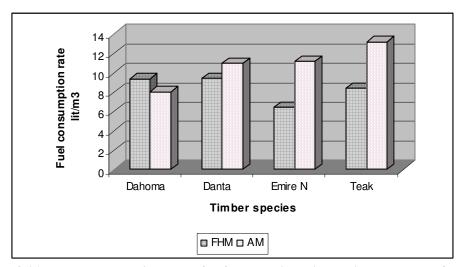


Figure 8.21: Fuel consumption rates for four species milled with Freehand & Frame attachments

8.3.6 Cost effectiveness ratios for four technologies

Table 8.10 describes the cost effectiveness ratios of using four technologies (Husqvarna Freehand (A), Husqvarna with attachment (B), Stihl freehand (C) and logosol (D)) to produce lumber from five tree species. It is important to note the cost data were not discounted due to the fact that data could not be collected over a longer period of time.

Table 8.10: Cost effectiveness ratios of using four technologies (A, B, C, D) to produce lumber from 5 tree species

	Husqvarna freehand		Husqgvarna with a	ttachment	Stihl freehand	
				Total fuel		
		Total fuel cost/	Total cost/	cost/ lumber	Total cost/	Total fuel
	Total cost/lumber	lumber	lumber	volume	lumber	cost/ lumber
Species	volume(GHC/m ³)	volume(GHC/m ³)	volume(GHC/m ³)	(GHC/m ³)	volume(m ³)	volume(m ³)
Dahoma	78.71	24.19	136.75	36.60	91.53	26.06
Danta	77.96	23.44	127.83	27.67	92.63	27.17
Emire (P)	88.48	33.96	130.52	-	87.52	22.05
Teak	72.45	17.93	-	21.93	86.85	21.38
Emire (N)	71.65	17.13	122.09	30.36	81.45	15.99
Total cost/m ³	76.07	21.55	131.64	31.48	88.38	22.91
rank of totals	1	2	3	4	2	3

Source: Processing data 2009

Table 8.91: Continue

	Logosol	
	Total cost/lumber	
Species	volume(GHC/m ³)	Total fuel cost/volume of lumber (m ³)
Dahoma	-	6.648938
Bompagya	-	7.794971
Emire	-	9.316773
teak	-	15.02703
Total cost/m ³	-	7.50068
Rank of totals		1

Source: Processing data 2009

Considering the overall fuel which include both petrol and engine oil used in processing the trees into lumber using these four technologies (A, B, C and D), the cost effectiveness ratio of D is the least implying that the least amount of fuel in Ghana cedis is used to produce one cubic meter of lumber from the specified tree species.. The next technologies with the smaller CE ratios are the Husqvarna with freehand (A) and the stihl with freehand(C) respectively. The Husqvarna with attachment has the highest ratio also implying that it is the least efficient in terms of fuel consumption. On tree species basis, D is still the most efficient technology in terms of fuel consumption, though in the other technologies Bompagya was not processed. For the remaining technologies A, B and C, B has the highest ratios for all species. However, in the case of A and C, A performed better (has the smallest ratios) in terms of fuel consumption for Dahoma, Danta, and teak, while C is better or consumed the least fuel in the processing of Emire (N) natural forest and Emire (P) plantation forest. Regression analysis run on volumes of lumber produced from these species as dependent variable and fuel consumption and other technical explanatory variables of these trees (De Lasaux et al. 2004) could provide further confirmation to these findings.

In terms of the overall cost of producing lumber from these species using these technologies i.e. A, B and C, A has the least cost effectiveness ratio followed by C. The Husqvarna (B) technology with attachment has the highest ratio, implying that it is the least efficient, while Husqvarna with freehand (A) is the most efficient. One explanation for these findings may be that, it takes time for the attachment to be fixeddone to the Husqvarna machine that is why the one without the attachment performs better in terms of cost. Available data for the logosol which also has attachment is not there for a comparison to be made to ascertain the real cause of the lower performance of the Husqvarna technology with attachment. However, one other explanation for its low efficiency in terms of cost may be that the attachment does not really fit well for this technology since the Husqvarna and the attachment seemed to have been made by different companies.

8.3.7 Factors influencing processing efficiency

Some factors that affected or could have influenced the recovery rates of the study included:

The skill of chain saw operators – Trees felled were all directed to an area whereby minimum damage was caused to the ecology of the area. Again, no tree got broken or

cracked at its merchantable portion. Thick and thin, which lowers lumber grade and increases residues generation was minimal.

Market demand – This was a factor that was experienced when the operators kept on advising the project team to allow them to cut only some specific dimensions that had easy market. Moreover, operators carefully milled dimensions pecies that were in high demand.

Defects in logs – It was observed that the operators did not want to "waste" their time to mill logs that were defective, especially hollow logs, no matter the degree of the defect. They also did not want to mill buttressed and small diameter (branch woods) logs.

8.3.8 Field observations

To minimize cost of labour (in carrying lumber to accessible road) and transportation, trees were felled closed to accessible roads

One-face cutting technique was used by the operators. In this case, an initial cut made gives an open face for the log to be turned or rotated at an angle of 90 degrees. This makes the log stable for further cuttings to be undertaken to remove slabs at the opposite sides of the log. It was in one occasion that all slabs were removed from all the four sides.

With two of the milling technologies used (Freehand milling with Husqvarna 395XP, Husqvarna 395XP with frame attachment), the operators learned its handling in the cause of the study.

The sample sizes for some of the tests were not representative enough hence parameters determined are not conclusive, even though the results are comparable to other studies that have been made. Therefore additional data will make the results more potent.

Time did not allow the researchers to vary lumber dimensions to establish the variations or trend in their recoveries. Dimensions were cut based on the maximum recovery and those that were found on the timber market of Ghana.

Again, because of the limited time, recoveries based on density classes were not considered even though we could not find any authentic information in the Ghanaian timber industry.

Operators used black markers (a cylindrical cord of about 1-2 mm diameter, put in a mixture of water and carbon extract from used dry cell batteries) to make lines through the entire length of the log on one face of the slabbed log (at top face). This directs the operators, especially the unskilled, to keep the cutting straight, thereby minimizing waste.

In most cases fuel was allowed to overflow and ran around the machines

It was observed that Rroutine maintenance of the machines was observed not to be strictly adhered to. The operators waitedy wait until the machine stops functioning or the part involved is completely destroyed.

Skilled operators could produce better quality lumber and increase recoveries under security-free working conditions (no ban but operational rules engulfing chain saw operation)

The quality of lumber generated with the frame and logosol rail attachments were comparable to that of sawmill lumber.

8.4 Conclusion

The conversion efficiency ratios (lumber recovery/yield, production rate and fuel consumption rate) have been established for four milling technologies that were used based on the number of timber species and trees felled. The average diameters of the trees felled from the forest were all above the felling.51 lit/m3. Comparison of the efficiency ratios of the freehand and attachment milling technologies(using the same species for all of them) reveals that percentage lumber recovered was higher with the attachment technology (49.6%) than that of the freehand (43.5%). In terms of the lumber produced per hour, freehand technology recorded a higher rate. limits of 50 cm dbh. The average recovery rates for the four technologies ranged between 36% and 61.9%. The lumber production rate also varied from 0.26 m³/hr to 0.76 m³3/hr while the fuel consumption rates were estimated to be between 5.67 lit/m³3 and 14of 0.52 m³/hr as against 0.43 m³/hr for the attachment technology. The fuel consumption rates of 8.4 lit/m³ and 10.8 lit/m³ were computed for the freehand and attachment technologies respectively.

The main conclusion from the CEA findings is that the Husqvarna freehand technology seemed more efficient in terms of cost in the production of lumber.. In terms of fuel consumption, the logosol is the most efficient in relation to the others technologies technologies A, B and C. It is important to point out again that the data were not discounted to obtain these results and the findings for a more definite conclusion to be drawn. These results could change if the data were discounted (Potts, 2002) using discount rate to obtain present value of cost and the effect data.

Chapter 9

INVESTMENT IN CHAINSAW MILLING COMPARED TO IMPROVED CHAINSAW MILLING IN EIGHT FOREST DISTRICTS OF GHANA

Lawrence Damnyag and Beatrice Darko Obiri

7 6

9.1 Introduction

Though chainsaw lumber production for commercial use has been banned since 1998, the activity is being carried out in the various forest districts of the Ghana as one of the informal economic activities in the rural communities. The continuous existence of this activity is attributed to inadequate supply of legal lumber to the domestic market, weak law enforcement and governance structures (Odom 2005) among others in the supply side. In the demand side, estimated lumber demand of the furniture and construction industry alone has been found to be more than 95 percent of the total local lumber demand. This implies there is a large and ready market for the chainsaw lumber that supports it continuous existence. It is therefore not surprising that Chainsawn lumber has been found to constitute more than 70 percent of the lumber retailed locally in the country. One other important underlying cause for the existence of this business is probably the profit accruing to the chain of actors engaged in this business. Profit is the ultimate motivating factor that would attract one to investment capital into a business, as such if there were no profits generated from this activity, actors would probably have diverted their capital, skills, expertise and time into other ventures that would be more profitable to them.

However, the distribution of the benefits of chainsaw lumber production seemed to be skewed favorably to one category of actors, particularly the lumber dealers. Odom (2005) found most of the benefits from chainsaw lumbering to be accruing to lumber dealers, with the local communities serving mainly as carriers of lumber and chain sawing equipment to and from the stump to the nearest roadside. In support of this fact, this study found that about 60-80 percent of the chainsaws used in chainsaw lumber production belong to these lumber dealers located far from the source of the timber. This probably justifies why these dealers should take a larger share of the chainsaw lumbering proceeds, since they provide the main investment capital and equipment. This however seem to defeat the purpose of chainsaw lumbering serving as one source of livelihood for local communities, and the individuals chainsaw operators that undertake chainsaw operation. It seems most of these chainsaw operators are being sponsored by these dealers to produce the lumber for sale to them at a much lower price than what pertains in the market. This tends to make it difficult for the local community members and the chainsaw operators to have any significant control over the profits accruing from chainsaw lumbering.

From the forgoing arguments local communities including chainsaw operators seem not to benefit much from chainsaw lumber production. Therefore the research questions addressed in this study are;

- Is the investment cost in chainsaw milling affordable to the local community members including the chainsaw operators/chainsaw millers?
- What are the actual costs of the required inputs?

- What are the operational costs?
- What are the returns on investments in chainsaw milling compared to the use of improved chainsaw-milling

In line with these questions the overall objective of this study is to determine the nature and cost of investments in chainsaw milling compared with improved chainsaw milling. Specifically, this study seeks to analyze capital investment, cost of raw materials in chainsaw milling compared with improved chainsaw-milling.

9.2 Methodology

9.2.1 Sampling and data collection

Through review of literature and other secondary documents, a checklist on investments issues in chainsaw milling was developed and discussions held with chainsaw lumber operators in two sites of the study areas. From these discussion fora, questionnaire on the cost of investment in chainsaw milling was designed and pretested in September 2008. Modifications were made to allow for ease of interviewing, avoid fatigue of respondents as well as bias responses. The selection of individual chainsaw operators to be interviewed in the eight forest districts did not consider the total population of chainsaw operators in these areas to get the sample since this number could not be established. Rather, selection was based on the individual respondent's availability and willingness to respond to the questionnaire at the time of the visit for the interview by the trained enumerators. This was done because chainsaw lumber production and sale is an illegal activity in the country and as such operators work in a clandestine manner in order to avoid being caught by the law enforcement agencies and the Forestry officials monitoring their activities. To allay the fears of these operators and enable them to participate in the interviews, the interview team accessed the operators through special community facilitators engaged by the EU chainsaw project and located in the study areas.

These community facilitators organised the operators in the communities for the interview. Face-to-interview was done with these individual chainsaw operators using simple random sampling of the total number of operators assembled for the interviews in September-November 2008. The issues included in the interview were;

- Information on most recent chainsaw operation in 2008. This involved species, number of standing trees cut and number of pieces of lumber of the various dimension obtained.
- Information on all other chainsaw lumber operation within 2008. This covered the species, number of standing trees cut, number of lumber obtained, price sold per piece, cost of tips/bribes paid to police at the various check points on the road, forest guards and range supervisors of the Forest Services Division and the Task Force Team, and village/community barriers and check points.
- Cost of operation including; labour employed (numbers) and amount paid per each (based on the most recent operation); Cost of capital equipments used in most recent operation; list of capital equipment, quantity and unit price per each.

- Recurrent/variable cost items for the most recent operation, involving the cost item and total value of the item.
- Gross revenue obtained from sale of lumber produced during the most recent operation. This entailed the total lumber produced and price sold per unit.
- The source of funding for the chainsaw lumber production and main customers of the lumber produced. These were asked in order to determine the sponsors of chainsaw lumber production.

9.2.2 Improved chainsaw milling

For the improved chainsaw milling activity, a search for a type equivalent to the chainsaw milling was made in the project sites through a survey of small scale saw millers such as mobile and static bush mills and bench saws, focusing on the capital equipment they use. For 15 of the static small scale saw milling entities found, three use the wood mizer; nine use the bench saw and one use band saw. From all indications, though the use of this machinery to process wood may be an improvement on wood processing than chainsaw milling where only the chainsaw machine is the main equipment used, the two processing systems are not similar. While with chainsaw milling the processing is done in-situ, wood mizer processing is done by transporting logs to the site where this machine is located. For the bench saw, the processing is done in the timber market mostly where these machines are also located and its raw materials are the chainsaw beams and lumber in the market.

These technologies for wood processing involving the use of these machines are therefore not similar to the chainsaw operation technology. Therefore closer technology to the chainsaw operation was employed for the comparison using the activities of ITTO project 143/06. The main machine used in this ITTO project is the M7 (Logosol from Sweden). It is a specially designed carriage mill with a number of accessories which enable it to process wood in a more refined way than the ordinary chainsaw machine. This ITTO project has employed this logosol technology to process trees on farmlands for the farmers in its project sites in Asangragwa and Dunkwa forest districts in the Western and Central regions respectively. The aim of this ITTO project is to enable farmers benefit from the trees on their farmlands. In this way it is the hope of the project that illegal chainsaw operations would be minimized and farmers would also nurture and protect trees on their farmlands.

9.2.3 Data collection for the improved chainsaw milling

The key data for the improved chainsaw milling analysis were on the timber processing and marketing activities. These were collected from the records mainly from the processing and marketing activities of Ankaasie community in the Western region from August to November 2008. This was intentionally done to coincide with the time when the chainsaw milling survey was done to collect its primary data. The basic reason for this was to allow for the same conditions to prevail on the two systems of lumber production for a fair comparison to be made.

9.2.4 Study area

The distribution of the number of individual chainsaw operators in their respective villages/communities where they were interviewed across the 8 forest districts of the EU chainsaw project sites are indicated in Table 9.1. The number of operators interviewed in the various forest districts was based on the operators' availability,

accessibility of their locality and their willingness to participate in the interview. In the case of the improved chainsaw milling, the study area was Ankaasie community in the Asangragwa Forest district as earlier indicated.

9.2.5 Analysis of data

The information collected from the interview was processed and analysed in SPSS using graphs, frequency tables and statistical tests including differences in means tests involving one tail and two tail t-tests. This was to help understand the distribution and variability of profit margins of the individual respondents across the study forest districts. These tests were also done to determine significant difference between costs of production and profit margins of chainsaw operators engaged in the chainsaw activity across the 8 forest districts in the project sites. The net revenue of these chainsaw operators were computed in relation to the pieces of lumber sold. These net revenues were also computed in relation to volume of lumber (M3) sold, though generally these operators do not sell their lumber on volume basis but rather by pieces. Improved chainsaw milling data were also analysed in a similar way to compare the cost, revenue items and the profit margins between the two production systems.

Table 9.1: Distribution of chainsaw operators across the project districts

	Forest D	Forest Districts and the number of chainsaw operators interviewed							
Village/Commu									
nity	Sunyani	Juaso	Begoro	Kade	Assin Fosu	Oda	Goaso	Nkawie	Total
Nkankama	0	0	2	0	0	0	0	0	2
Fawohoyeden	0	0	0	0	0	0	1	0	1
Akrodie	0	0	0	0	0	0	9	0	9
Assin Andoe	0	0	0	0	5	0	0	0	5
Asuakwa	3	0	0	0	0	0	0	0	3
Ayibye	6	0	0	0	0	0	0	0	6
Begoro	0	0	11	0	0	0	0	0	11
Onumabo	0	0	0	0	0	4	0	0	4
Osuoye junction	0	0	1	0	0	0	0	0	1
Pramkese	0	0	0	19	0	0	0	0	19
Oda newtown	0	0	0	0	0	1	0	0	1
Akromso	0	0	1	0	0	0	0	0	1
Feyiase	0	0	3	0	0	0	0	0	3
Assin Fosu	0	0	0	0	2	0	0	0	2
Akwansirem	0	0	1	0	0	0	0	0	1
Obogu	0	9	0	0	0	0	0	0	9
Kyekyewere	0	0	0	0	0	0	0	7	7
Apanimade	0	0	0	0	0	0	0	5	5
Techiman	3	0	0	0	0	0	0	0	3
Total	12	9	19	19	7	5	10	12	93

Source: Survey data 2008

9.3 Results and discussion

9.3.1 Investment analysis in chainsaw milling

2.3.1.1 Aggregate cost and revenue analysis for the most recent operation

Table 9.2 describes the cost and revenue analysis in chainsaw lumber production for the most recent chainsaw operation in 2008. It involves the activities of 90 individual chainsaw operators distributed across the 8 forest districts in the project sites. The cost of chainsaw lumber production is classified into three broad headings of labour, variable items and payments in the form of tips/bribes to facilitate access to the trees and movement of the products on the road to the market centers (Table 2.3).

Table 9.2: Cost and revenue analysis of chainsaw lumber production (n = 89)

Cost and revenue	Total amount (GH¢)	%of total cost	Mean ((GH¢)
Cost			
Labour cost	55626.91	44.5	625
Variable cost Tips/bribes	50282.56	40.2	565
payment	19135	15.3	215
Total cost	125004.3		1405
Revenue			
Gross revenue	144234.2		1621
Net revenue	19229.88		

Source: Survey data, 2008

Labour is the highest cost element for the chainsaw lumber production for these chainsaw operators. It takes over 44 percent of the total cost of production. As one single operator can not perform all the functions of processing the wood for sale alone, the services of other members outside and within the community are usually engaged. These include the loading and off loading assistants, miller/feller, scout, and carriers/head porters. Similar categories of employees have been found to be engaged in chainsaw lumber production in the country (Adam et *al*, 2007; Sarfo-Mensah 2005 and Odum 2005).

The variable cost which takes 40.2% of the total cost of chainsaw lumber production includes;

- repair/maintenance of chainsaw machine
- Purchase of accessories such as chain, files for sharpening the chain, etc
- Petrol and engine oil to power the chainsaw machine
- Others, such as payment of interest on loans contracted to do the processing.

Payments such as tips/bribes take 15% of the total cost of the chainsaw lumber production. Most of these payments are made to enable the operators to have access to the trees to process and facilitate movement of processed lumber from the bush to the market centers. These payment include

- Payments for the trees from the farmer
- Payments to Forest Services Division Officials (mostly the range supervisors in charge of the forest area)
- Payments to the task force involving a combined team of military, police and forestry officials
- Compensation to farmer, in case his crops are destroyed in the process

- Commission to farmer, if he offered some assistance to the operator in the course of milling
- Payments at community check points mounted by community members
- Offer of drinks to the traditional ruler or the local chief in the area

The fixed cost items include barely a chainsaw machine and jack to prop the log to allow for milling. In computation of the chainsaw lumber production costs, the cost of these fixed items could not be included, basically because the data was cross sectional one taken only at the time of interview with the chainsaw operators. Also it was difficult to account for how much of the machine and the jack is used for this short period in terms of depreciation cost.

9.3.1. 2 Average cost of chainsaw lumber production in study areas for the most recent operation

The average costs of chainsaw lumber production for the most recent operation in 2008 for the different components and across the project sites are described in figure 9.1. Expenditure on tips and bribes chainsaw operators pay is relatively lower than the remaining cost items of labour and the variable items. Except in the Assin Fosu forest district where there is a significant difference in cost between labour and variable items, these two cost items seem to be very closed in the remaining districts.

This is quite reasonable in the sense that fuel, lubricant and labour costs that are the most significant cost items in this chainsaw lumber production do not differ much across and within these districts.

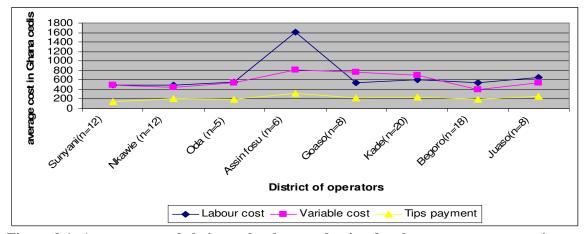


Figure 9.1: Average cost of chainsaw lumber production for the most recent operation across the eight forest districts of the study area, 2008 (n= number of chainsaw operators interviewed)

Further, though the cost for payments on tips/bribes is lower than that of the labour, fuel and lubricant costs, it does not also differ significantly across the districts, implying that the payment for trees, task force, community check points and forest guards and range supervisors is not significantly different from one forest district to another.

9.3.1.3 Revenue and cost analysis for the individual chainsaw operators interviewed on the most recent operation

Individual chainsaw operators interviewed in the first four districts have seen many more of them performing impressively in terms of the differences between their gross revenues and costs. For instance, in Juaso only 2 (25%) individuals made losses (figure 2.2). In Nkawie about 5(45%) made losses (figure 2.3) and only 1(12.5%) person made a loss in Goaso (figure 9.4). In Nkawie an outlier figure provided by operator number 5 was dropped in the analysis hence the break in the gross revenue graph.

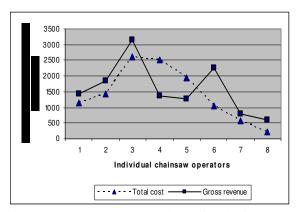


Figure 9.2: Gross revenue and cost for chainsaw lumber production for 8 chainsaw operators in Juaso Forest districts for the most recent chainsaw operation in 2008

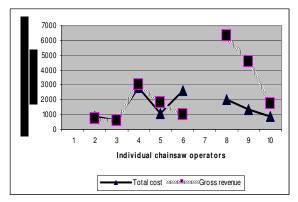


Figure 9.4: Gross revenue and cost for chainsaw lumber production for 8 chainsaw operators in Goaso Forest districts for the most recent operation in 2008

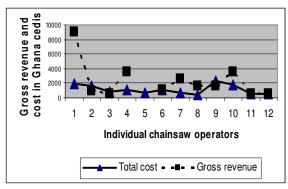


Figure 9.3: Gross revenue and cost for chainsaw lumber production for 11 chainsaw operators in Nkawie Forest districts for the most recent operation in 2008

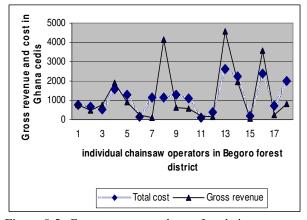


Figure 9.5: Gross revenue and cost for chainsaw lumber production for 18 chainsaw operators in Begoro Forest districts for the most recent chainsaw operation in 2008

Similarly in Goaso figures provided by individuals one and seven were also found to be outliers, and were also dropped giving rise to the breaks in the graphs. In Begoro (figure 9.5) there is a split of 9 (50%) of the individual operators that gained and those that made losses. However, for those that made gains, their margins are significantly larger than the margins of losses, pointing to an overall gain in this district than losses if the data is aggregated.

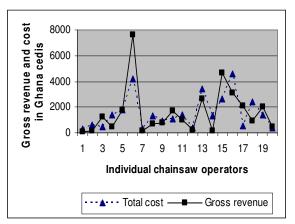


Figure 9.6: Gross revenue and cost for chainsaw lumber production for 20 chainsaw operators in Kade Forest districts for the most recent operation in 2008

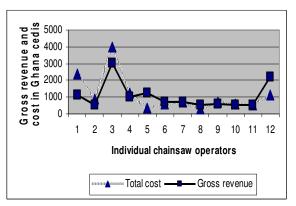


Figure 9.8: Gross revenue and cost for chainsaw lumber production for 12 chainsaw operators in sunyani Forest districts for the most recent operation in 2008

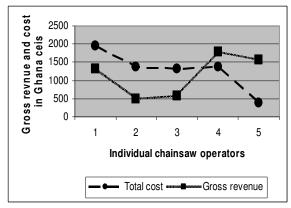


Figure 9.7: Gross revenue and cost for chainsaw lumber production for 5 chainsaw operators in Oda Forest districts for the most recent operation in 2008

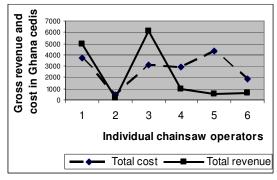


Figure 9.9: Gross revenue and cost for chainsaw lumber production for 6 chainsaw operators in Asin Fosu Forest districts for the most recent operation in 2008

Following closed to Begoro district is Kade (figure 9.6). In this district, though more (13) (65%) operators made gains as against only 7 (35%) that made losses, the margins of the gains have not been very significant compared to that in Begoro district, though it also points to overall gains in that district with the aggregation of the data for all the individual operators. The worse performing districts in terms of gains in revenue over losses were operators in Sunyani (figure 9.8), oda (figure 9.7) and Asin Fosu (figure 9.9). However, among these three districts, operators in Sunyani did better also pointing to the fact that overall loss by operators in this district may be smaller than that in the Oda and Asin Fosu districts with the aggregation and averaging of the individuals' data in section 9.3.1.5

9.3.1.4 Net revenue per unit volume of lumber (cubic meters) for the most recent chainsaw operations

On individual chainsaw operator basis, the highest positive net revenue per volume of lumber in cubic meter is obtained in Begoro forest district (figure 9.10) and least is obtained in Nkawie forest district (figure 9.11). However, in these districts, 7 operators made positive net revenue per volume of lumber in cubic meter out of 18 in Begoro, whilst in Nkawie 7 out of 11 made positive net revenue per volume of lumber in cubic meters. The trend of the performance of these individual chainsaw operators on net revenue per unit volume of lumber (M3) basis is not significantly different from the findings in the preceding section (9.3.1.3). As indicated in figures 9. 10 to 9.17 and in Table 9.3, Goaso, Juaso and Nkawie are the districts operators have peformed very well in terms of net revenue, where the average net revenue per unit volume of lumber (m3) are 36, 35 and 32 Ghana cedis respectively. These are followed by operators in Sunyani, Begoro and Kade though with negative average net revenue per unit volume of lumber in cubic meters. The worst performed districts are Oda and Asin Fosu, but with higher negative net revenue per unit volume of lumber in cubic meters.

Table 9.3: Net revenue (GH ϕ) per unit volume of lumber in cubic meters

total	average	Forest District
291	36	Goaso
280	35	Juaso
350	32	Nkawie
-55	-5	Sunyani
-171	-10	Begoro
-191	-10	Kade
-237	-47	Oda
-555	-93	Asin Fosu

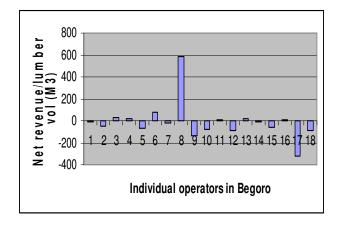


Figure 9.10: Net revenue $(GH\phi)$ per unit volume of lumber (M^3) earned by individual operators in Begoro for the most recent chainsaw operation

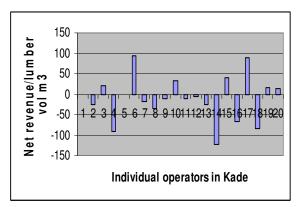


Figure 9.12: Net revenue (GH¢) per unit volume of lumber (M³) earned by individual operators in Kade in the most recent chainsaw operation

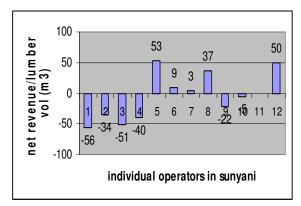


Figure 9.14: Net revenue (GH¢) per unit volume of lumber (M³) earned by individual operators in Sunyani in the most recent chainsaw operation

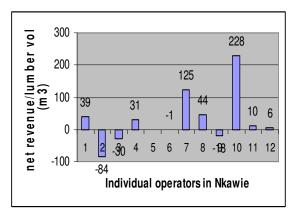


Figure 9.11: Net revenue (GH¢) per unit volume of lumber (M³) earned by individual operators in Nkawie in the most recent chainsaw operation

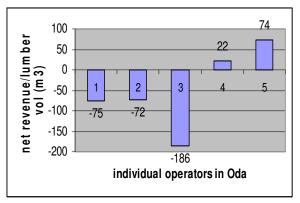


Figure 9.13: Net revenue (GH¢) per unit volume of lumber (M³) earned by individual operators in ODA in the most recent chainsaw operation

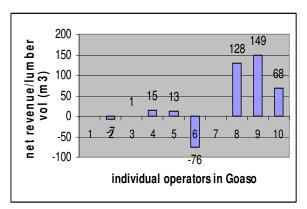


Figure 9.15: Net revenue (GH¢) per unit volume of lumber (M³) earned by individual operators in Goaso in the most recent chainsaw operation

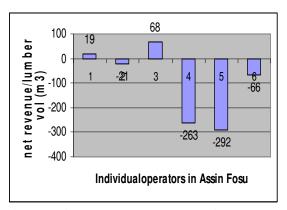


Figure 9.16: Net revenue $(GH\phi)$ per unit volume of lumber (M^3) earned by individual operators in Assin Fosu in the most recent chainsaw operation

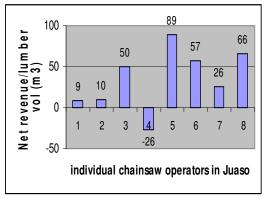


Figure 9.17: Net revenue (GH ϕ) per unit volume of lumber (M³) earned by individual operators in Juaso for the most recent chainsaw operation

9.3.1. 5 Aggregate gross and net revenue for the most recent operation

The components and the calculation of the revenue is obtained from the various tree species, the total lumber produced per tree, the dimension in inches and feet, the unit price for each lumber produced and the amount /revenue generated by these chainsaw operators in the Tables displayed in Annexes 9.1 to 9.8. The overall net revenue per the pieces of lumber sold for the 89 operators in the 8 forest district is positive indicating that cost of chainsaw lumber production for the most recent operation is lower than the revenue that is generated. The highly significant positive revenue obtained in Nkawie and Goaso in Figure 9.18 may have made the overall average revenue of the 89 chainsaw operators to be greater than the cost. Contrasting this with the over all net revenue per volume of lumber (M3) sold a negative figure is obtained, implying these operators loose a lot by not selling their lumber on volume basis but rather by pieces.

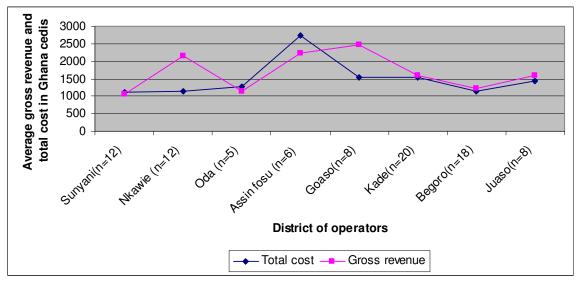


Figure 9.18: Average total gross revenue and cost of chainsaw lumber production for the most recent operation across the 8 forest districts

9.3.1. 6 Average profit margins of chainsaw lumber production for the most recent operation in 2008

Figure 9.19 describes the average profit margins of chainsaw lumber produced in 2008 for the most recent operation in the 8 forest districts of the project sites. On the average operators in Sunyani (12), Oda (5) and Assin Fosu (6), were observed to have operated at a loss for the most recent operation as indicated earlier. However, significant gains have been made in Nkawie (12) and Goaso (8), followed by Juaso (8), Begoro (18) and Kade (20) in a descending order.

The plausible explanation for this trend may be that in the districts where profits were made (i.e. Goaso, Nkawie, Kade, Juaso, Begoro), the task force activities may be relaxed a bit, police barriers and customs check points may be fewer and community check points may also be minimal as compared to the districts (Sunyani, Oda and Asin Fosu) where losses were made. A further elaboration and support for this explanation seemed to be revealed in figure 9.20 though additional investigation may be required to identify the factors responsible for these differences in revenue gains

among these forest districts. As indicated in figure 9.20, the most significant informal payments reducing the profits of the chainsaw operators in these districts are payment to the FSD officials and those at the police barriers and customs check points.

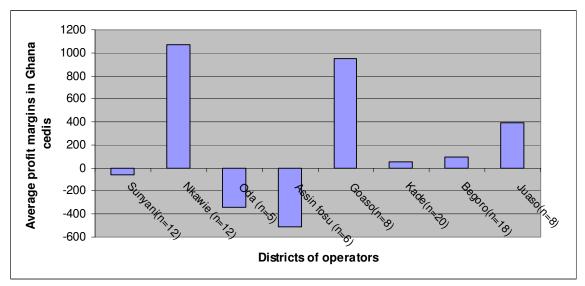


Figure 9.19: Average profit margins for chainsaw lumber production for the most recent operation across the 8 forest districts in the study area in 2008. N indicates the number of operators interviewed

In Nkawie, Goaso and Juaso districts in which the highest average net revenues have been made, it was in these districts that the least payments were made to these FSD officials. Even in the Goaso district, no such payments were made, pointing to a possible relaxation of the activities of FSD officials in these areas. In Kade where the least net average revenue was made, the highest payments to the FSD officials were made here. In case of the payments at the police barriers, the highest payment was again recorded in the Kade Forest district.

Another factor explaining the differences in performance in net gains from this chainsaw operation in these districts may be that prices at which operators sold lumber may be higher in the profit making districts. Also the profit making districts may have access to more tree resources particularly in the reserve areas than the least or non profit making districts.

From these results chainsaw lumber production by these operators may not be all that lucrative as perceived by the public, though three districts out of 8 made negative average returns. Similar findings have been observed in Adam *et al.* 2007 study, where the mean net returns of 32 chainsaw operating units was negative. It is worth noting that significant amount of cost is involved in this chainsaw lumber production by these operators and this is certainly understandable.

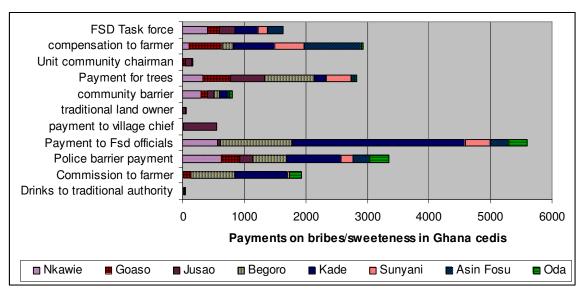


Figure 9.20: Effect of informal payments/bribes in absolute figures on forest districts performance in their net revenues or profit margins for the most recent chainsaw operation

In that a single operator can not perform all the functions of felling, milling, carrying, loading and transporting the processed lumber to the market for sale. Certainly he needs additional hands to be able to do the work. However, the revenue generated through this process is distributed among a wide range of people, some of whom do not contribute meaningfully to the chainsaw lumber production process.

9.3.2 Cost and revenue analysis for the remaining chainsaw operations for the year

Table 9.4 describes the number of additional chainsaw operations/activities carried out by these operators to produce lumber for sale in the study forest districts for the rest of 2008.

Apart from the most recent chainsaw operations, these operators did on the average four additional chainsaw operations to produce lumber for sale in the year 2008. This figure on the total number of operation carried by chainsaw operators within the year is similar to the one found in Adam *et al.* 2007 study. The highest additional operations carried out by these operators are 18 and the least is 1. The standard deviation of 3 is quite large, and implies that the number of operations by the individual chainsaw operators differ widely from the mean value of 4.

Table 9.4: Description of additional operations after the most recent operations in 2008

Question on number of remaining chainsaw operations	Number of	f	number of ac	lditional ch	ainsaw operations
in the year	(operators)		Maximum	Mean	Std. Deviation
Apart from this last operation, indicate the number of other operations you have carried out this year (2008)	. 78	1	18	3.90	2.979

Source: Survey data, 2008

This average revenue analysis does not include the data for the most recent operation. As indicated in Figure 9.21 and Table 9.5 some amount of profits is made by these operators. This is in contrast with the most recent operation where significant losses have been made in some districts. Possibility it is because this result does not include the variable cost and the labour cost items which are very important cost items in the chainsaw lumber production. These cost items could not be estimated due to difficulty of recall by responding chainsaw operators largely due to the fact that they do not keep proper records of their operations. Some negative net revenue would probably have been recorded in some of these forest districts if these cost variables were available and taken into accounts in the analysis. This notwithstanding, the highest average net revenue has been recorded in the Goaso as against the minimum in Oda. This compares quite well with the average net revenue values for the most recent operations. As indicated, operators in Goaso, Nkawie and Juaso recorded the highest amount of average net revenue in the most recent operation, while those in Oda and Assin Fosu and Sunyani recorded the least i.e. negative average net revenue. Data for the remaining chainsaw operation in Sunyani was not available to be included in this analysis.

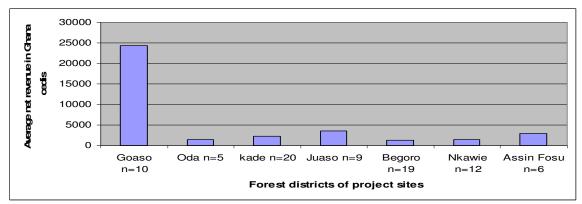


Figure 9.21: Average net revenue for additional chainsaw operation in the year (2008) without the data for the most recent operation for 81 chainsaw operators across 7 forest districts in the project sites (n = number of chainsaw operators interviewed)

Table 9.5: Total revenue and cost for chainsaw lumber production for the remaining and excluding data for the first operation of 81 chainsaw operators (n=81) in 2008 across 8 forest districts of the project sites

districts of the	project site	J 8						
Total	Gaoso	Oda	Kade	Juaso	Begoro	Nkawie	Assin	Combine
revenue/cost	(n=10)	(n=5)	(n=12)	(n=9)	(n=19)	(n=12)	Fosu	d total
							(n=6)	(n=81)
Total revenue								
(Gh¢)	244584.5	8233.5	57990.3	34806	28630.5	19456.7	21082	414783.5
cost of								
tips/bribes(Gh¢								
)	1705	1055	13109	3470	3191	2495	3428	28453
Net Revenue								
(Gh¢)	242879.5	7178.5	44881.3	31336	25439.5	16961.7	17654	386330.5
Average net								
revenue(Gh¢)	24287.95	1435.7	2244.07	3481.78	1338.92	1413.475	2942.33	

Source: Survey data, 2008

What remains for the further investigation as indicated earlier is to find out factors responsible for the high net returns for chainsaw business particularly in Goaso, Nkawie and Juaso compared to lower returns in Oda and Assin Fosu, though there is

indication that this might be due to variation in access to and availability of timber resources in the different districts.

9.3.3 Economic viability of chainsaw milling

The economic viability of chainsaw milling was assessed in this section using both the most recent operation and the remaining operation undertaken for the year 2008. As the data was only a cross sectional one on chainsaw lumber production, the benefits and cost data could not be discounted. For the same reason, the other techniques of Net Present Value (NPV) and Internal Rate of Return (IRR) could not also be used in evaluating the economic/financially viability of chainsaw lumber production. For these techniques to be applicable, annual or monthly data for total revenue and costs of chainsaw lumber production need to be recorded or collected over a period of time.

9.3.3.1 Undiscounted benefit cost ratios for chainsaw lumber production and trade The undiscounted benefit cost values of the chainsaw lumber production are presented as undiscounted benefits and cost ratios in Table 9.6 for the most recent operation and in Table 9.7 for the remaining operations. In both the recent operation and the remaining operation for the year, the undiscounted benefit cost ratios obtained by dividing total revenue by total cost are more than one indicated in Table 9.6 and 9.7. However, the undiscounted benefit cost ratio for the remaining operations is significantly greater than that of the most recent operation. This implies total revenue is greater than the total cost in both cases. The higher B/C ratio for the remaining operations is certainly due to the fact that cost of labour and variable items like fuel and lubricant, machine and machine repairs could not be factored into its computations.

Table 9.6: Benefit cost analysis of chainsaw lumber production for the most recent operation in 2008

/lean amount (GH¢)
405
621

Source: Survey data, 2008

Table 9.7: Benefit cost analysis of chainsaw lumber production for the remaining operation in 2008

		Benefit-cost	
Cost and revenue	Total amount	ratio (B/C)	Mean amount (GH¢)
Total cost	28453		351.27
Gross revenue	414783.5	14.58	5105
Net revenue	386330.5		

Source: Survey data, 2008

9.4 Cost and revenue analysis of improved chainsaw milling compared with chainsaw milling

The cost and revenue analysis of lumber production with the M7 logosol machine as an improved form of chainsaw milling is discussed in this section. The cost data as indicated earlier include a monthly allowance of GH¢ 120 to 130 that is used to hire

the services of 5 trained chainsaw operators, one supervisor and data recorder in the project site. The other cost items include the fuel and lubricant. The data was recorded for the period of four month where one cycle of processing was completed and the lumber sold. The revenue data was also collected on the processed lumber (Annex 9.9) sold. The data collected between August and November 2008 was used to generate the cost and revenue indices indicated in Table 9.8. The positive undiscounted benefit cost ratio of 1.09 that has been realized during the period of four months implies that the revenues generated from the project are greater than the costs. As to whether the project is financially viable at this stage is yet to be determined as the data collection on the cost and revenue on this project is still continuing as it has barely been operated for one and half years.

Table 9.8: Cost and revenue indices of using M7 logosol machine to process trees on farmlands into lumber for sale

Tarrinands III	ito fufficer for saic			
Cost and		Cost items		Undiscounted Benefit-
revenue	Total amount(GH¢)		% of total cost	cost ratio (B/C)
		Labour	78.33	_
Total		Fuel +		
cost	4443.25	lubricant	21.68	1.09
Gross				
revenue	4826			
Net				
revenue	382.75			

Source: Records of ITTO Project PD 431/06, 2008

Comparing the revenue from the sale of lumber from the logosol to that of chainsaw lumber produced at the most recent operation in Annexes 9.1 to 9.9, revenue from the logosol technology does not seem to have any significant urge over the chainsaw lumber, though its technology is more advanced. This none difference in revenues between the two systems of production might be from the price at which the logosol lumber is sold. Wood dealers in the chainsaw lumber markets are the main buyers of this logosol lumber. In bargaining for this logosol produced lumber for sale, dealers try to perk the price below the prevailing lumber prices in the market, just like how they buy lumber from the chainsaw operators, though they admit that the logosol lumber is more refined and produced to specified dimension as required by consumers.

This reveals one major challenge to the logosol lumber production system, which is the marketing of its lumber at prices that would enable it to break even and be sustainable. Relying on these lumber dealers to buy the lumber from this logosol production system for retail would imply that larger part of the profits to be generated from this system would be taken over buy these lumber dealers to the disadvantage of the target beneficiaries who are the local community members. One implication of this finding is that, with the presence of the cheap chainsaw lumber for dealers in the market, product of any improved chainsaw milling will find it very difficult to compete in the local market. Would consumers of lumber prefer a more refined lumber that is produced to specification at a relatively higher price than the chainsaw lumber. As revealed by Odom (2005), the cheaper chainsaw lumber for dealers to trade in has probably discouraged saw mills from supplying their products to the local market.

In the light of this, another area for further investigation is whether wood consumers would prefer wood that is more refined and produced to the desired dimension, but at a relatively higher price from an improved chainsaw milling to, wood from the usual chainsaw milling that are not refined and are not mostly produced to the desired dimensions but relatively cheaper.

9.5 Conclusion and policy implication

This study sought to determine the nature and cost of investments in chainsaw milling compared with improved chainsaw milling. The study finds that cost of labour, fuel and lubricant are the most significant cost items in the production of chainsaw lumber. From one forest district to another in the project sites these cost items do not differ significantly. Further, though the cost for payments on tips/bribes is lower than that of the labour, fuel and lubricant costs, it does not differ significantly across the districts, implying that the payment for trees, task force, community check points and forest guards and range supervisors is not significantly different from one forest district to the other. This study also finds that operators in Goaso, Nkawie and Juaso forest districts recorded the highest amount of average net revenue both in relation to pieces of lumber and to unit volume of lumber (m³) produced in the most recent operation, while those in Oda, Assin Fosu and Sunyani recorded the least.

The implications of the results of this study are that chainsaw lumber production may not be all that lucrative for these operators in the communities since a significant amount of cost is involved in the form of payment of bribes, labour and fuel and lubricant. What seems to be the case is that financiers and lumber brokers in the urban areas are raping the larger benefits of this chainsaw lumber production to the disadvantage of the chainsaw operators and the rural community members. This has implication for using chainsaw lumber production as livelihood option to improve the well being of forest fringe community members and ultimately to reduce forest degradation. To ensure such a measure succeed to improve the lots of forest fringe communities and enable them support the effort of minimising forest degradation, need to be done to redistribute economic rent from the chainsaw lumber production to the advantage of these forest fringe community members and the chainsaw operators. More specifically these rural community members and the chainsaw operators need to be empowered to process and market the lumber on their own. In this way they would be able to redistribute a larger share of the economic rent of chainsaw lumber production to themselves.

One key challenge to any improved chainsaw milling system is the marketing of its lumber at prices that would enable it to break even and be sustainable in the presence of the cheap chainsaw lumber in the market. Lumber dealers are able to manipulate the lumber trade to their advantage, raping much greater profit from the lumber production than the chainsaw operators and the forest fringe communities. This implies that lumber from any improved chainsaw milling is likely to face the same manipulation from these dealers and may find it difficult to compete with cheaper chainsaw lumber in the local market. What may be advisable is for the chainsaw milling to be replaced with the improved chainsaw milling and the local communities and their chainsaw operators empowered to operate the system to their mutual benefit with the state

Chapter 10

A COMPARATIVE ANALYSIS OF CHAINSAW AND SAWMILL LUMBER SUPPLY TO THE DOMESTIC TIMBER MARKET IN GHANA

Kwame Asamoah Adam and Akwasi Dua-Gyamfi²⁰

10.1 Introduction

Production and trade in illegal chainsaw lumber appear to have become acceptable in Ghana as operators now have easy access to the raw material both in the forest reserves and off-reserve timber utilization contract (TUC) areas. They are also able to transport their products from the forest to the market despite the heavy presence and regular patrols of military/police task force and Forestry commission monitoring teams. Some of the reasons provided by the Ghanaian public for the persistence of illegal chainsaw lumber on the local market are that i) The supplies from the traditional sawmills are insufficient to satisfy local demand; ii) the prices of the sawmill products are unaffordable to most Ghanaians iii) the are no distribution outlets for sawmill lumber even in the timber production areas. With these and several other reasons, producers of illegal chainsaw lumber continue to enjoy the support and sympathy of most rural and communities and even some politicians.

The sawmill operators also claim that they cannot sell most of their products on the local market because local consumers are not willing to pay for the true value of the lumber even for them to make marginal profit or break even . Again since operators are also working with borrowed capital of high interest rate they need to sell at a price that can absorb the interest rate and that option is the export price.

This study was undertaken with the aim of determining the relative importance of the two main sources of lumber supply to the Ghanaian local market. This is with the view of determining how the marketing of lumber can be made more sustainable to ensure that the demands of the local market are met adequately and in an acceptable manner.

10.2. Background to the Timber industry and the sawmill operations in Ghana

The timber industry in Ghana comprises three levels of industrial processing. These are the primary processing (mainly loggers); secondary processing (saw millers, veneer production and ply millers); and tertiary processing (Furniture and joinery). All these levels of industrial processing play important roles in the development of the forestry sector and the general economy of the state.

Table 10.1: Structure of timber industry in Ghana and log processing capacity

Tueste 10.11. Surveyore of time of measury in Shana and 108 processing cupacity						
Category	Activity	Number	Installed	Actual log		
		existing	capacity (M ³)	intake (M ³)		
Primary	Logging*	250				
Secondary	Sawmilling	110		1,320,000		

²⁰ CSIR-Forestry Research Institute of Ghana

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	Bush mills	26		
	Veneer milling	15)	390,000
	Plymilling	9	>	
			2,700,000	800,000
	Illegal-Chainsawing	-		
Tertiary				
	Furniture & joinery	44		
	Flooring	6		
	Toys	4		
	Moulding	12		

^{*} Most Sawmill companies also have logging units

10.2.1 Primary processing

Primary processing which involves mainly logging and harvesting started during the later part of the 19th century. Timber exploitation mainly of African mahogany started in 1891 when about 3000 m³ of mahogany were exported (Taylor, 1960). Logging and log export grew steadily and become an important economic activity. The commercial harvesting of Ghanaian timber species have been promoted generally by the individual timber companies. Starting with only 3 species of mahogany in 1891 the number of exploited species increased to 25 in the early 50s and to about 66 in the 1970s and currently over 90 species are being harvested and processed by the industry (Adam 2006). This means that the economic value of the forest in terms of timber continues to be high despite the dwindling area of the production forest.

For instance in terms of log production the statistics show that industry has been producing between 800,000 and 1,700,000 m³ over the last 15 years (Figure 10.1).

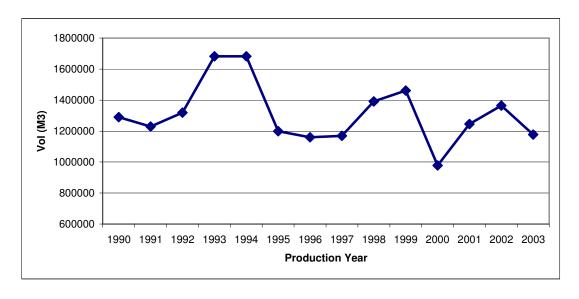


Figure 10.1: Annual log production statistics as recorded by the Forestry Department between 1990 and 2003

At this log production level industry pays total stumpage (i.e., value of standing tree) of between 5.6 million and 12.6 million US Dollars per year. Part of this money (60%) is used by the FC to cover cost of forest management, and part (4%) for

administration of the stumpage money by the Administrator of stool lands. The remaining (36%) is distributed to the customary land owner referred to as the stool (20%), traditional council (25%), and District assemblies (55%) of the respective stool land area. In addition to stumpage industry pays land rent charged per hectare per year for the total concession holdings of individual companies. The rent is paid to the stool land owner for the use of the land for timber production instead of other potential uses to which the land could have been put.

There are over 200 timber firms in Ghana that are involved in logging and harvesting and are offering employment to people to under take various operations:

- Timber inventories-
- Construction of logging roads and camps
- Felling and bucking
- Skidding and log yard operations-
- Haulage Transportation of logs from the forest to the mill

10.2.2 Secondary Processing

This involves principally the break down of the green log into lumber using the saw mill machines or into veneer using a rotary or slicing machine or reconstituting the veneer into plywood using ply mill machines. The number of timber companies involved in secondary processing includes 110 sawmills, 15 veneer mills and 9 ply mills. The regional distribution of sawmills in Ghana is shown in Table 10.2.

Table 10.2: Distribution of sawmills in the administrative region in the forest zone

Region	Sawmills		Bush/Mobile	Bush/Mobile mills		
	Number	Log input	Number	Log input		
Ashanti	64	1,186,740	4	28,868		
Western	24	871,896	2	14,211		
Eastern	14	402,084	1	7,151		
Brong Ahafo	4	82,294	12	120,883		
Central	2	44,349	1	7,515		
Volta	1	3,968	-	-		
Greater accra	1	5,445	-	-		
	110	2,596,776	20	178,628		

Source: TIDD Annual Statistics 2000.

10.2.3 Tertiary Processing

This involves the conversion of lumber or any reconstituted wood (plywood, chipboard or glue-laminated boards) into semi-finished or finished products such as doors, cabinets, chairs, beds, and profile boards or mouldings. The numbers of wood processing companies with facilities for tertiary processing comprises

•	Furniture manufacturing	-40
•	Floorings	- 6
•	Chipboard	- 2
•	Doors	- 4
•	Toys	- 4
•	Profile boards	- 12

■ Small scale carpenters - 41,000

The secondary and tertiary processing also offer employment to large number of people with specialized skills in various departments. These include:

- i. Log procurement and log yard management
- ii. Lumber procurement and lumber shed management
- iii. Milling
- iv. Product design
- v. Product grading
- vi. Marketing
- vii. Transport management and vehicle maintenance
- viii. Plant and equipment maintenance
- ix. Finance
- x. Personnel management and administration
- xi. Health and safety

10.2.4 General Economy

10.2.4.1 Contribution to GDP

Within the forestry sector of the economy of Ghana timber is the main commercial and export commodity. For instance between 2000 and 2008 export earnings was always above 150 million USD per year (Table 10.3).

Table 10.3: Total volumes and values of all wood product exported from 2000-2008

year	Export volume m3	Export Value (EURO)
2000	498846	210292774
2001	496502	189284156
2002	472427.0	177864861
2003	444388	162992783
2004	403206.7	150788341.3
2005	412883.6	154407238.8
2006	451608	170097902
2007	528570	184174023
2008		

Source: Compiled from TIDD permit reports from 2000-2008

Historically, contributions from timber industry to the total value of goods and services produced in the country in one year excluding income from investments abroad (i.e., Gross Domestic Products (GDP) has been between 5% and 6% of the total. Timber products exports earn about 11% of Ghana's foreign exchange and provide 30% of total earnings.

The industry plays an important role in the generation of income to the Forestry Commission. Currently the total payments of the timber industry in the form of stumpage, export levies and service charges accounts for nearly 75% of the annual revenue to the Forestry Commission (FC).

In the informal sector the timber industry supports jobs for tens of thousands especially the small scale wood working enterprises (lumber retailers, and Carpenters) through the supply of wood products (lumber, plywood, profile boards,

chipboard). For example TIDD statistics show that in 1995 there were as many as 41,000 small scale carpenters and 25 medium to large scale furniture and joinery companies in Ghana. These enterprises produce household and office furniture components, doors, windows, and frames, general joinery, pallets, crates, chop boxes, coffins, and many others that consumes about 75% of the annual total timber requirement of Ghana (Coleman, 2004)

10.2.4.2 Contributions to community development

The timber industry especially logging and milling companies are well noted for the direct provision of feeder roads, school buildings, health, water and recreational facilities in their areas of operation. Most road networks in the high forest zone have initially been constructed for logging activities and latter upgraded for community use. Under the Timber Resources management Act, 1997 (Act 547) contribution to developmental projects in the operational areas of logging companies have become mandatory. Timber companies have to enter into social responsibility agreement with the commitment to contribute in cash or kind but in value not less than 5% of the estimated stumpage from the concession holding. The SRA thus represents a huge contribution of industry to community development.

10.2.4.3 The industry as a consumer of services

The timber industry is also contributing to the growth of the general economy by paying for the use of other public and private services and facilities. These services include:

- 1) Banking and financing services
- 2) Plant pools
- 3) Mechanical Shops
- 4) Spare parts supplies
- 5) Utility services providers (Electricity, water, telephones)
- 6) Hospitality industry (food and accommodation)
- 7) Office and stationary supplies
- 8) Road and building contractors
- 9) Road and rail transport
- 10) Consultancies (architects, lawyers, management consultants, accountants etc.)

It is noted that developments in the timber industry has direct or indirect impacts on other sectors of the economy and especially those that provide direct services to the timber industry (e.g., road and rail transport, plant pools, spare part suppliers and electricity). A real case in point was the drastic reduction in cargo handled by the Ghana railways when log export ban was imposed on the timber trade in 1994 and the collapse of the rail transport system.

10.3 Methodology

10.3.1 Data collection

Field data collection employed three approaches. The first approach involved a quick consultation with selected individuals of five stakeholder groups (Small scale saw millers, Chainsaw millers, lumber retailers, Small scale carpenters and estate developers) to identify broad issues relating to investments, access to raw material and distribution of sawn lumber.

In the second approach, structured and coded questionnaires were administered to a sample of the five categories of stakeholders

In addition to the broad issues that were identified during the initial stakeholder consultations the questionnaire was structured to answer the following questions:

(i) Is the investment cost affordable to the financial capabilities of the rural communities? What are the actual costs of the required inputs? What are the operational costs? What are the returns on investments as compared to harvesting small size concessions under a conventional sawmilling or when improved chainsaw-milling techniques are employed?

What is total chainsaw lumber production? How does this compare with sawmill supply over time)? What is the actual share of the local lumber market for the chain-sawn lumber enterprise? (ii) How much of chainsaw limber is exported from Ghana?

What are the supply trends over the past 5 years as an assessment of the success level of policy on supply to local market?

(iii) Can the employment figures quoted by previous works be confirmed in order to strengthen the argument for regularising CSM? Can this employment level be sustained? What conditions are required to achieve this?

What are the strengths and weaknesses of CSM as rural industry? What factors can ensure the survival and growth of the CSM enterprise?

In doing this respondents were given the assurance that their cooperation would contribute positively to find out how their business could be made more efficient and profitable. The survey was conducted in selected regional and lumber markets within the project areas.

The third approach involved field verification of sawing cost and recovery rate associated with the conversion of logs into lumber using the chainsaw. The freehand sawing technique and sawing using appropriate chainsaw attachments were employed to saw a total of XX trees selected from three diameter classes (50-59; 60-69 and 70-79 cm dbh) and three of the most abundant species (Q Z YZ). The cost centres were labour time spent (idle, searching, cleaning or preparing to fell, felling, bucking, milling, transporting, dealing with the machine – cleaning, sharpening, repair, other); materials (fuel, lubricants, files protective clothing);

10.3.2 Data analysis

Questionnaire data was analysed using SPSS to demonstrate trends and establish correlations where applicable. The milling data was analysed using the appropriate statistical package and software to identify variations in material cost and recovery rates between milling type, species and diameter classes.

10.4 Results and discussion

10.4.1 Lumber supplies to the local market

In this section we present the outcome from the survey of lumber markets and interviews with saw-millers, chainsaw millers, lumber retailers, carpenters and building contractors. The main issues presented and discussed are;

- The actual share of the local lumber market for the chain-sawn and sawmill products
- Main lumber products supplied by mills and chainsaw operators
- The real consumers of chainsaw lumber on the local market.
- Supply trends of lumber over the past 5 years as an assessment of the success level of policy on supply to local market
- Efficiency in resource utilisation with respect to range of species, tree quality and tree parts

10.4.2 General description of the markets

10.4.2.1 Location of markets

Eleven lumber markets distributed in five regions (Table 10.4) were visited to collect information on the supply of chainsaw and sawmill lumber to the local market. Generally regional capital markets were found to be more organised in terms of business protection and level of integration. In all regional markets there are well organised business associations that deal with pricing of products and the general welfare of members especially protecting members in event of arrest

Table 10.4: Sampled markets within the regions District

Region				
Greater Accra Achimota Ashiaman Accra Central	Ashanti Anloga Atonsu Kwadaso Santasi	Brong Ahafo Sunyani Techiman	Central Kasoa	Eastern Akim Oda
3	4	2	1	1

10.4.2.2 Types of lumber business in the timber markets

A total of 389 individual comprising Lumber retailers (235), Bench saw operators (51) and Furniture and joinery shops were encountered in the eleven markets selected from the five regions (Table 10.5). The operations of these three wood business types are very integrated by way of movement of materials, further processing and marketing. Usually chainsaw products (especially re-wood species) are delivered on the market in the form of large boards (2x 6 x 8) or beams (4x6x4) and these are sent to the bench saw mills located within the market premises to be re-sawn into smaller dimension. This service is rendered to lumber retailers, joinery shops and other customers.

Table 10.5: Region * Type of business

	TYPE OF BUSINE (Number of respon			TOTAL
REGION	Lumber retailer	Bench saw miller	Furniture & joinery	
GREATER ACCRA	44	28	36	108
ASHANTI	81	11	9	101
BRONG AHAFO	50	10	40	100
CCENTRAL	20	2	18	40
EASTERN	40			40
TOTAL	235	51	103	389

10.4.2.3 Management and control of business in the timber market

An examination of the positions of the respondents in the market survey (Table 10.6) seems to suggest that the businesses in the timber markets have evolved their own unique management and control structures. Compared with the others the day to day transaction of business among the lumber retailers is controlled more by the owners (70%) than in Bench saw-mills (41%) and Furniture/Joinery shops (46%). The use of shop mangers appear to be more frequent in lumber retailers (15%) than in Bench-saw shops (12%) and Furniture/Joinery shops (8%). On the other hand the use of caretakers and apprentices to take charge of shops is more frequent in Furniture/Joinery shops (47%) and Bench-saw shops (43%) than in lumber retailer shop (10%).

Table 10.6: Type of business and management controls

Business Type	Respondent's position in the firm (Number of respondents)						Total
	Apprentice	Care Taker	Manager	Owner	Sales Assistant	Secretary	
Lumber retailer	2	26	36	164	7		235
Bench saw miller	8	14	6	21		2	51
Furniture & joinery	8	40	8	47			103
Total	18	80	50	232	7	2	389

This control structure may be attributed to the risk level of the different businesses as well as the specific activities in the shops.

10.4.3 Lumber products on the timber market

Table 10.7 shows the main lumber products on the timber markets are boards, scantlings and beams. The survey revealed that the proportion of products handled by respondents varied with their category of lumber business. Proportionately more Lumber retailers (59%) handle boards and scantlings than beams (<1%). In the case of bench saw operators majority (65%) deal with all 3 products. Beams and boards appear to be the main products handled by majority (56%) the furniture and joinery shops

Table 10.7: Main lumber products traded on the timber markets

Lumber products	Type of busin	Total		
	(Number of re	espondents)		
	Lumber	Bench	Furniture	
	retailer	saw miller	& joinery	
only boards	6		8	14
only beams		7	28	35
only scantlings	20			20
beams & boards	2	2	22	26
boards and scantlings	139	9	16	164
beams and scantlings			2	2
all three products	68	33	27	128
	235	51	103	389

10.4.4 Share of chainsaw lumber on the local market Lumber

This issue is addressed by describing the sources of lumber that come onto the local market as well as the re-distribution channels. Tables' 10.8A-10.8C shows the sources where the three lumber based enterprises obtain their lumber products for further processing and retailing. Results in Table 10.8a shows that most (86%) of lumber retailers interviewed obtain their stock of boards from the chainsaw millers as against 14% obtaining supplies from sawmills. Supply of boards to Furniture and Joinery shops is sourced almost equally from chain saw-millers (37%), sawmills (31%) and lumber retailers (29.5%).

Table 8A: Main supply source for boards to the three Types of lumber based enterprises

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Supply Source	Type of business			Total		
	(Number of respond	(Number of respondents)				
	Lumber Retailer	Bench Saw	Furniture &			
		Miller	Joinery			
Sawmills	29	6	24	59		

Lumber retailers Chainsaw millers Others (FSD confiscated lumber)	184	14 27 4	23 29 2	37 240 7
	214	51	78	343

Majority of bench saw millers (53%) also indicated that they get direct supply of boards from chainsaw millers as against 12% obtaining supply from sawmills. Although only 180 out of the total respondents indicated their source of supply for beams, most (62%) of them said they get their supply from the chainsaw millers. It is worth noting also that as high as 36% of furniture and joinery shops have had supplies from sawmills.

Table 10.8b: Main supply source for Beams to three types of lumber based enterprises

Supply Source	Type of business				
	(Number of respond	lents)			
	Lumber retailer	Bench saw miller	Furniture & joinery		
Sawmills	6	4	28	38	
Lumber retailers		8	15	23	
Chainsaw millers	63	15	34	112	
Others (confiscated lumber)		7		7	
	69	34	77	180	

This is possible because it is only sawmills that can supply some specific species and dimension required by the furniture and joinery shops. The pattern of sourcing scantlings among the three lumber base enterprises is similar (Table 10.8C).

Table 10.8C: Main supply sources for scantlings to three types of lumber based enterprises

	Type of business (1	Number of respon	dents)	Total
	Lumber retailer	Bench saw miller	Furniture & joinery	
Sawmills	40	2	2	44
Lumber retailers		16	22	40
Chainsaw millers	185	20	29	234
Others (confiscated lumber)	4	4	2	8
	229	42	55	326

In all three business types most shops rely on chainsaw millers for their supply of scantlings. However, a higher proportion of lumber retailers than the other two enterprises seem to have supplies directly from sawmill. This should be expected as the lumber retailers also supply scantlings to the other two enterprises.

10.4.5 Lumber stocks

The composition and quantity of lumber stocks appeared to vary with the enterprise type. With respect to boards, the lumber retailers had more in their stocks than the other two enterprises (Figure 10.2) For instance lumber piles containing between 700 and 2000 pieces of boards were found only in the sheds of lumber retailers. The bench saw and furniture shops had none or very little stock of boards.

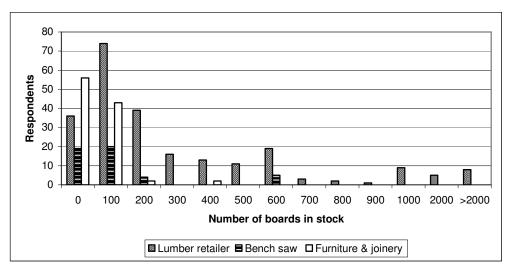


Figure 10.2: Histogram showing the reported quantities (number of pieces) of boards in the sheds of respondents at the time of interview

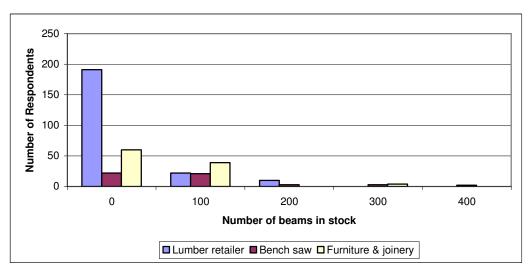


Figure 10.3: Histogram showing the reported quantities (number of pieces) of beams in the sheds of respondents at the time of interview

Proportionately many bench saw and furniture/joinery shops keep more stocks of beams than lumber retailers. This trend should be expected because the lumber retailer will usually convert more of their stock of beams into smaller dimensions to meet the needs of many customers.

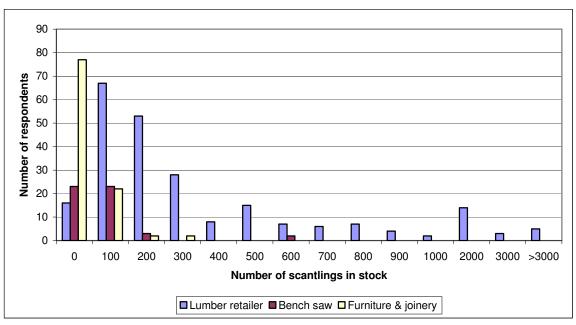


Figure 10.4: Histogram showing the reported quantities (number of pieces) of scantlings in the sheds of respondents at the time of interview

Like the boards, the lumber retailers keep larger stocks of scantlings than the other enterprises (Figure 10.4).

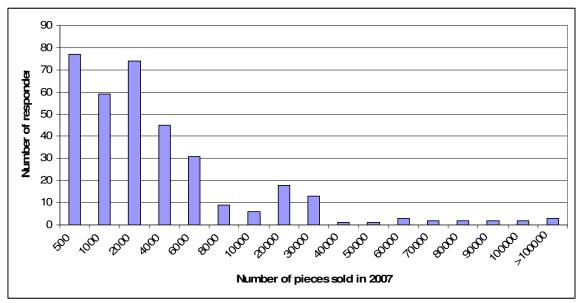


Figure 10.5: Total lumber stocks handled in 2007 by individual firms in the three main lumber enterprises operating on the various markets

In terms of total stock holdings of individual businesses there was a wide range. Figure 10.5 shows a range of 500 to over 100,000 pieces per individual. However, most respondents had in stock between 500 and 6000 pieces of lumber. This may be an indication that most of the businesses are operated on small scale.

10.4.6 Major Consumers of Chainsaw Product

Up to 360 respondents comprising all three types of lumber enterprises gave five level ratings to five listed consumers of chainsaw lumber on the local market (Table 10.9). The results indicate that individual consumers (41.2%), small scale carpenters (33%) and building contractors (29.4) are rated as important customers by many operators of the lumber markets. Government institutions (8.6%) and large scale carpenters (13.5%) however, are identified by few operators as their major customers. It may be inferred from this result that large scale carpenters and government institution have other sources for procuring lumber as against individuals, small scale carpenters and building contractor who can source lumber mainly from the lumber markets.

Table 10.9: Percentage of operators of lumber enterprises rating consumers of chainsaw

lumber based on the frequency and volume of business transacted

	Consumers of c	Consumers of chainsaw lumber								
Consumer	Building	Large Scale	Small Scale	Government	Individual					
Ratings	Contractor	furniture	furniture	Institutions	Consumers					
	(360	(326	(333	(336	(357					
	respondents)	respondents)	respondents)	respondents)	respondents)					
major	29.4	13.5	33.0	8.6	41.2					
Average	20.8	18.7	16.2	24.4	25.8					
Minor	5.8	8.6	26.4	6.5	8.1					
Rare	15	15.3	8.1	12.8	10.9					
No	28.9	43.9	16.2	47.6	14.0					
	100	100	100	100	100					

In respect of the choice of client the most acceptable criteria out of the 7 proposed was the ability of client to pay higher prices which was selected by 93.3% of respondent as very important (Table 10.10). The next very important criteria were 'secure payment system' selected by 81.8% and 'ability to make large orders' selected by 75.2% of respondents. Interestingly, the ability to show documentation of proof of legal source of lumber was seen by 82.5% of respondents as not important. This may be an indication of the level of connivance for illegal lumber trade on the local market

Table 10.10: Expressions from lumber market operators on what they look for in their customers

Criteria for selecting customer	% number of res	spondents		Total number of respondents
	Very	Important	Not	•
	Important		important	
Ability to supply or take lumber wide	46.3	24	30	313
range of primary species				
Ability to supply or take lumber from	33.2	14.2	52.6	331
wide range of lesser used species				
Ability to pay higher prices for lumber	93.3	5.5	1.2	330
products				
Ability to make large orders	75.2	23.5	1.2	323
Have secure payment system	81.8	15.8	2.4	368
Ability to organize prompt evacuation of	36.9	18.7	44.4	374
consignment				
Ability to show documentation for proof	8.6	8.9	82.5	371
of legal source of lumber				

In the course of the interviews it was revealed that though the building contractors take large orders they delay payments and also ask for over invoiced quotations especially when undertaking public contracts hence they are not preferred costumers.

10.4.7 Supply Trends

10.4.7.1 Species traded on the local market

Out of the many species known to be sawn by the chainsaw millers for the local market, only about 26 were noted to be common on most markets surveyed (Table 10.11).

Table 10.11List of common species trade on the local market

		Respondents	
Scientific	Local	Number	% total
Triplochiton scleroxylon	Wawa	185	47.6
Piptadeniastrum africanum	Dahoma	105	27.0
Khaya species	Mahogany	48	12.3
Entandrophragma angolense	Cedar	45	11.6
Terminalia superba	Ofram	38	9.8
Sterculia rhinopetala	Wawabema	36	9.3
Bombax buonopozense	Akonkodie	24	6.2
Milicia excelsa	Odum	22	5.7
Aningeria species	Asanfena	21	5.4
Celtis species	Esa	20	5.1
Antiaris toxicaria	Kyenkyen	17	4.4
Turreanthus africanus	Avodire	16	4.1
Alstonia boonei	Sinuro	15	3.9
Nesogordonia papaverifera	Danta	14	3.6
	Walnut	14	3.6
	Ceiba	9	2.3
	Emire	8	2.1
	Watapuo	8	2.1
	Mansonia	6	1.5
	Esiaa	5	1.3
	Guarea	4	1.0
	Baku	2	0.5
	Cedrella	2	0.5
	Otweese	2	0.5
	Sapele	2	0.5
	Yaya	2	0.5

The top 5 species handled by many traders are Wawa (48%) Dahoma (23%), Mahogany (12%), Cedar (11.6%), and Ofram (9.8%). This trend can be understood from the point of view of the species application in the housing construction and manufacturing of furniture. For instance Dahoma and Ofram are now used extensively to produce scantlings for roofing and manufacturing of door and window frames. Esa which is a lesser used species is also now coming up as material for roofing. Wawa traditionally has been used for scaffoldings and framework for concrete. Mahogany is the main species for furniture and panel doors.

10.4.7.2 Lumber products from various Species

Figures 10.6a, 10.6b and 10.6c show the main species used by chainsaw millers for the production of beams, boards and scantlings respectively.

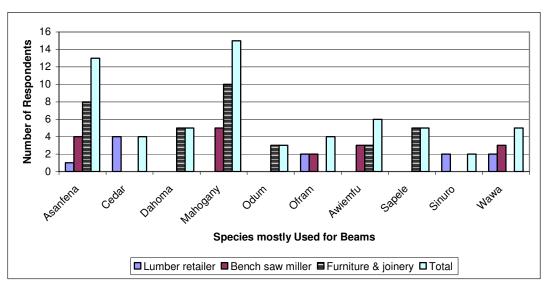


Figure 10.6a: Bar chart showing the various species stocked in the form of beams by the three lumber based enterprises in the timber markets.

Only 10 species were noted to be supplied mostly in the form of beams (Figure 10.6a). Out of these more respondents listed mahogany and Asanfena. The beams of these two species also appear to be the lumber preferred by the furniture and joinery shops. This is probably so because they need lumber of thicker dimensions for the various joinery and furniture products. In the same vain only the furniture and joinery shops listed Dahoma, Odum and sapele as the species usually supplied in the form of beams. These are the species noted to be most suitable for joinery work.

For board production 15 main species were listed (Figure 10.6b). Most respondents listed wawa and ofram as the main species for board production. Lesser used species like Sinuro/nyamendua, Ceiba and Akonkodie are also being milled into boards.

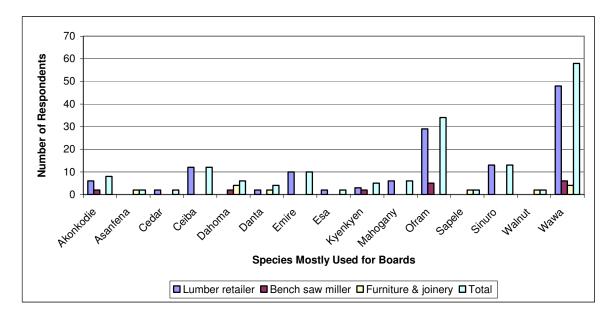


Figure 10.6b: Bar chart showing the various species stocked in the form of boards by the three lumber based enterprises in the timber markets.

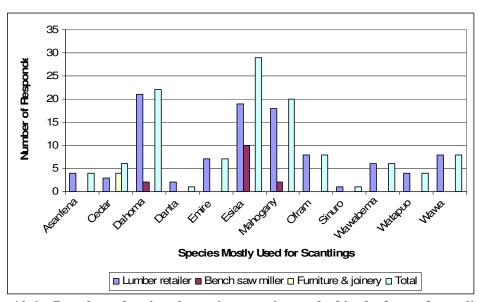


Figure 10.6c: Bar chart showing the various species stocked in the form of scantlings by the three lumber based enterprises in the timber markets

For the 12 species that were listed as important for scantlings, Esia and Dahoma were listed by more respondents. This is an interesting development since the two species were not desired in the past but are now among the most marketable species on the local market

10.4.7.3 Lumber prices

Respondents from both the timber markets and sawmills quoted prices per piece of given timber products instead of per cubic volume. For a given species the price per piece vary according to product (board, scantling or beam) which is an indication of the volume and possibly the cost of production. However, the saw-millers prefer to produce mainly thicker boards and scantlings for the domestic market. The saw-millers explained that they are compelled to do this because of the high production cost of small dimension lumber and consequently higher selling price per unit volume of such products which the local consumers are unwilling to pay. Consequently the millers find the sales of small dimension products only profitable on the international market.

For the few species that the sawmills offer for sale on the local market ,the price per piece is between one and half to about four times the price of chainsaw lumber as shown in Table 10.12. This confirms the public knowledge that the saw mill lumber is very expensive. It was also noted that the prices from the conventional mills are uniform as against the high variability among dealers of chain-sawn lumber.

Table 10.12: Mean price (GH¢) per piece of lumber product of some species as obtained from the lumber markets

	Chainsaw Lumber price			Sawmill lumber price		
Species and dimension	N	Mean	Std.	N	Mean	Std.
		Deviation			Deviation	
Wawa scantlings (2x4x14)	38	2.63	1.66	10	5.00	
Wawa board (2x12x14)	137	4.67	1.29	10	16.00	
Wawa beam (4x8x14)	17	11.44	5.18			
Watapuo scantling (2x4x14)	20	4.51	0.29			
Sapele scantling (2x4x14)	4	7.25	0.86			

Sapele board (2x12x14)	2	16.50	0.00			
Ofram scantling (2x4x14)	29	4.49	1.64			
Ofram board (2x12x14)	79	5.47	1.77	10	21.00	
Ofram beam (4x8x14)	14	11.21	6.04			
Mahogany scantling (2x4x14)	48	4.50	2.18	4	11.02	
Mahogany board (2x12x14)	37	8.33	3.34	2	20	
Mahogany beam (4x8x14)	28	13.17	4.03			
Esia scantling (2x4x14)	56	3.33	1.75	2	4.25	
Esia board (2x12x14)	2	4.00	0.00	2	6.30	
Danta scantling (2x4x14)	34	4.55	1.76	2	6.40	
Danta board (2x12x14)	4	12.50	4.61			
Danta beam (4x8x14)	2	13.00	.00			
Dahoma scantling (2x4x14)	105	4.10	2.22	10	6.00	
Dahoma board (2x12x14)	3	6.33	1.15	10	21.00	
Dahoma beam (4x8x14)	3	8.67	1.15			
Celtis scantling (2x4x14)	28	5.42	0.46	3	3.5	
Celtis board (2x12x14)	8	6.60	0.44			
Celtis beam (4x8x14)	6	11.00	0.00			
Brown sterculia board (2x12x14)	2	10.00	0.00			

10.5 Conclusion

Share of the local lumber market for the chain-sawn and sawmill products

There is overwhelming evidence that greater majority (86%) of lumber retailers on the local market are selling mainly lumber products from chainsaw millers. Same can be said about the volume of lumber products on the local market. Very little supply come from the conventional saw-millers. This confirms the results of the DFID chainsaw study in 2006 that also noted that the local lumber market is not adequately catered for by the conventional saw mills. There appears to be no incentive for saw-millers to process lumber for the local market.

Main lumber products supplied by mills and chainsaw operators

The survey revealed that wider range of lumber products is supplied by chain saw millers on the local market than that supplied by conventional saw mills. Chainsaw products are made up of all dimensions of beams, boards, and scantlings to serve several end uses. Saw-mill products on the other hand are mainly boards and scantlings of thicker or wider dimensions for specific end use.

The real consumers of chainsaw lumber on the local market.

All categories of consumers of wood products in Ghana are using lumber products produced by illegal chain saw millers. The implication is that every Ghanaian is directly or indirectly supporting the perpetuation of illegal lumber production and trade. It may be inferred that aggressive and extensive sensitization of consumers on the negative impacts of this illegal business may help significantly to reduce commercial chainsaw milling.

Success level of policy on supply to local market

The low supply of sawmill lumber on the local market gives room to question the effectiveness of the implementation of the legal provision for the supply of not less than 20% of mill products on the local market as well as those companies issued with

special permit to harvest and process for local market. There is immediate need for the review of this legal provision. For instance it will be necessary to examine the basis for fixing the supply level at 20% of mill production. It is now evident that the 20% level is woefully inadequate to meet the local demand. A more practical approach rather than legal provisions only will be needed to get reasonable quantities of lumber to the local consumer.

Efficiency in resource utilisation with respect to range of species, tree quality and tree parts

In terms of number of species utilized, the chainsaw lumber producers are processing more species for the local market than the conventional sawmills. However, in terms of tree or log quality, the materials handled by chainsaw lumber producer are low. The resultant effect is that chain saw lumber products are generally of inferior quality putting the end users into serious problems of product deterioration and high rate of structural maintenance or product replacement. Additionally chainsaw milling is introducing lot of species of less durable wood on the market which poses safety problem and which will require special attention to improve the service quality and service life of structure and products in which the lumber is applied.

Chapter 11

SUSTAINABILITY OF JOBS CREATED BY CHAINSAW ACTIVITIES IN GHANA

Emmanuel Marfo²¹ and Emmanuel Achempong²²

11.1 Introduction

Even though chainsaw milling in Ghana has been criminalised since 1998, the operation has survived till date. One reason that has been identified is that it serves as the primary supplier of timber to the domestic market (Odoom, 2005; Parren et al. 2007; Adam et al. 2007). This market opportunity has sustained the operation and offered job²³ opportunities to rural folks as well as urban timber brokers. Over the past few years, there is an increasing public debate as to how to deal with the issue in policy and in practice. It has been argued that chainsaw milling provide livelihood to many people and even if the ban is effectively enforced will throw many people out of jobs. Others have argued that the provision of jobs does not legitimise entertaining an illegal operation and some have gone as far to compare it to cocaine business and have asked whether it has to be entertained just because it provides jobs for some people.

In spite of the larger public interest in the issue, information on the level of employment generated by the operation and the extent to which this is sustainable in the face of dwindling forest resources and its illegality status is scanty and scattered. For example, Birikorang (2001) estimated that primary chainsaw milling operations provided jobs for about 900 people in 1999. More lately, Odoom (2005) reported that an estimated 50,000 people were engaged in chainsaw in Ghana. This figure can be taken to represent a conservative estimate for the early periods of the 2002- 2004 as Odoom carried out his work in the first half of the year 2004 and cited this as a secondary data. The activities were reported to be predominantly occurring in western, Ashanti, Brong Ahafo, Central and Eastern region. The chainsaw enterprise if described according to the various operational phases (Stump site, highway transportation, re-processing and marketing) was judged as an important employment avenue giving jobs to about 80,000 people (Adam et al, 2007). They further estimated that the reprocessing/utilization and marketing sector of the chainsaw milling enterprise alone provides employment to nearly 50,000 people per year. Thus, while some estimates exist, these have not been systematically validated and compared in order to inform the policy discourse about the growth in this sub-sector. More importantly, the sustainability of this employment is crucial if CSL as an alternative livelihood strategy can be given any serious currency. There has also not been a systematic attempt to assess the sustainability, at least in qualitative sense, of the jobs offered by chainsaw operations.

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²³ The word job and employment has been used interchangeably without particular emphasis on the degree of permanency associated with each.

This study attempted to fill these gaps by validating and estimating current number of jobs offered by chainsaw-related activities and to assess the sustainability of these jobs within the current policy and legal framework.

This introductory section is followed by a description of the methodology used. The presentation and discussion of the results follow. The paper ends with a conclusion section that highlights the main findings and recommendations.

11.2 Methodology

11.2.1 Estimating number of people employed through chainsaw activities

Due to the illegal framework within which chainsaw operations occur, it is difficult to have official records to help one estimate employment levels. Adam et al. (2007) approached the challenge by using indirect estimation based on volume of trees reported to have been exploited by illegal operators, recovery rates of the milling and re-sawing operations and number of people engaged in the various phases of the logging, milling and marketing process (from site logging, haulage, reprocessing and then selling). This involved using survey data to corroborate secondary data. We followed a similar approach in principle but collected fresh empirical data on number of people engaged in site operations, haulage, re-saw sites and lumber retail sites. This was to help us validate the figures observed by Adam et al. (2007) even though we recognise that study was more extensive than this one. However, we could rely more on the approach if the figures we observe come close those by the previous study. Moreover, we used the secondary data on the annual volume of trees estimated to be exploited by illegal chainsaw operations. This figure stands at 2,700,000m³ (Birikorang, 2003). However, the study was doubtful about the suitability of the 50% recovery rate of chainsaw milling adopted by Adam et al. (2007) from the studies of Akrasi (1997) and Frimpong Mensah (2003) as it suggests that chainsaw milling is more efficient than sawmilling which is estimated as 34% in 1999 (see Birikorang, 2001).

We argue that a range estimation approach should be used until a more recent empirical study to measure conversion efficiency of chainsaw is found. We also prefer to use industrial measurement values than academic experimental values for our estimation to be close to the real situation of milling in the bush, taking into consideration the haste with which these 'illegal' operations are undertaken. Thus, a 34% recovery rate is adopted as the minimum and the 50% as the maximum within the constraints of limited empirical data on recent recovery rate of free hand chainsaw milling. The 34% adopted is further justified as it tallies very much with a more recent estimation in Guyana which gave a recovery rate across all studied locations, considering all studied species and dimensions to be 34% (Vanessa, 2008). Following the aforementioned approach, the formula for estimating the employment level of CSL by Adam et al. (2007) can be stated as indicated in box 11.1

Data was collected from chainsaw operators, lumber brokers and re-sawers as summarised in table 1. And questions coded with a prefix of 2 in the questionnaire (see annex 1) were mainly asked.

Table 11.1 number of respondents from each stakeholder group interviewed in the various Districts to obtain data for estimating number of jobs created by chainsaw activities

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	Nkawie	Goaso	Sunyani	Akim-	Kade	Assin	Kumasi	Techiman	total
				Oda		Fosu	(Anloga)		
Chainsaw	10	14	6	10	-	10	-	-	50
operators									
Resawers	-	-	-	16	-	4	11	10	41
Lumber	-	-	-	16	-	5	10	10	41
retailers									
Total									132

(Source: field database)

Box 11.1 formula for estimating the number of jobs created by chainsaw activities

E=A+B+C+D

E=[ac/12d) + (bf/365e) + (bh/365g) + (bj/i)]

Where

E = estimate of total jobs created by chainsaw operations

A = estimate of jobs generated at stump site

B = estimate of jobs generated through haulage/transportation of chainsaw beams/lumber

C = estimate of jobs through re-sawing spots

D = estimate of jobs generated through sale of lumber

a = total annual estimated volume of timber exploited through illegal chainsaw operations (m³)

b = estimated total recovery volume using a 50% recovery rate (m³)

c = average size of milling crew at stump site

d = input volume per month per production crew (m³)

e = average capacity of haulage trucks (m³)

f = average size of the haulage crew

g = average capacity of re-saw mills (m³)

h = average size of the re-saw crew

i = average annual stock received by a broker

j = average number of people engaged by a broker

11.2.2 Assessing sustainability

The literature on sustainability assessment is varied. For example, assuming that the level of employment is fundamentally dependent on resource availability, sustainability assessment can be made considering how much is taken by CS to how much is available. Barring that all factors remain the same, when will the resource base supply pose natural threat to chainsaw operations can be a useful question for

assessing sustainability of chainsaw employment? However, given the limited up-to-date inventory and exploitation data at year-by-year levels, the study opted to do a more qualitative assessment rather than comparing the projection of exploitation to resource availability over the next 10 or so years.

In spite of the differences in the conceptualisation, Philip Sutton (1998) reports that a number of definitions embed several principles, including:

- conservation of biodiversity and ecological integrity (including halting the non-evolutionary loss of biodiversity)
- constant natural capital and sustainable income
- ensuring intergenerational (within generations) and intergenerational (across generations) equity
- recognizing the global dimension
- dealing cautiously with risk, uncertainty and irreversibility (see below)
- ensuring appropriate valuation of environmental assets
- integration of environmental and economic goals in policies and activities
- Social equity and community participation.

Among the others, the principle of dealing cautiously with risk, uncertainty and irreversibility was adopted. This principle is exciting for investigating sustainability of employment of chainsaw milling in Ghana because it is operated within an illegal framework, making all related jobs legally risky and uncertain. A SWOT analysis was carried out to do a qualitative assessment because of its strengths in helping to construct strategic directions and to forecast. To be effective and comprehensive, a multi-stakeholder participation approach was used. A Participatory Situational Diagnosis Analysis workshop was organised, employing the recommended number of 25 experts/informants with substantial knowledge in the CSL situation in Ghana. The list of participants and their institutional affiliation is given in annex... The workshop identified the strengths, weaknesses, opportunities and threats confronting the question, 'How can illegal chainsaw operations and trade be sustained to provide employment'? The individual outcomes were discussed in plenary to cluster cards with common meaning and then were ranked by participants. The first five priorities of the various SWOT elements were displayed in a Strategic Orientation Matrix (SOM) and with a vote of 20; each participant used his votes to answer the following questions:

- 1. **Can** this Strength help chainsaw operatives to make better use of this Opportunity?
- 2. **Can** this Strength be used to fight this Threat?
- 3. **Does** this Weakness hamper the operatives in realising this Opportunity?
- 4. **Does** this Weakness make this Threat even more threatening or real?

The results of the voting were counted and the totals used to check for patterns of participants assessment which led to the formulation of five strategic statements that can be justified from the overall patterns displayed on the SOM.

11.3 Results

11.3.1 Employment levels and patterns

Table 11.2 summaries the results of the computations from the survey data and compares with some previous studies. The estimated total jobs created by chainsaw related activities are between 86770 and 92217 in 2007. Figure compares the contribution of various activities within the process based on the 34% and 50% recovery rates to the total job estimates for the year 2007.

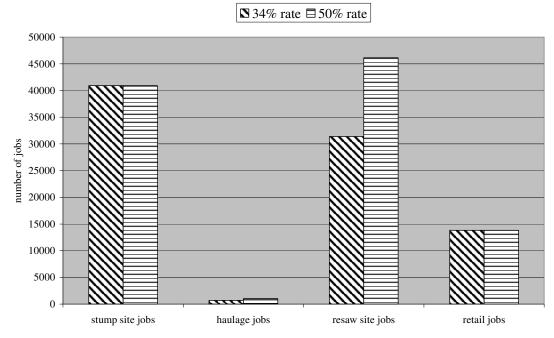


Figure 11.1: graph showing the number of jobs estimated to be created at the various points in the chainsaw enterprise using a milling recovery rate of 34% and 50%.

Following the estimations reported by Odoom (2005), computed by Adam et al. (2007) and Marfo et al. (2008) to represent employment levels of the years, 2003, 2005 and 2007 respectively, figure 11.2 suggests a trend over the past five years or so. We adopt the 2007 upper level based on the assumption of 50% recovery rate to take care of possible jobs involved in the emerging over-land export of chainsaw lumber to the West Africa sub-region which was not empirically estimated in this study. The 2005 and 2007 estimates show an increase of 18.9% (14,636) over 2005 estimate of 77,581 by Adam et al (2007). The study has shown that chainsaw milling and related activities provide substantial number of jobs. Comparing to the conservative estimate of 100,000 jobs provided by timber industry (Acquah-Moses, 2004), it can be argued that chainsaw milling offer competive employment levels.

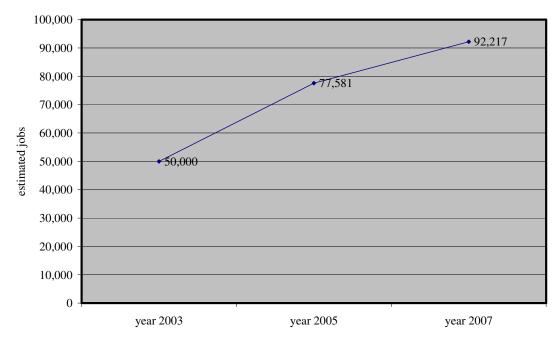


Figure 11.2 a graph showing the number of estimated jobs created by chainsaw activities over the periods 2003, 2005 and 2007 as reported by Odoom (2005) and estimated by Adam et al. (2007) and this study.

Table 11.2 summary of employment estimates of chainsaw milling and trading

Table 11.2 summary of employment estimates of chainsaw milling and trading									
	1999	2003		2007	2007				
	(Birikorang)	(Odoom,	2005 (Adam et al. 2007)	(this study)	(this study)				
		2005)							
Volume of processed	1,696,000								
Average recovery	34% for		50% by Akrasi (1997) Frimpong	50% recovery	34% recovery				
	sawmilling		Mensah (2003) could be high						
	assumed.								
Total annual volume processed (secondary data); (a)			2,700,000						
Annual volume to local market (b)			1,350,000	1,350,000	918000				
Operators Crew size (c)			6	6	6				
Input vol./month/crew (d)			50	33	33				
Monthly vol. processed (a/12)			225,000	225,000	225,000				
Number of milling crews engaged per month (a/12d)	000		4500	6818	6818				
Total number of people employed at stump site	900		27000	40908	40908				
(A=ac/12d)			27	26	26				
Haulage truck vol. m ³ (e)			27 50,000	26 51923	26 35308				
Total roundtrips for haulage trucks (b/e) Size of haulage crew (f)			12	31923 7	33308 7				
Total number of jobs in the haulage sector (B= bf/365e)			1644	996	677				
Average capacity of re-saw mill (g)			0.36864	0.40083	0.40083				
Re-saw crew size			4	5	5				
(h)			7	3	3				
Milling cycle for input vol. (b/g)			3662109	3368007	2290248				
Total number of jobs in the re-saw sector			40133	46137	31373				
(C = bh/365g)									
Average annual stock received by brokers, m ³ (i)			460	391	391				
Total number of brokers that will be engaged by annual			2935	3453	3453				
production (b/i)									
Average number of people engaged by a broker (j)			3	4	4				
Total number of people engaged in the lumber retailing			8804	13812	13812				
(D = bj/i)									
Total estimated number of jobs		50,000	77,581	92217	86770				

11.3.2 Sustainability of chainsaw operations

The list SWOT elements identified by the PASDIA participants are given as annex 11..... The SOM constructed following prioritisation of these SWOT elements is displayed as table 11.3

Looking at the Matrix, the SWOT elements combinations which led to the formulation of the strategic statements relevant to basic question have been circled in red. These were the combinations that received highest votes and for which there is some logical connections.

Strategic statement 1

The lack of political will, ready market, business network and lack of obligations for tax/fee payments strongly enables the operatives take advantage of initiating a business. This implies that so long as the factors remains within the grasp of operatives, all things being equal, chainsaw business will flourish.

Strategic statement 2

Chainsaw business flourishes in the domestic market as long as industrial timber remains relatively costly and unavailable

Strategic statement 3

The dwindling/limited availability of timber weakens the chainsaw operatives to take advantage of opportunities for financing their business

Strategic statement 4

The lack of political will to enforce the ban weakens law enforcement efforts by the FSD and security agencies

Strategic statement 5

The high market demand for timber does not make the low quality of chainsaw products affect the business of operatives and the quality concerns remain only a potential threat

Generally, the identified strengths were perceived to have the capability to take advantage of the opportunities than the weaknesses can constrain them. Thus even though there are a number of weaknesses, chainsaw operatives comparatively seem to have the strength to deal with the opportunities.

Table 11.3 Strategic Orientation Matrix of the sustainability of chainsaw employment workshop

Opportunities

Strategic Orientation Matrix 1	Ready market and sponsorship 15	Global environmental support 7	High cost/non availability of sawmill lumber 7	Non availability of alternatives 4	Strong desire to reduce chainsaw conflict 3	Totals
Lack of political will to enforce the law (21)	49	7	27	4	6	93
Ready yawning market 1(5)	57.5	32	32	1	1	123.5
No law to restrict the importation and sale of chainsaw machine (13)	16.5	6	19	11	4	56.5
Chiefs and farmers readily setting out timber to chainsaw operators (12)	33	5	19	18	4	79
Non –payment of fees and taxes (11)	32	4	18	3	4	61
Fear of imprisonment when caught 15	30 30	9	16	8	16	79
Use of old technology 15	14.5	0	10	8	1	33.5
No formal registration 12	5	0	1	2	5.5	13.5
Lack of cooperation from certain communities/chief and FC officials 12	11	8	9	5	4	37
Dwindling resources 12	16	18	7	6	2	49
Totals	264.5	89	158	66	47.5	625

Threats

Strategic Orientation Matrix 2	Awareness from chainsaw lumber users about quality of chainsaw lumber 11	Activities of security agency 7	Activities of VPAs 6	Legality: criminalization 6	Activities of environmentalists e.g. climate change 5	Totals
Lack of political will to enforce the law 21	9	19	6	6	1	41
Ready yawning market 15	10	3.5	5	3	4	25.5
No law to restrict the importation and sale of chainsaw machine 13	5	5	9.5	7	6.5	33
Chiefs and farmers readily selling out timber to chainsaw operators 12	9 10	2	4.5	5	4	24.5
Non –payment of fees and taxes 11	10	3.5	4.5	5.5	2	25.5
Fear of imprisonment when caught 15	1	7	1	7 7	1	17
Use of old technology 15	4.5	0	1	0	0	5.5
No formal registration 12	0	2.5	0	0	1	3.5
Lack of cooperation from certain communities/chief and FC officials 12	3	3	1	2	1	10
Dwindling resources 12	3	2	0.5	0	12.5	18
Total	54.5	47.5	33	35.5	33	203.5

11.4 Conclusion

The estimation exercise in the study has shown that chainsaw milling continues to provide substantial number of jobs even within the illegal framework and that the trend seems to be going up over the year. The study has a limitation in predicting whether the employment levels will increase over the next two or so years or not as this will depend on several factors that cannot be easily held as a constant. However, assuming the current level of enforcement, domestic timber demand, the sustenance of emerging overland export of timber to neighbouring countries and the current level of limited supply of timber from the industry, it is predicted that the current figure might go up. We however suspect that the rate of increase might be lower than the 2005-2007 jumps as the scarcity of the resource, especially in off-reserve, was recognised as affecting financing of chainsaw operations due to limited access to timber trees. This condition is likely to affect the projection if monitoring of forest reserves is tightened as there is increasing speculation that chainsaw operators are likely to target them under critical scarcity situation.

The study confirms that the domestic market demand, poor governance in the form of weak law enforcement and political will to 'crush' established and growing 'illegal' timber markets are incentives to keep the jobs safe.

Several options have been suggested to deal with the illegal chainsaw issue (see Odoom, 2003; Adam et al. 2007). The MSD process under the EU-chainsaw project also seeks to develop options. The utility of the developed strategic statements in dealing with sustainability of chainsaw related jobs depends on the legal framework that will prevail. If the at the end of the day, the chainsaw milling remains illegal (status quo) and there is the real need to enforce the law, then the statements suggest actions that must be taken to tackle the problem from the employment end. For example, it suggests that political will to take actions such as monitoring or closing of timber markets must exist. It also suggests that dealing with broader governance issues such as fighting corruption related to enforcement is crucial. At the same time, if the option is to regularise chainsaw operations, then these statements can also guide specific actions needed to secure chainsaw related jobs. For example, it will be required to secure supply of timber trees and institute other fiscal incentives that will make their operations competitive and profitable.

PART IV

SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACT OF CHAINSAW MILLING

Background to the study of social, economic and environmental impact of chainsaw milling

Background

Chainsaw milling is now considered as one of the main issues threatening the development of the forest sector and sustainable forest management in Ghana Adam et al (2007a). This is because illegal chainsaw millers in haste to convert the logs into lumber, fell trees indiscriminately and use inappropriate sawing techniques with the chainsaw that are likely to result in low recovery and consequently wasteful use of resources. In this connection it is estimated that about 2 million m³ of logs are illegally processed by chainsaw millers annually leading to the loss of about 14 million US dollars in terms of stumpage revenue (Parren et al. 2007).

The chainsaw milling and trade has evolved a highly complex production chain consisting of many actors that carry out specialised functions and ensures wide distribution of benefits within the communities where milling takes place. According to Adam and others (2007 b) the apparent flow of direct cash benefits makes it extremely difficult to solicit the help of the local communities in controlling the illegal chainsaw milling and any associated negative impacts.

Despite the reported benefit flow among actors it is not well understood if there can be a fair deal especially if the whole business transaction is being done in an illegal and uncontrolled environment. In this situation it can reasonably be assumed that, chainsaw milling and associated lumber trade has more negative than positive impacts. However, there is the need to have a more empirical data to assess the extent to which chainsaw milling is impact on society, the economy and the environment.

Objectives

The main objective of this study is to understand and describe the positive and negative impacts of chainsaw milling.

Specific objectives

- 1) To evaluate the impacts of CSM with respect to direct and indirect contributions to the rural and national economy
- 2) To examine the environmental impacts of CSM in terms of contribution to forest degradation and impairment of ecological functions
- 3) To assess the social impacts of CSM with respect to social stability and challenges it poses for forest governance.

Scope of study

Generally this report builds on the DFID project on chainsaw milling in Ghana that described CSM to have positive or negative impact on rural livelihoods and sustainable development depending on operation mode. However, that study could not give quantitative estimates of the impacts. This sub-study of the EU-chainsaw

project aims at quantifying the economic, social and environmental impacts of chainsaw milling under both the illegal and a regularised state.

The study was carried out in only the 8 pilot districts and addresses the following:

- 1) Evaluation of the Economic impact
 - i. Effect on rural livelihood and national economy;
 - ii. Distribution of benefits (benefit flow); and
 - iii. Loss of state revenue
- 2) Examination of the Environmental impact
 - Degradation to forest resources as associated with illegal chainsaw milling; and
 - ii. Encroachment and damage on ecologically sensitive sites:
- 3) Assessment of Social impact of CSM
 - i. Conflict associated with chainsaw lumbering; and
 - ii. Governance impacts

Study Methods

Through a gap analyses a set of issues were identified with respect to the perceived impacts and relevant research questions developed. In this study we try to evaluate the net impact of chainsaw milling on the Ghanaian society. The main areas of perceived impacts and research questions are presented in Chapters ...-... and their implications discussed in chapter ... of this report.

Arrangement of Chapters

Chapter 12 deals with the economic impact of CSM through a Cost-Benefit-Analysis. This chapter elucidates the effect on rural livelihood and national economy; distribution of benefits; and loss of state revenue. Chapter 13 examines the environmental impact of CSM through a quantitative and qualitative field assessment and presents a description on degradation to forest resources as associated with illegal chainsaw milling; encroachment and damage on ecologically sensitive sites. Chapter 14 presents an assessment of the social impact through stakeholder consultations and community surveys to describe the conflicts associated with controlling chainsaw milling as well as the impact on effective forest governance.

Chapter 12 ECONOMIC IMPACT OF CHAINSAW MILLING ON RURAL AND NATIONAL ECONOMIES

Beatrice Darko Obiri & Lawrence Damnyag

12.1 Introduction

Chainsaw lumbering in Ghana has been described as a "necessary evil" (Nketiah *et al.*, 2003), in that, even in its criminalized state in the country, the practice plays a key function in providing employment and livelihood opportunities to many rural and urban dwellers in the wood and allied industries. Other positive economic impacts include income and lumber from trees on farmlands for farm households (Odoom, 2005), which otherwise would have been lost to legal concessionaires who hardly pay any compensations for extraction of trees on farmlands. Some traditional authorities may also gain through payments of entry/access fees by chainsaw operators. According to Counsell (2007), local communities tend to earn from direct compensation payments from illegal logging as they could potentially earn from legal logging. Conversely, these transactions impact negatively especially on the national economy through loss of revenue to the state. Forest rent may be lost to corrupt forest and other law enforcement officials who have been mandated to police forest resources.

This aspect of the study is aimed at determining the effects of chainsaw lumbering by quantifying the economic impacts of chainsaw milling under the illegal state on rural and national economies of Ghana. Specifically, the study assesses the forms and quantum of economic contributions by the different actors in CSM to the national and rural economy through employment generation, payment of taxes and provision of infrastructure, etc. The study also estimates the potential loss of revenue to the state from illegal chainsaw operations due to non-payment of official royalties and taxes. It also describes the distribution of benefits accruing from chainsaw operations to the three key actors (farmers/landowners, porters/carriers and the operators) in the chainsaw milling chain and how these benefits compare with their inputs (Time, money and expertise), if these are invested in other alternative income activities in the rural economy.

12.2 Methodology

Reconnaissance visits were made to study sites to make initial contacts and assess rural stakeholder perceptions of the possible economic impacts of chainsaw lumber production the local economies. Studies done by Odoom (2005) and Adam *et al.* (2007) were also consulted to gain insights into the economic impacts of chainsaw lumber production in Ghana. A questionnaire was then designed, pretested and administered on 102 chainsaw lumber stakeholders across the 8 forest districts of the project sites. The questionnaire was designed to cover two major themes, including the forms and quantity of economic contributions by an actor in the chainsaw milling chain to the rural community (employment, Taxes, provision of infrastructure) and that which he or she has gained from the chain.

Other issues covered were chainsaw lumber production as source of livelihood and its contribution to the household budget. The was data collected through face-to-face interview of the primary stakeholders, including chainsaw lumber sponsors, chainsaw machine owners, chainsaw operators, lumber carriers/head porters; transporters of chainsaw lumber, small scale saw millers, village/community chiefs, unit committee members and lumber dealers on timber markets in study districts. The categories of stakeholders were identified from informal interactions during the reconnaissance visits and from previous studies by Odoom (2005) and Adam *et al.* (2007). They were interviewed based on their availability and willingness to grant audience for interviewing. The distribution of chainsaw lumber stakeholders surveyed across the 8 forest districts is presented in Table 2.1.

Table 12.1: Distribution of the respondents across the 8 forest districts in the project area

Category of Respondents

Forest District and number of respondents

	Assin Fosu	Begoro	Sunyani	Goaso	Kade	Oda	Juaso	Nkawie	Total
Chainsaw operator	3	8	5	4	2	2	0	2	26
chainsaw owner	0	7	2	4	2	1	5	3	24
Lumber carriers/head porters Small scale saw miller	3	2	3	1	1	7	0	3	20
Lumber dealer	0	1	1	3	0	1	1	0	7
Transport owner/drivers	0 1	0	2	0	0	3 2	0	0	5
Chainsaw lumber sponsor	0	0	0	3	0	0	1	1	5
Carpenters	0	0	0	1	0	2	0	0	3
Unit committee member	0	0	0	0	2	0	0	0	2
Farmer	0	1	1	0	0	0	0	0	2
Chief	0	0	0	0	0	1	0	0	1
Total	7	19	15	17	8	19	8	9	102

Source: Survey data, 2008

The data has been analysed descriptively with the Microsoft SPSS software and summarized by using frequencies, percentages and bar charts.

12.3 Results and Discussion

12.3.1 Structure of the Ghanaian rural economy

The social, economic and demographic structure of Ghana has not changed much since independence (GSS, 2007). The primary sector (agriculture, mining, quarrying and forestry) continues to dominate the economy, in terms of its contribution to output, employment, revenue generation, and foreign exchange earnings. Agriculture is the main economic activity and currently, accounts for about 51 percent of the Gross Domestic Product and about 54 percent of the labour force (GSS, 2007). The social structure remains predominantly traditional, rural and informal, with close family links, while the population remains young, with relatively high but declining fertility and low mortality levels as indicated in Table 12.2

Table 12.2: Percentage Distribution of Urban /Rural Population by Sex (1960, 1970, 1984 and 2000)

	1	960	19	1970		1984		2000	
	Urban	Rural	Urban	Rural	Urban Rural		Urban	Rural	
Sex									
Male	11.9	38.7	14.4	35.2	15.6	33.7	21.4	28.1	
Female	11.2	38.2	14.5	35.9	16.4	34.3	22.4	28.1	
Total	23.1	76.9	28.9	71.1	32.0	68.0	43.8	56.2	

Source: Ghana Statistical Service, 2007. Key social, economic and demography

In 2005 the rural population as percentage of total population was 52.2 and the total of this rural population that was poor in the same year was 5.8 million. In the area of health percent of rural population with access to water in 2004 was 64 and percentage with access to improved sanitation facilities was 11.

Rural poverty affects 40% of the rural population in Ghana and unemployment rate is 20%. This may be due to low incomes earned from agriculture which employs a greater proportion of the population in this sector. Agricultural production is seasonal and largely rain-fed. Thus the current irregularity in the rainfall pattern coupled with the declining soil productivity in agricultural lands in most rural communities, results in low crop productivity and farm income. Consequently, illegal chainsaw operation has gained prominence as a major source of supplementary income in some communities in the high forest zone of the country.

12.3.2 Chainsaw lumbering, rural livelihoods and economy

12.3.2.1 Contributions of chainsaw lumber production to the rural economy

Figure 12.1 describes the overall economic contribution of chainsaw lumber production to the economies of the study districts between 2004 and 2008. Various actors have benefited from engaging in this practice. Chainsaw lumber producers and traders have gained directly or indirectly from chainsaw lumbering mainly through the provision of employment. Employment contributes about 84% of the total economic gain from chainsaw lumbering to the rural economies under study. However, operators and traders have also contributed to community development through establishment of infrastructures such as schools and boreholes, payment of informal taxes and provision of timber. The same trend is observed within each of the districts with employment from chainsaw operations mainly offered to youth being the largest proportion of the economic benefits gained by the rural economies (Figure 12.2). The monetary value of these contributions made between 2004 and 2008 are presented in Figure 12.3. It must be noted that gains reported were not made consistently over the five year period.

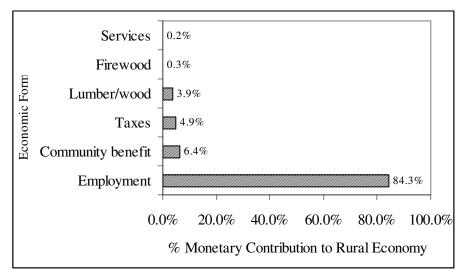


Figure 12.1: Overall economic contribution by proportion of chainsaw lumber production to the rural economies in the study forest districts between 2004 and 2008

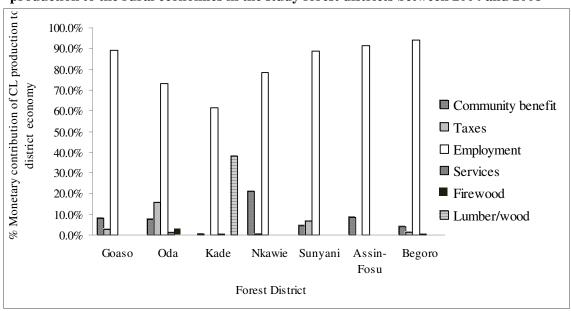


Figure 12.2: District distribution of the economic contribution of chainsaw lumber production to the district economies between 2004 and 2008

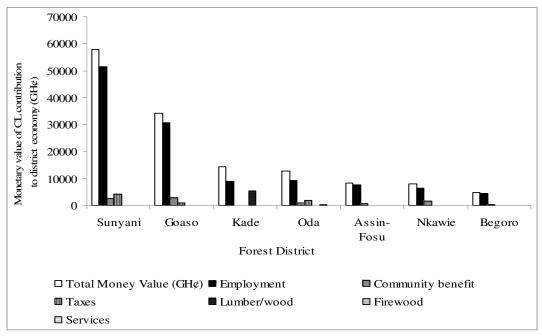


Figure 12.3: Economic value of contribution of chainsaw lumber production to study district economies between 2004 and 2008

Chainsaw operations contributed a total monetary value of approximately GH¢141,000 to the district economies under study between 2004 and 2008. District economic gains ranged from about GH¢5,000 in the Begoro forest district to GH¢58,000 in the Sunyani forest district (Figure 12.3). At the economic form level, employment contributed about GH¢51,300 in the Sunyani forest district as compared with GH¢7,600 gained from chainsaw operations in the Begoro forest district. The trend in observations made in Figures 12.2 and 12.3 shows that chainsaw operations contribute most by providing employment to a segment of the population in the study districts. The findings also indicate that chainsaw operation contributes most to the rural economy of the Sunyani forest district and probably the practice is most rampant in this district. However, it must be noted that the sample distribution of the number of respondents interviewed across the districts was unequal. Although contacts were made through the district platforms formed by the FSD, respondents were interviewed only when they were available at the time of visit and willing to grant audience.

While the value of the contributions towards community development, taxes to traditional authorities and lumber are relatively lower, that for firewood and services are almost negligible. This is because operations are usually done secretly, hence traditional authorities, landowners and farmers hardly receive any payments or lumber from trees harvested. Firewood is usually available on farms for household use in many rural communities in forest areas; hence, not many households may be depending on off-cuts from chainsaw operations for their firewood needs. Also, vehicles used for transporting lumber to the market may be used occasionally to convey particularly the sick in distant forest locations to healthcare centres for medical treatment.

12.3.2.2. Contribution of chainsaw lumber production to rural livelihoods

Chainsaw lumber production as a source of livelihood to rural communities

Table 12.3 shows the different livelihood activities in which the primary stakeholders interviewed engage for income. Generally, respondents engage in more than one livelihood activity for survival, accounting for the total percentage being over 100. This notwithstanding, over 80 percent of these primary stakeholders are engaged in chainsaw operation, indicating that many more of them are engaged in this activity than in any other livelihood activity. It must be noted that the sample of respondents was generally dominated by people involved in chainsaw operations.

Table 12.3: livelihood activities respondents are engaged in and for which they earn income

Livelihood activities/source of income	Number of responses	% of total responses
Chainsaw operation	70	81.4
Farming	53	57.7
Sawmilling operation	8	8.2
Livestock rearing	7	7.2
Petty trading	7	7.2
Paid work	7	7.2
Lumber carrier/porter	7	7.2
Carpentry	6	6.2
Collection and sale of products from wild	4	4.1
Taxi driver	3	3.1
Total	184	189.7

The distribution of responses for the range of livelihood options which respondents pursue for survival in the study districts is presented in Table 12.4. Figure 12.4 indicates that major livelihood activities among respondents in the study districts are chainsaw operation and farming. The fact that the proportion of responses for chainsaw operation is higher (81%) than that of agriculture (58%) indicates that about 23% of the rural population is possibly relying solely on chainsaw lumbering for survival or may be supplementing income from non-agricultural work with that from chainsaw operations. The results also indicate that there could possibly be outsiders or migratory chainsaw workers who purposely come into the study districts to undertake operations. These obviously will not be interested in any agricultural work.

Table 12.4: Distribution of number of primary stakeholders engaged in different livelihood activities for income across the study forest districts.

Livelihood activity/sources of	Number of respondents engaged in the different livelihood activities for income in study forest districts							Total
income	Assin Fosu	Begoro	Sunyani	Goaso	Kade	Oda	Juaso	_
Chainsaw operation	6	16	10	12	8	9	9	70
Farming	3	8	10	11	6	9	6	53
Sawmilling operation	0	0	1	3	0	4	0	8
Livestock rearing	1	1	1	0	3	1	0	7

Paid work	1	1	0	1	2	1	1	7
Lumber carrier/porter	1	1	4	0	0	0	1	7
Carpentry	0	3	0	1	0	2	1	7
Petty trading	0	1	0	1	1	1	1	5
Collection and sale of products from wild	0	0	0	0	1	2	0	3
Taxi driver	0	0	1	0	1	1	0	3
Total	12	31	27	29	22	30	18	169

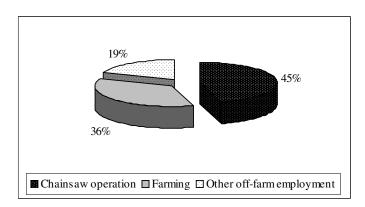


Figure 12.4: Livelihood activities undertaken by respondents in study forest districts

While chainsaw operation has emerged as a key supplementary livelihood option in the rural economy, it must be acknowledged that the quick return it provides makes it an attractive venture that will draw more people into the practice than any other livelihood activity in the rural economies under study. Amanor (2006) indicates that chainsaw lumber production has been a practice of old in forest areas in southern Ghana. Formerly, when the practice was legal, it employed well organized groups of the youth in these areas until it was criminalized in the 1990's. The practise has reliably supplied timber to the domestic market since the 1970's, when legal timber firms failed to satisfy domestic demand for lumber due to the recession or decline in the Ghanaian economy in those years. This means that the practice has been in existence for well over 3 decades. Criminalizing it has only lead to the development of networks of gangs that promote the practice to sustain livelihoods not only in rural areas but also in urban areas.

Contribution of chainsaw lumbering to rural household budget

The important role chainsaw operations play in supporting rural livelihoods is further portrayed by its contribution to the household budget of those involved in this enterprise. The annual gross income earned by a sample of 98 respondents from the variety of livelihood activities they undertake ranges from GH¢25-GH¢35,000 with a mean earnings of GH¢2000 per annum (Table 12.5).

Table 12.5: Gross annual income of respondents from different livelihood activities in 2008

	N	Minimum	Maximum	Mean	Std. Deviation
Total gross income of each individual (GH ¢)	98	25.00	35000.00	2000.5372	4799.32056

The distribution of earnings from chainsaw operations as a share of the total household income for seventy-nine out of the 98 respondents in the study forest districts indicates that more than 50% of them earn over 80% of their income from chainsaw operations Figure 12.5. This is not surprising because all of them are involved in chainsaw related activity for income which brings in relatively higher earnings. The details on the distribution of chainsaw earnings as the share of total household incomes in each of the 8 study districts are presented in Appendix 12.3.

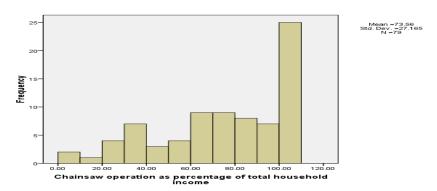


Figure 12.5: Chainsaw as a percentage share of household income in the 8 forest districts

12.3.3 Benefit Cost Ratio of chainsaw milling to alternative economic activities in the rural economy

Chainsaw operators, lumber carriers/porters and farmers are the three key actors who are directly engaged in the production of chainsaw lumber at the rural level. Table 12.6 summarizes net benefits in terms of the monetary value these stakeholders derive from engaging in chainsaw lumber production compared with estimate of their engagement in alternative work in the community other than chainsaw lumbering. Generally, the income (CI) earned from chainsaw operations is comparatively higher than that from alternative work (AI), which is usually farming. However, in some cases particularly for lumber carriers and farmers they may be better off doing the alternative work, instead of engaging in chainsaw lumber production as indicated by the negative net benefits and smaller CI/AI ratios for wood and lumber benefits in Gaoso, Assin Fosu and Begoro. Nevertheless, chainsaw operation may serve more as a supplementary rather than an alternative income source to such people.

Table 12.6: Chainsaw lumbering benefits compared with alternative rural economic activities

District	Year	N	Type of Benefit	Chainsaw Income (CI) (GH¢)	Benefit from Alternative income (AI) (GH¢)	Net Benefit (NB) (GH¢)	CI/AI ratio
Goaso	2005-2008	17	Money for Livelihood	87,850	68,124	19,726	12.89
	"		Lumber/Wood	803	2,030	-1,227	3.95
	"		Farmland	701	2,000	-1,299	3.51
Oda	2006-2008	18	Money for Livelihood	149,628	24,990	124,638	59.87
Kade	2007-2008	7	Money for Livelihood	44,908	23,630	21,278	19.00

Nkawie	2007-2008	9	Money for	6,000	3,991	2,009	1.50
			Livelihood				
Sunyani	2007-2008	14	Money for	13,040	2,812	10,228	46.40
-			Livelihood				
	"		Lumber/Wood	251	0	251	100.0
Assin-	2008	7	Money for	10,080	6,750	3,330	14.93
Fosu			Livelihood				
	"		Lumber/Wood	500	200	300	25.0
	"		Farmland/Land	1.0	500	-499	0.02
Begoro	2006-2008	17	Money for	16,770	12,980	3,790	12.90
-			Livelihood				
	"		Farmland	110	200	-90	0.55

12.3.4 Distribution of chainsaw lumber revenue among the actors along the chainsaw commodity chain

The structure of the chainsaw commodity chain (Figure 12.6) is described in detail in Part I of this volume. The major route for access to trees, processing and supply of chainsaw lumber to the market is indicated by the thick arrows in Figure 12.6. Timber flows mainly from farmlands through the operator producing for haulage to supply timber merchants/brokers on the market who may pre-finance operations.

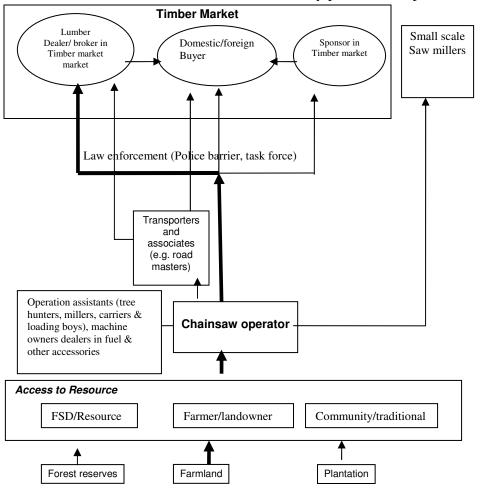


Figure 12.6: Stages of chainsaw lumber production and marketing (adapted from chapter 3 of this Volume)

The stakeholders or actors involved in the processing and marketing of chainsaw lumber operate at three key levels. At the lower level of the chain are resource owners (farmers/landowners, traditional authorities/village chiefs and other community leaders) and official resource managers i.e. FSD staff who provide access to tree resources for processing. Chainsaw workers comprising operators and people who assist them in the processing of trees e.g. scout/tree hunters, the head porters/lumber carriers and loading boys are also at the lower level. These produce the lumber for supply to the domestic market. Other key actors at the lower level are the machine owners renting out chainsaws as well as dealers in fuel, chains, sharpeners and other accessories required for production.

At the middle level are the transporters involved in the distribution of chainsaw lumber. Also at this level are the law enforcement agents at police barriers and FSD task force that control haulage and passage of the lumber to the domestic market. The third or topmost layer is the receiving end that has the timber brokers/sellers and buyers as well as financiers of chainsaw operations on the timber market. Some small scale saw millers are also at the third level receiving supplies of chainsaw lumber. These may be located in rural or urban areas producing lumber mainly for export.

Figure 12.7 shows the distribution of revenue or cash gains from chainsaw operations along the commodity chain among actors in the chainsaw enterprise. The resource owners and managers at the lower level earn the least. Likewise are the law enforcement agents in the forest areas and at the barriers in the middle level. Their earnings in total constitute 10% of the gross market value of the lumber and are usually gained in the form of informal payments made by the operator to them for access to trees and passage for processed lumber to the market.

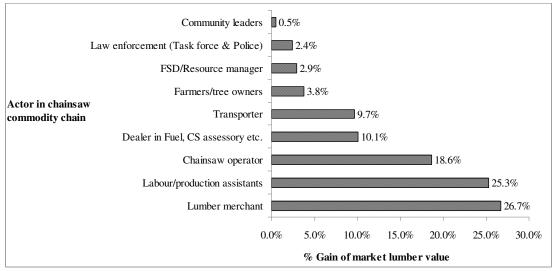


Figure 12.7: Distribution of chainsaw revenue from a single operation among key actors along the chainsaw commodity chain

The transporter gains 9.7% while those who supply the machine, fuel and accessories gain 10%. The operator gains 18.6% of the market value of the lumber as net income or profit while his labourers or production assistants offering various services earn a relatively higher proportion of 25.3% of this revenue. The lumber merchant on the market has the highest gain of 27% as profit on the sale of the chainsaw lumber supplied. The margin between the operator's and lumber merchant's gain or profit is about 8%. This figure although conservative due to the wide variation in prices of

lumber for the wide array of species on the markets gives an indication of the potential gain of the lumber merchant in the chain. Obviously as tends to be the case for many commodity chains, the sellers at the end of the chain make the highest gain.

Generally, the distribution of neither the revenue from illegal chainsaw lumber production nor the official forest revenues distributed by the Forestry Commission favour forest fringe or forest resource owning communities. Forest revenues which the Forestry Commission collects are appropriated inequitably and illegally by powerful interest groups (Opoku, 2006). Ghana's constitution provides a formula for distributing this revenue accruing from stool lands set in out in Article 267 (6). This formula provides 10% of the revenue accruing from stool lands to the office of the Administrator of Stool Lands (AOSL) to cover administrative expenses. The remaining revenue is disbursed such that 20% goes to the stool through the traditional authority for the maintenance of the stool in keeping with its status; 25% traditional authority; and 55% percent to the District Assembly, within the area of authority of which the stool lands are situated. Notwithstanding this constitutional provision, the Forestry commission officially appropriates 60% of revenue derived from forest reserves and 40% of revenue derived from off-Reserves as stumpage revenue to cover the cost of management incurred on behalf of the owners. Currently, 50% instead of 40% of the forest reserve revenue has been proposed for payment to the AOSL for distribution by the constitutional provision (see Owusu et al, 2006).

It is thus observed that for traditional forest communities, the constitution selects three institutions to receive their shares of royalties on their behalf, i.e. District Assemblies (55%), stools (25%) and traditional authorities (20%). Generally, none of these institutions account to forest-owning communities for royalties they receive and many of them do not also deploy these resources in development projects (Opoku, 2006). By implication, forest owning communities generally do not benefit much from the distribution of the formal forest revenue generated.

12.3.4 Chainsaw Lumbering and the National Economy

Chainsaw lumber production as an enterprise in the forestry sector impacts both positively and negatively on the national economy. Positively, chainsaw lumbering contributes to some economic forms for national development and negatively mainly through the loss of revenue to the state.

12.3.4.1 Economic contributions to the state

The domestic demand for wood is approximately 456,417 m³ (Odoom, 2005). About 102,000 m³ of this demand is being supplied by the regular sawmills (Odoom, 2005). The demand deficit of approximately 350,000 m³ is being met from other sources including chainsaw operations. Nationally, an estimate of lumber supplied to the domestic market from CSL is difficult to attain, however an estimate of 1926m³ of lumber was supplied by a sample of 78 operators in a single operation across the forest districts in this study. Employment and physical assets (roads, water, and school) provided to the rural economy also contribute to national development. An un-estimated number of lumber dealers on the numerous wood markets across the country, wood workers and affiliates earn their livelihoods from illegal chainsaw lumber. It must also be acknowledged that chainsaw lumber supplies are essential for government construction work and private infrastructure development.

Sub-regionally, overland wood/lumber distribution to neighbouring countries of Mali, Burkina Faso and Togo generate revenue from waybills, road taxes, custom duties paid to enable conveyance of such goods to their destination. It is interesting to note that once illegal lumber reaches the domestic market, it ceases to be an illegal good. The lumber of variable dimensions (correspond with the size or dimension of the vehicle for haulage to the market) is resized or re-sawn and polished by table top mills on the market. The lumber is marked and neatly parked for other destinations under official permit in the form of waybills for conveyance. Under such conditions, the state only stands to benefit from conveyance revenue rather than impounding the goods as illegal.

12.3.4.2 Loss of revenue to the state

Stumpage fees

The major adverse economic effect of illegal chainsaw lumbering on the Ghanaian economy is the loss of potential revenue from stumpage or permit and conveyance fees from timber or lumber produced from the resource base to the market. An estimate of stumpage revenue loss from 642 trees harvested by a sample of 78 respondents in a single operation in study districts in 2008, totals about GHC 4,815. This implies that the state would have earned this much of revenue if those trees were allocated under a concession. A report by Schmithüsen (2006) indicates that the total revenue loss to the nation from illegal logging operations including chainsaw is 36.22 billion GH¢ (28.97 million USD) per annum, equivalent to about 2% of the GDP.

The estimated revenue loss does not take into account an amount of GH¢ 2,831 paid to farmers/landowners directly for trees harvested (Figure 12.7) as informal royalty. This figure is relatively low because trees are either stolen from the off-reserve or may be sold by the farmer/landowner at a very low price to cater to household contingent monetary needs. Chainsaw operators pay an average value of GH¢12 (24 \$10) per tree directly to farmers. This is comparatively lower than an estimated official stumpage value of GH¢31.5 per tree (\$22.5, i.e. 3 m³ average tree volume x 7.5\$ per m³) for trees on farmlands. The farmer potentially loses on the average GH¢19.5 (\$14) for selling a tree on his/her land to the chainsaw operator if he were to have the right to sell it legally. However, the meager income earned directly from the transaction by the tree owner serves a crucial purpose to the farm family.

Informal payments

Figure 12.8 shows the distribution of informal payments made to various actors in the chainsaw lumber commodity chain, mainly farmers, traditional authorities and state officials responsible for checking or controlling illegal chainsaw operations. Eleven different types of informal payments are made. The total value of informal payments made for access to timber trees, fees and bribes or sweeteners to enable passage to the market in this single operation amounted to about GH¢19,900 (Figure 12.8). According to Fobih (2003) an estimated amount of GH¢1200, 000,000 (¢12 billion) revenue is generally lost through informal payments annually from illegal logging in the country.

²⁴ 1\$ equivalent to GH¢1.2 in February 2009

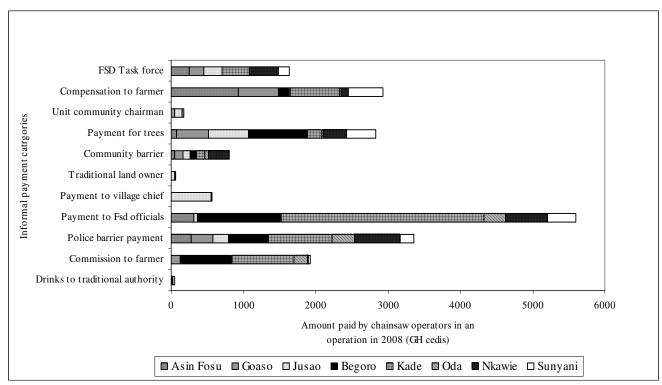


Figure 12.8: Distribution of informal payments and respective amounts (GH¢) across study forest districts in a single operation in 2008

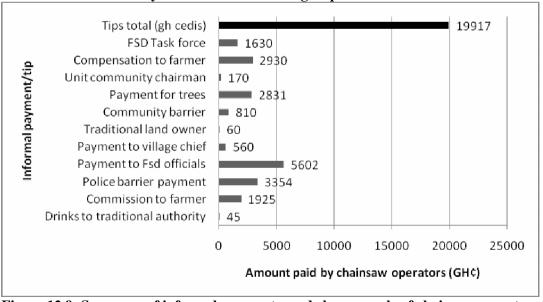


Figure 12.9: Summary of informal payments made by a sample of chainsaw operators in a single operation in the 8 study forest districts in 2008

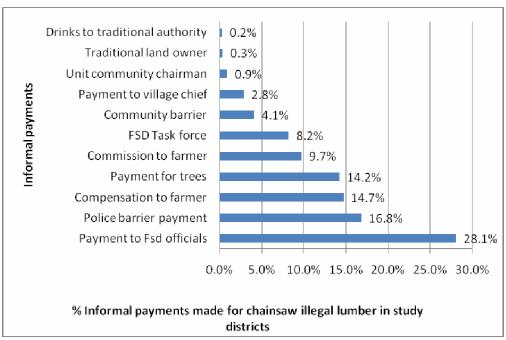


Figure 12.10: Percent Informal payments earned by farmers, traditional authorities and government officials in a single operation in the 8 study forest districts in 2008

Staff of the Forestry Services Division (FSD) earned the highest amount from informal payments i.e. GH¢5,600 representing 28.1% while the traditional authorities earn GH¢45 representing 0.2% (Figures 12.9 and 12.10). The FSD task force earned 8.2% of the total informal payments which is significantly lower than that earned by the FSD staff, mainly forest guards and range supervisors. This observation indicates high incidence of connivance with FSD officials and that operations may be quite illusive, making it difficult for the task force to genuinely arrest culprits.

The connivance is obvious because FSD forest guards, range supervisors and task force that are paid to manage and protect the resource fail to effectively exercise their duties. They are also sometimes forced to accept bribes or allow extraction for fear of losing their lives, as chainsaw gangs have become recalcitrant and sophisticated in the use of weapons. Furthermore, forestry officials do not have the mandate to arrest and prosecute offences. Illegal chainsaw lumber cases are reported to the police who claim that they lack adequate knowledge on processing dockets on such cases for prosecution at the formal law courts. Cases may be delayed and culprits released from police custody after a while. Also traditional authorities especially chiefs may influence the police to release their subjects who be arrested and kept in police custody. This is a disincentive to forestry officials. Consequently, they tend to extort money from culprits rather than report to the police who may take advantage of the situation to benefit from cash payments.

Although the Forestry Commission (FC) pays royalties to traditional resource owners and stools as indicated in section 12.3.4, this amount usually goes directly to paramount chiefs of the traditional areas. The paramount chief has the prerogative in the distribution of this forest revenue to his subjects. In some areas, local communities apply for some of this fund for community infrastructural development (school, toilet facilities, etc.). The local traditional leadership may not gain directly neither will the farmer gain directly from the pooled earnings. Direct earnings from compensation

payments (14.7%) and commission on trees (9.7%) harvested by farmers are also significant (Figure 12.10). These incomes would have been lost to the farm family if the trees were harvested by a legal concessionaire.

12.4 Conclusion and Policy implications

The findings above outline some aspects of the potential economic impact of chainsaw lumber production on rural and national economies of Ghana. In sustainable livelihood parlance, chainsaw operations can be said to be contributing to some capital assets of the rural economy. With respect to the areas under study, it contributes mainly to the financial and physical capitals. Chainsaw lumber production impacts on the rural economy in the study forest districts mainly through the provision of employment for income and some basic amenities to the people.

The distribution of benefits from chainsaw lumber production is generally skewed in favour of lumber dealers or brokers and financiers on urban lumber markets who gain 27% of the gross market value of the lumber supplied by chainsaw operators as profit. At the lower level of the chainsaw commodity chain, the production assistants and operators benefit the most from the practice, gaining 25% and 19% of the gross market value of the lumber respectively. The results of the cost of investment analysis in part II of this volume indicate that chainsaw lumber production may not be all that lucrative for these operators. That notwithstanding, this study indicates that illegal chainsaw activities contribute 80% to their household budgets. Also the practise is more lucrative compared to alternative income ventures in the rural economy as indicated by their higher Benefit/cost ratios. The import of these findings is the seemingly livelihood supportive role illegal chainsaw lumber production offers to the rural economy and urban timber merchants and affiliates on the domestic market.

Nationally, illegal chainsaw practice is mainly supplying lumber for domestic consumption. An estimated volume of 2000m^3 was supplied to the market in a single operation in 2008 from a sample of 78 operators in the eight study forest districts. Adam *et al.*, (2007) estimated the number of chainsaw operators in the country to be about 80,000. Currently, the figure is estimated to be about 100,000 (Marfo and Acheampong in this volume). The annual supply by proportion could be overestimated but these findings suggest that the volume of chainsaw lumber supplied to the domestic market could be significant.

Conversely, the nation is losing stumpage and other revenue, which could have been earned for development. The indications of connivance of operators with FSD staff and resource owners will certainly make regulation of the illegal chainsaw practice extra difficult for the government. To aggravate this situation is the fact the farmers/landowners on whose land the trees are allocated earn directly from three categories of informal payments, i.e. payment from trees, compensation and commission payments. The critical issue here is the direct flow of benefits from tree resources to resource owners that protect or nurture them for timber.

In the light of the findings above, the key issues that may be raised for policy dialoguing with stakeholders on the regulation of illegal chainsaw lumbering in the country may include the following:

- 1. The sustenance of rural livelihoods and preventing a further decline in the rural economy since agriculture the major rural economic activity is less lucrative
- 2. The potential contribution of chainsaw lumbering to rural and national economic development
- 3. Minimizing or eradication of connivance of chainsaw operators with FSD staff and local communities
- 4. Effective harnessing of forest revenues for equitable distribution and community and national development

Prosecution procedures for illegal chainsaw logging must be well defined to assist police officials in processing such criminal offences effectively. Also connivance with local communities may be minimised by devising measures that will ensure that the primary owners of timber trees harvested from off-reserve areas gain directly from proceeds from their lands. Some competitive percentage of the revenue must be paid directly at stumpage to the farmer or landowner. This will be an incentive for them to cooperate in the protection of timber trees. This also means that standard percentage of royalties that must be paid to these stakeholders needs to be derived for various species and diameter classes. The average amount paid per tree by chainsaw operators in this study is GH¢12.0. This could be as low as GH¢5 in some cases. The average official stumpage value for extraction of trees from farmlands is GH¢31.5 (USD 22.5) per tree (Adam, 2009), which is nearly three times that paid by the chainsaw operator. This option will be more attractive if the amount earned from official royalty is relatively higher than that from chainsaw operators.

Chapter 13

ENVIRONMENTAL IMPACTS OF CHAINSAW MILLING

Kwame Asamoah Adam and Akwasi Duah-Gyamfi²⁵

13.1 Introduction

Tree felling and in-situ conversion of logs to lumber as is the usual case in chainsaw milling (CSM), can have both positive and negative environmental impact depending on the mode of operation. These may be in reference to: choice of tree (species, tree size, and location) to be felled; felling techniques (as it relates to minimization of felling damage) and; sawing techniques (as they affect recovery or residue generation and consequently sustainability of resource).

Previous survey reports have indicated that chainsaw milling is being conducted indiscriminately without the operators observing any environmental standards. If there is the real need to make chainsaw milling a sustainable avenue for employment and revenue generation it would be very necessary to understand its potential environmental impacts so as to enhance its positive aspects and develop strategies to mitigate its negative environmental impacts.

In this chapter the environmental impacts of chainsaw milling were assessed in terms its contribution to degradation of forest resources and damage on ecologically sensitive sites. We do this by addressing specific research questions that lead us to present both quantitative and qualitative assessment of the environmental impact of CSM.

Research questions:

Degradation to forest resources as associated with illegal chainsaw milling:

- i. What are the actual volumes of standing trees removed through CSM per year?
- ii. How much of the protected or restricted species are being removed

Encroachment and damage on ecologically sensitive sites:

- i. What are the negative impacts of CSM on forest ecology?
- ii. Which sensitive ecological areas are negatively impacted?

13.2 Methodology

The environmental impact assessment involved three stages. The first stage involved stakeholder consultations in the pilot sites to identify components of forest and rural environment that are perceived to be impacted upon by chainsaw lumbering. We did this by talking to community leaders, farmers (including men and women), timber concession holders, and forest managers

In the second stage following the stakeholder consultations 6 indicator variables (Ground vegetation disturbed; forest/tree canopy loss during felling and milling; harvesting density as a measure of frequency of illegal felling; amount of residue

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generated; recognition for protection of immature trees; recognition for protection of water bodies and; recognition for protection of agricultural crops) were identified. In the third stage field surveys were conducted to have a quantitative assessment of the selected indicator variables as they relate to illegal chainsaw logging and conventional logging.

Field Assessment of environmental impacts of chainsaw milling were conducted in four forest reserve (Asenayo and Nrabia Tano Offin and Atiwa range) shown as green squares in Figure 1 and two off-reserve areas, Goaso and Kade shown as black circles in Figure 13.1. In each reserve two compartments were selected for the impact study. In each compartment 4 transects were laid at 400 meters interval along the long axis of the compartment. The field team walked along these transects and searched for felled trees within 100 meters on both sides of each transect. The felled trees were then classified into chainsaw milling and conventional logging. Around each felled tree, assessment was done using standard forest mensuration procedures to determine ground vegetation disturbed and forest canopy loss during felling, milling; harvesting density as a measure of frequency of illegal felling; amount of residue generated; recognition for protection of immature trees; recognition for protection of water bodies. In the off-reserve area the team were assisted by local operator to visit old milling sites. In the off-reserve assessment was done on; harvesting density as a measure of frequency of illegal felling; amount of residue generated; recognition for protection of immature trees; recognition for protection of water bodies and recognition for protection of agricultural crops.

Data Analysis

Field measurements were summarized into tables to facilitate quantitative descriptions.

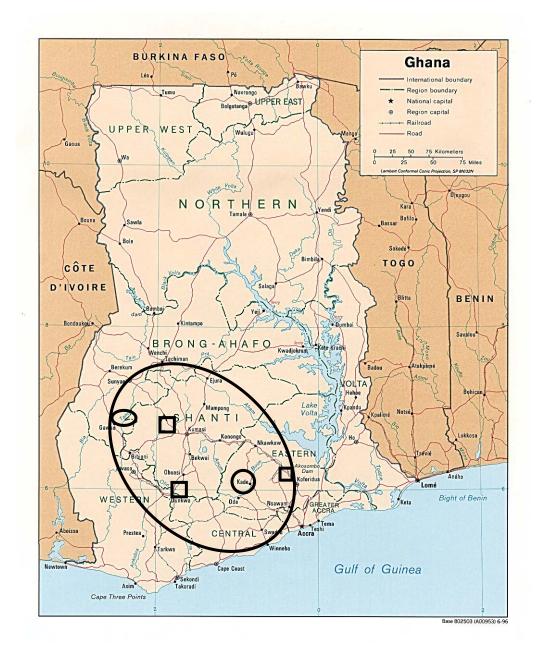


Figure 13.1: Map of Ghana showing the location of the main study zone (Marked by the black large oval) and the sites for the environmental impact assessment. The squares indicate location of Forest reserves and circles the off-reserve logging areas.

13.3 Results and discussions

The findings from the field assessment of environmental impact of chainsaw milling are presented in this section and also discussed in the light of the research questions.

13.3.1Ground area disturbed

This is described in terms of land area within the operational zone that showed visible signs of plant destruction or damage and soil disturbance during the felling, milling and transportation of lumber. Assessing the disturbed area in terms of the magnitude

of the average gap width (Table 13.1) the disturbed zones around a single felled tree appeared wider in the case of chainsaw milling compared with conventional (CONV) logging.

Table 13.1: Widths of ground areas disturbed around felled trees in Asenayo and Nkraia Forest Reserves

Location	Minimum Gap		Maximum Gap		Mean	
	Width (meters)		Width (meters)		(meters)	
	CSM	CONV	CSM	CONV	CSM	CONV
Nkrabia	6.3	2.2	25.5	10.6	6.3 ± 3.5	5.3 ±2
Asenayo	4.7	2.5	6.6	3.8		

For total area of operational zone disturbed, measurements in Nkrabia (Table 13.2) indicates larger areas disturbed by chainsaw milling compared with conventional logging.

Table 13.2: Total ground area disturbed around felled trees in CSM and normal logging operation

Type	of	Range of	Minimum Area	Maximum	Mean area
Logging		diameter of	Disturbed	Area disturbed	disturbed
		trees felled	(M^2)	(M^2)	(M^2)
CSM		60-120	140	589	293 ±115
CON		70-160	75	595	238 ± 121

This is explained by the fact that stump area disturbed in chainsaw milling is a combination of the tree fall gap and clearings using machete to ease movement of the milling crew (Figure 13.1).



Figure 13.1: Picture showing instances of ground area disturbed in a chainsaw milling (A) and conventional logging (B)

However, in the case of conventional logging the area disturbed at the stump site is only by the tree fall. For the movement of the harvested timber, the chainsaw milling only leads to the creation of foot paths (Figure 13.2A) as against wider skid trails (Figure 13.2B) in the case of conventional logging. The foot paths are obviously narrower than the skid trails and also do not turn over the soils as is in the case of the skidder.

This very difference between skid trail damage and that of the foot paths is used by the CSM operators to argue that chainsaw milling is more environmentally friendly than conventional logging. This claim is however debatable since it has also been shown that soils turned over by the skidder machine or the log been dragged on the forest floor promote natural regeneration from the soil seed banks (Pinard et al, 1999).



Figure 13.2: Pictures showing the widths of - (A) foot path used by CSM operators to cart lumber from stump site at Tano Offin FR and (B) Primary trail used by skidding machines to move logs from stump site to loading bay at Asenayo FR.

13.3.2 Forest/tree canopy loss during felling and milling

In terms of forest canopy reduction no difference was observed between the impact of chainsaw milling and conventional milling as demonstrated with comparative data from Asenayo forest Reserve (Table 13.3). Forest canopy openness is described here as the percentage of area 1.5 meters above forest floor that receives overhead light. The extent of openness affects microclimatic variables such as irradiance, air and soil temperature, relative humidity, and soil moisture that influence seed germination, seedling survival and growth.

Table 13.3: Comparatives figures of forest canopy openness in chainsaw milling gaps and conventional logging gaps

Location	Test of significance	Percentage car	nopy openness in the
		Felling gap area	a
		Chainsaw	Conventional
Nkrabia			59.4 ± 14
Asenayo	df1,75; F = 1.35; P=0.25	53.7 ±10.9	50.2 ±12.1

13.3.3 Harvesting intensity

Transect survey in previously logged compartments in Nkrabia and Asenayo Forest Reserves showed that illegal chainsaw activities are more frequent in areas closer to villages and also distant to active logging operational areas. In such areas harvesting intensity as high as 7 trees per hectare was encountered in Asenayo and in Nrabia there was a frequency of one tree felled per 30 meter of transect walk. These harvesting intensities far exceed the conventional allowable felling intensity of 2-3 trees per hectare.

Since these illegal activities are happening in already logged compartments the implication is that the residual forest in severely being impoverished in terms of future economically harvestable stems per unit area.

13.3.4 Amount of residue generated

Nineteen trees made up of seven species encountered at Nkrabia forest reserve to have been milled by illegal chainsaw operators were used to determine CSM residue. For these trees, the estimated average plank/beam recovery was about 64% and ranged between 18% and 86% of the total bole volume (table 13.4). In another sense the milling process generated residue amounting to 36% of the bole volume. The residues were composed of slabs, off-cuts in the shape of billets and saw dust (Figure 13.3). The average recovery appears to be similar to the average logging recovery of 76% of bole volume reported by Adam and others (1994). The similarity lies in the fact that logs taken to the mill have up to 60% milling recovery of log volume that translates to 45.6% of the harvestable bole volume. If we assume 70% recovery for re-saw of chainsaw beams to smaller dimension lumber that also come to around 45% of the tree bole volume. Following these analyses the argument that chainsaw milling is more wasteful than conventional sawmilling is weakened.

Table 13.4: List of trees milled at Nkrabia FR by CSM operators and estimates of residue

generated by volume and as percentage of total log volume

Scientific name	Local name	Vol. total	Vol.	% Recovery of
•		log	Residue	total log
Entandrophragma angolense	Edinam	3.68	3.03	17.6
Entandrophragma angolense	Edinam	10.27	4.52	55.9
Entandrophragma angolense	Edinam	19.32	2.66	86.2
Khaya ivorensis	Mahogany	22.56	6.52	71
Khaya ivorensis	Mahogany	11.00	2.03	81.5
Nesogordonia	Danta	6.79	2.15	68.2
Nesogordonia papaverifera	Danta	7.81	1.26	83.8
Nesogordonia papaverifera	Danta	3.14	0.42	86.3
Petersianthus macrocarpus	Esia	9.11	2.36	74
Petersianthus macrocarpus	Esia	3.50	1.65	52.7
Petersianthus macrocarpus	Esia	14.01	2.10	84.9
Petersianthus macrocarpus	Esia	4.56	3.7	18.5
Piptadeniastrum africanum	Dahoma	7.58	1.46	80.7
Piptadeniastum africa	Dahoma	4.57	2.00	56
Sterculia rhinopetala	Wawabima	6.97	1.02	85.4
Triplochiton scleroxylon	Wawa	5.25	3.14	40.2
Triplochiton scleroxylon	Wawa	8.81	4.59	47.8
Triplochiton scleroxylon	Wawa	6.29	1.37	78.1

Triplochiton scleroxylon	Wawa	14.08	7.45	47.0
	All spp Avg	8.91	3.20	64.



Figure 13.3: Types of solid wood residue generated during chainsaw milling process. Picture from Nkrabia FR showing residue from a sawn mahogany tree

13.3.5 Recognition for protection of immature trees

Interviews with operators and field observations revealed that the chainsaw millers are felling wide range of tree sizes and unaware of the felling restrictions on harvestable diameters. For instance 9 out of 21 trees felled in Nkrabia Forest by the illegal chainsaw millers were below the felling limit (Table 13.5). At Asenayo 6 out of 21 illegally felled trees were also below felling Limit. It appears the most important criteria for the chainsaw millers in selecting a target tree is the presence of a marketable tree species.

Table 13.5: Diameters of timber trees milled by illegal chainsaw operators in Asenayo and Nkrabia Forest reserves as against the minimum felling limit (MFL).

Location	Species	-	MFL	Diameters of
	-			felled trees
Nkrabia	Nesogodornia papaverifera	Danta	70	92, 76,50*
			cm	
Nkrabia	Khaya ivorensis	Mahogany	110	108,90*,
Nkrabia	Triplochiton scleroxylon	Wawa	90	63*, 79*, 73*, 109,
				109,
Nkrabia	Piptadeniatrum africanum	Dahoma	110	70*, 86*,
Nkrabia	Petersianthus africanus	Esiaa	70	78, 80, 101, 60,
Nkrabia	Steculia rhinopetala	Wawabima	70	80
Nkrabia	Entandrophragma angolense	Edinam	110	55*,84*, 116, 116,
Asenayo	Nesogordonia papaverifera	Danta	70	99, 100, 70,
Asenayo	Terminalia superba	Ofram	70	110
Asenayo	Aningeria spp	Asanfena	90	140, 100,
Asenayo	Entandrophragma	Sapale	110	95*, 95*,
	cylindricum			
Asenayo	Daniella ogea	Shedua	90	75*, 110, 122,
Asenayo	Khaya ivorensis	Mahogany	110	95*, 100*,
Asenayo	Petersianthus	Esiaa	70	100,
Asenayo	Mansonia altissima	Prono	70	59*
Asenayo	Tieghmella heckelii	Baku	110	110
Asenayo	Triplochiton scleroxylon	Wawa	90	175, 95, 115, 110,
				102

Note; * Stem diameters lower than the permissible felling diameter size

It is interesting to note that most of the trees harvested from the forest reserves are the high value and high demand species and even restricted species like *Tieghmella heckelii*. Again since the operators work mainly in logged compartments, the appearance of very large trees among the harvested list means the removal of large size trees that have been retained as seed trees or those to give structure to the residual forest. The impacts of this operation in Forest Reserves can be i) reduction in potential crop trees when immature stems are removed, ii) reduction in seed supply and subsequent decline in natural regeneration when retained seed trees are remove, iii) Further opening of canopy by removal of large trees retained for structure will significantly modify the microclimatic conditions which may increase the seedling mortality of non-pioneer species and cause shift in species composition possibly in favour of low value pioneer species.

13.4 Recognition for protection of water bodies and sensitive ecological areas

Chainsaw millers have extended illegal operations into wholly protected and sensitive ecological areas such as Globally Significant Biodiversity Areas (GSBAs) and convalescent areas in forest Reserves. Reconnaissance survey in Tano Offin and Atiwa Range Forests Reserves GSBAs (selected specifically to address this section of the study), revealed a high prevalence of chainsaw lumbering in these ecologically important forest site.



Figure 13.4: Photos from Tano Offin GSBA showing the undisturbed boundary and another site with chainsaw milling activity

GSBAs are areas within Forest Reserve set aside to ensure that some forest blocks are preserved in their close to natural condition as much as possible for the preservation of unique flora and fauna. The GSBA concept is an innovation in conservation that calls for the protection and conservation of all kinds and sizes of living organisms as well as the ecosystems within which they have evolved and in this case the tropical high forest. For effectiveness and acceptability, the GSBA concept is being pursued through collaborative management planning and implementation processes. The communities around these GSBA are benefiting from schemes such alternative livelihood, and small grants. In return they are among other things to help prevent illegal activities in the GSBA. It is doubtful if the communities around these GSBAs are fulfilling their responsibilities under the collaborative arrangement for the management and protection of the GSBAs.

Areas set aside in forest reserve to convalescent (i.e to recover from heavy exploitation) are not given out to the Timber Utilization Contract holders for logging. In most case convalescence area have individual large size timber trees scattered over a wide area but not occurring in concentration to allow for economic logging. Invariably these scattered trees have become the target of illegal chainsaw millers. This development has caused many TUC holders we interviewed to question the relevance of the Convalescence area as a management intervention if the remnant trees cannot be protected against illegal felling.

13.5 Recognition for protection of agricultural crops

The field observations on chainsaw milling in farm lands (Figure 13.4) did not reveal that operators do pay any attention to minimize damage to agricultural crops. It was noted from informal interviews with operators that they do not practice directional felling for the sake of reducing crop damage but to direct the trees such that it will ease the sawing process.





Figure 13.4: Field photographs showing damage to cocoa trees and food crops in an offreserve TUC area near Goaso in the Brong Ahafo Region.

However, the operators claimed that because they do not use heavy machinery like the timber jack or crawler tractors to move the logs or lumber, the damaged to crops is minimal and invariable the crops are able to sprout back few months after the operation. This claim from the operators was corroborated by many farmers who were also interviewed. This assertion among farmers was identified as one of the major reasons for their partnership with the chainsaw millers to work on their farms.

13.6 Conclusions

13.6.1 Degradation to forest resources as associated with illegal chainsaw milling:

What are the actual volumes of standing trees removed through CSM per year?

The estimates of actual volume of trees harvested per year through chainsaw milling could not be obtained in this study due to the relatively short period for field data collection as well as the lack of any extensive secondary data to form bases for such calculation. However, the frequency of milled trees as observed in the field is ample evidence to show how wide spread and intensive the CSM operations have become and especially in production forest.

How much of the protected or restricted species are being removed?

Production forest reserves are extensively and aggressively being invaded by chainsaw millers removing mainly high value species, restricted species as well as potential crop trees. This trend of indiscriminate felling in logged over forests will significantly reduce future commercial value of the production forests.

13.6.2 Encroachment and damage on ecologically sensitive sites:

What are the negative impacts of CSM?

Further reduction in the population of large size trees that have been retained as seed trees or canopy trees will deprive the residual stand of good quality seeds and appropriate environmental conditions for effective natural regeneration. Similarly the removal of the remaining few trees of species like Baku, Asanfena and Wawabima whose seeds serve as food for wildlife will impact on the wildlife population and their roles (seed dispersal, control of pest insects etc) in the forest.

Which sensitive ecological areas are negatively impacted?

CSM operations as observed in the Atewa and Tano offin GSBAs is a development that will defeat the purpose for which the GSBAs were created. As a block of forest set aside for the conservation of the unique upland evergreen forest type and other plant and animal species, disturbance from humans must be very minimal and definitely not to the extent of chainsaw logging and milling.

Removal of both mature and immature trees in convalescence areas is likely to destroy the forest integrity beyond its natural recovery. These sensitive ecological areas will need more effective protection strategies to ensure the maintenance of their ecological status. In respect of GSBAs the role of the immediate communities need to be re-examined.

Chapter 14

CHAINSAW CONFLICTS AND THEIR IMPACT ON COMMUNITIES AND OFFICIALS

Eric Nutakor and Emmanuel Marfo²⁶

14.1 Introduction

In spite of the position held by some national stakeholders that CSM and trade are illegal acts that are detrimental to the forest and national economy, others are of a contrary view that the operation provides important benefits to local communities in terms of jobs and extra income to the poor and unemployed, land owners, farmers and rural households. This latter category of thinkers is arguing for the activity to be regularized while the former is in favour of sustaining the ban on the activity (Sarfo-Mensah 2005; Adam et al. 2007c).

Chainsaw logging and milling in West Africa (and Ghana) is an important economic activity for the deprived rural poor that has generated protracted debate over the last 15 years (Adam et al. 2007c). Apart from its illegal nature and the fact that operators and brokers do not pay taxes to government, chainsaw lumber production in many parts of the world is known to thrive on corruption and also serves as a means to fund armed conflicts (Tacconi, 2007; DFID, 2007; Williams, 2008). Adam et al. (2007b) show that in West Africa, illegal logging with the chainsaw persists because of corrupt forestry and law enforcement officials. Thus collusion and engagement is between operators and dealers on the one hand and forest managers, law enforcement officials and then with community members/land owners and farmers on the other. Brokers tend to have confrontation with the staffs of the forestry department of the Forestry Commission (FC) and law enforcement officers. Increasingly, communities are collaborating and benefiting from CSM operations (Hiller, 2004) because of poverty (DFID, 2007) but this does not negate conflict that arises between them and actual land /tree owners or custodians.

Since chainsaw logging is illegal in Ghana, it is done covertly by stealing timber from forest reserves and from farms off reserve (Adam et al. 2007b). Thus, it is possible that some form of conflict (Zeiden, 1998; Thomas 1992) could manifest among the key actors i.e. farmers, operators, forest managers and law enforcement officials. Indeed, Marfo (2006) observes that chainsaw related conflict is one of the pervasive forest-related conflicts in Ghana. In spite of this observation, chainsaw related conflict has not been well studied to understand its dimensions and social impact and how such an understanding can inform policy.

Objective

The purpose of this study was to understand how CSM contributes to conflict within forest communities and how the actors involved have coped and managed the conflicts.

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Scope

This component of the CSM study sought to describe the nature and extent of social conflicts, or disorders associated with illegal CSM. The study determined how communities and other actors cope with these conflicts and disorders, the methods of conflict resolutions being used by the various stakeholders, including law enforcement, and how they have fared in cases involving illegal chain sawing activities. It describes the cost to the FC with regards to time and logistical requirements, human capital demands placed upon the FC and consequences (injuries etc) of managing or resolving these cases. The extent of success in handling cases has also been determined.

The concept of conflict, like power, is one of the most contested repetoires in social and political studies. The subject of conflict has been widely studied and several concepts have evolved over time that attempt to provide an ideal model for studying the subject (Pondy, 1967; Fink, 1968; Lewicki et al. 1992; Glasl, 1997; Marfo 2006 and Yasmi and Schanz 2007). With reference to natural resource conflict, forest-related conflicts in particular; Marfo (2006) and Yasmi (2007) have extensively reviewed conflict theories and developed models for studying natural resource conflict. For example, Marfo (2006) developed the two-actor game model built upon the work of Glasl (1997) which basically helps one to conceptualise a conflict situation and study actors' behaviour over time. Yasmi and Schanz (2007) also proposed a conflict impairment framework, also building upon the work of Glasl in which the sources of impairment in forest conflicts were categorized after an empirical application of the model. It was not the intention in this study to explore the concept but to build upon the essential elements in these earlier works towards a conceptualisation that can help a simple empirical application.

The term conflict in this study revolves around three key conceptual lines of thinking built upon these recent works. First, that chainsaw conflict is perceived as a manifestation by an actor that the behaviour of another has been experienced as impairment. Second, the series of behaviours (episodes) are followed in specific narratives of action-response interactions of the respective actors. Third, the responses to impairments are considered to be aimed at managing the conflict and therefore the notion of management spanned from accommodation to the use of violence or force. Fourth, conflict management is not used strictly in an interventionist sense, but also as an actor-oriented one.

14.2 Methodology

Since CSM is an illegal activity and not many of the operators are known or willing to be interviewed for fear of possible arrest, the district sensitisation meeting of the project was used as an entry point. An explorative study was conducted with the aim of gaining more insight into chainsaw conflict rather than making statistical conclusions and generalisations. Following the recommendation of Bernard (1995) suggesting that a sample of between 40 and 50 is adequate for such explorative inquiry, we used the project's district sensitization workshop to identify some chainsaw operators who led us to other operators until adequate number was reached.

The surveys focused on the eight project districts within the main timber producing areas of Ghana; Nkawie, Goaso, Sunyani, Juaso, Akim Oda, Kade, Assin Fosu and Begoro (see project map). Based on the District sensitization meetings, the main actors involved in the chainsaw conflict were identified as operators, farmers and forest officials. The study used a narrative approach where actors were asked to narrate specific conflict cases they have experienced. In addition to this, a questionnaire was administered to capture other areas relevant for understanding how chainsaw conflicts are managed (see annex 14). The individual data was triangulated with community durbars where the issue, among other things, were discussed.

The managers of the selected forest districts were asked questions about their experiences and opinions concerning the CSM. Through the sensitization workshop 50 chainsaw operators were identified who submitted themselves for the survey. In addition 85 farmers in the districts with experience of CSM activities were also interviewed. The data were analyzed with SPSS and Microsoft Excel. Tables, charts and graphs have been used to present the results.

14.3 Results and discussion

The results are presented as follows; section 14.3.1 deals with the general opinion by forestry management and other key stakeholders about CSM; 14.3.2 the process of operations and conflict as a social problem, 14.3.3 presents information on resulting conflict, engagement and influencing factors in two parts, one on conflict between operators and forest managers and the other between operators and farmers in 14.3.3.1 and 12.3.3.2 respectively. These are followed by conclusions and recommendations.

14.3.1 The Chainsaw conflicts

What leads to conflict in chainsaw operations? Following the narratives in this study, a number of reasons which underpin chainsaw related conflicts were identified. First, it was observed that in some cases there is no mutual agreement between land/farm owners and operators before a tree is felled on the farm. In some cases farmers may ask for a share of the proceeds of the lumber or demand money to compensate for the loss tree and when these conditions are not met, it may lead to confrontations.

Second, farmers may demand compensation for damage to farm crops when the operator is identified. There is usually confrontation then negotiation and then settlement of the case with the operator paying an agreed amount. If the transaction becomes difficult a third party may be called by either party to intervene to have amicable settlement. Adam (2007b) described the scenario in which operators usually scout for trees, locate them and then negotiate with the farmer who works on the land to arrive at a fee. This situation was not encountered or reported in this study but has been supported by other studies (example Marfo, 2006) who also observed that timber operators sometimes used natives of communities as tree spotters and as frontline people to negotiate compensations with farmers.

Thirdly, we also observed conflict cases involving operators and forestry officials. The illegal chain saw operators normally work without official permits from the FSD and they are usually confronted and arrested by the forest officers with the help of the

task force (a combination of forest guards and police or military personnel). This situation then has the potential to spiral into complex engagements involving other influential members in the community in an attempt to arrive at a settlement. This study also found that interference is common even with court cases and can frustrate the work of officials and further lead to impunity on the part of the operators.

The CSM conflict is about felling a tree from farms and forest reserves without permit from the FSD or consultation with farmers. This leads to confrontation with forest management officials and farmers first in trying to ensure that the law is enforced and second in dealing with farmers' and land owners' claims/rights to compensation or share of the produce. However, how effectively are these cases resolved? Sections 14.3.1 and 14.3.2 elaborate the two specific two-actor conflict fields studied (i.e. conflicts between operators and forest managers and between farmers and operators).

14.3.2 Chainsaw operator-official conflict episodes

At least half of district managers interviewed in the study reported that chainsaw related conflicts constituted about half of all forest-use conflicts in their districts. Indeed, majority of them reported that between 25% and 75% of forest-use conflicts are related to illegal chainsaw operations (Table 14.1). This is not strange since timber is about the most profitable forest product that attracts forest users though few are able to exploit this resource legally. As Marfo (2004) has argued, even though officials call this a 'problem', it is actually a daily struggle over access to forest resources where operators make claims to gain control over economic resources.

Table 14.1: Pro	portion of forest	conflicts that are of	chainsaw logging a	nd milling related

		Frequency		Cumulative Percent
Valid	0-25%	1	12.5	12.5
	25-50%	3	37.5	50.0
	50-75%	2	25.0	75.0
	75-100%	2	25.0	100.0
	Total	8	100.0	

Coping strategies of operators

Adam (2007a) reported that 72% of operators claim they were arrested by the range supervisors of the forestry department for illegal logging and their goods confiscated. In that study about 27% of the operators managed to pay bribes directly in order to escape arrests and/or confiscation of their goods.

If a high level of interaction is indicated by Adam et al (2007a) in terms of arrest and confiscation then the much mentioned corruption that is thought to prevail amongst FSD officials may not be warranted. This is because it can be argued that those who interfere with cases are the takers of the bribes and also, the givers may not be the operators themselves all the time but rather their sponsors/financiers, the brokers. Moreover, in response to factors that increase or affect their production costs, 45% of

More study needs to be conducted to determine the levels of interaction and what goes in and out at each level

the operators mentioned activities of law enforcement agencies in the sense that encounters with them may result in bribe taking or even confiscation of goods (Adam et al. 2007a). Generally therefore there is indication of conflict of interest and this can probably be resolved also by payment of bribes in a few cases that involved not only officials of the law and the forest service but other influential persons in the communities.

Coping strategies of Officials

Table 14.2 summarizes the responses of officials as to how they have been coping with the CDM problem. The conflict resolution method mostly used by the managers for all recorded cases is to report them to the police for action. Half of all other recorded cases are referred to the courts and the rest are undetermined as the offenders are not discovered and arrested. Perhaps because of the poor rate of success in resolving CSM cases with the police and the courts, the managers are of the opinion that the most effective way to deal with offences and prevent future occurrence is to confiscate the products and sell them out to the public (see figure 14.4)

Table 14.2: Conflict resolution method adopted

	-	Frequency	Valid Percent	Cumulative Percent
Valid	Report to Police	6	75.0	75.0
	Prosecute in Court	1	12.5	87.5
	Not Applicable	1	12.5	100.0
	Total	8	100.0	

Apart from confiscating and selling the products the managers use the Task Force to prevent offences and arrest the illegal operators. Information collected during the study indicated that in some cases the operators are armed and do exchange fire with the Task Force.

Effectiveness of coping strategies of officials

When the forestry managers were asked about the most effective methods they have adopted in dealing with chainsaw cases (Figure 14.4) they mentioned direct confiscation and sale of the illegal lumber in over 70% of the cases as against the use of the courts (13%) and mobilizing the Task Force against the operators (13%).

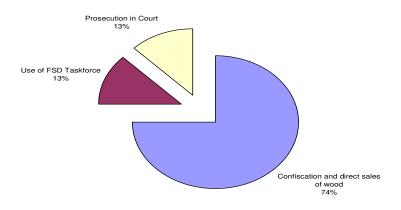


Figure 14.4: The most effective method for resolving chainsaw offences

The case of prosecution is of research interest because chainsaw milling is criminalized by law and as a criminal case, it is expected that the courts become the primary agents to deal with them. With respect to prosecution of offences, Table 14.3 shows that on the average out of the total number of cases reported to the police, less than 25% were prosecuted in court and about half of the prosecuted cases were won by the FSD. This shows that the success rate of using criminal prosecution as a mechanism to deal with chainsaw offences is low and ineffective.

Table 14.3: Managing cases and their effectivenes

	N	Minimum	Maximum	Mean	Std. Deviation
Number of cases reported to the police in a year	8	2.00	15.00	8.3750	4.92624
Number of cases prosecuted in court in a year	8	.00	6.00	2.6250	1.92261
Number of court cases won by FSD	8	.00	4.00	1.8750	1.45774
Valid N (listwise)	8				

Interference with CSM cases

In the course of dealing with CSM offences forest managers are faced with interference from influential persons in the community who make the management of offences difficult for the forestry staffs. The majority of forest managers in the districts (over 60%) strongly agreed that they have experienced political interference (PI) in 5 out of 10 cases relating to chainsaw operations (see Table 14.5)

Table 14.4 Agreement by managers that there is political influence

		Frequency	Valid Percent	Cumulative Percent
Valid	Partially Agree	3	37.5	37.5
l	Fully Agree	5	62.5	100.0
	Total	8	100.0	

The personalities who interfere in the cases are mostly District Chief Executives, (37%) traditional leaders or chiefs (25%), local politicians (25%) and Members of Parliament. 12%). These personalities²⁷ form the cream of society in the districts (local elite) who probably often meet at regular committee and other administrative and political interactions and are familiar with each other. Adam (2007a) determined that operators were not necessarily close to the seats of power in the community but they have often used a range of elite networks and contacts to influence official and legal decisions. In a study of various forest conflicts, Marfo (2006, 2007) has emphasised the use of chiefs and local elites in particular in interfering with official decisions at the local level. Most of these acts of intervention take place under the guise of protecting the offenders.

Impact of chainsaw conflict on FSD

Probably because of much interference and other reasons only 40% of cases reported to the police by the FSD are ever prosecuted (see Table 14.3) and only about half of the few that are prosecuted are won, by the FSD. These acts of interference in legal dispensation of justice invariably lead to corruption of the system. Generally therefore CSM related conflict management by the FSD is made ineffective due to various external factors among others that make the enforcement of the law banning CSM ineffective (see Table 14.3 Section 14.3.2)

In order to make an arrest forestry officials spend on average 3 to 4 hours pursuing reported offenders and making the arrest (Table 14.5). Thus even though, the rate of success in winning cases at the courts may seem to be high, the cost of enforcement to officials in terms of professional time in court is too high. The significant time cost of court cases to the FSD has been observed by other studies as well (see Inkoom, 1999).

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²⁷ Traditionally, chiefs are supposed to be the owners of the lands from which operators harvest trees whether they are on farms or in forest reserves. Hence it could be quite difficult to take legal issues with them even when they are implicated in the illegal activity. Technically the state is playing the custodian role and managing the resource for the traditional stools thus the chiefs have much influence in the matter. Other players are the Members of Parliament or District Chief Executives also wield considerable influence and can make life difficult for officials who are too strict on CSM offences.

In a week, most officials spend between 25% and 75% of their official time on chainsaw related matters (Table 14.6). This effectively takes them away from their

Table 14.5: Amount of time in causing an arrest

		N	Minimum	Maximum	Sum	Mean		Std. Deviation Kurtosis		
		Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error
Amount time causing arrest	of in an	8	2.00	6.00	29.00	3.6250	.49776	1.40789	564	1.481
Valid (listwise)	N	8								

normal administrative and other duties.

Table 14.6: Proportion of overall weekly time spent on chainsaw related conflict

	-	Frequency	Valid Percent	Cumulative Percent
Valid	0-25%	2	25.0	25.0
	25-50%	3	37.5	62.5
	50-75%	3	37.5	100.0
	Total	8	100.0	

The Police
19%
The FSD
53%

The Court
27%
Other stakeholders
1%

Figure 14.7: Proportion of cases handled by various agencies

There are times when other agencies handle the CSM cases (Figure 14.7), but it is the FSD that deals with the most cases (53%) followed by the courts (27%) and the police (19%). Forest managers have to spend much time in court (Table 14.7). On average they make 7 court appearances per case which lasts at least 3 hours per sitting (see Table 14.8).

Table 14.7: Frequency of court appearance

	N	Minimum	Maximum	Sum	Mean		Std. Deviation	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error
frequency of court appearance	8	.00	20.00	56.00	7.0000	2.88469	8.15913	171	1.481
Valid N (listwise)	8								

Table 14.8: Time spent per court sitting

Descriptive Statistics

	N	Minimu m	Maximum	Sum	Mean		Std. Deviation	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error
Time spent per court sitting Valid N (listwise)	8	.00	6.00	27.00	3.3750	.62500	1.76777	1.575	1.481

Forestry officials are also faced with the danger of injuries when they engage with illegal operators. About 2 to 3 injuries on average have been recorded in each district as a result of making arrests of offenders in chainsaw operations (Table 14.9).

Table 14.9: Frequency of injuries to forest officials dealing with chainsaw offences

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic		Std. Error
frequency of injuries	8	.00	10.00	21.00	2.6250	3.29231	4.062	1.481
Valid N (listwise)	8							

Casualties

In 80% of the studied cases (national survey), the FSD did not have any casualty. The range of casualties per district was from 1 to 8 in the 20% of the cases where the FSD reported casualty cases. Other than the FSD, it was reported that in 70% of the cases, there was no casualty. In the other 30% of the cases where there was some casualty, the range of persons varied from 1 to a maximum of 9.

14.3.3 Farmer-operator conflicts

Even though both farmers and operators interviewed indicated incidences of conflict, there was an indication of direct interaction between the two parties in most cases. In about 74% of the cases, farmers indicated that they knew the operators who felled trees on their farms. This seems to support the claim that notwithstanding misunderstandings that might arise in course of their engagement, there seems to be significant connivance between farmers and chainsaw operators leading to some form of 'soft' business network at the community level.

Coping strategies of operators

Asked about whether they consulted farmers before logging on their farms over 90% of the operators claim they consulted with farmers before removing trees (see Table 14.10). Even though the rate of consultation indicated seems relatively high compared to observations in other studies (Marfo et al. 2006²⁸), it can be argued that since about 74% of farmers indicated they knew the operators, at least we can be confident in assuming that the rate of consultation could be high. This is especially the case when farmers also indicated that about 44% of the operators live and operate within their own communities (see Table 14.11)

Table 14.10: Operators who consult farmers before logging

	e p		CHECKIC PRIMITION	9 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1
		Frequency	Valid Percent	Cumulative Percent
Valid	Yes	47	94.0	94.0
	No	3	6.0	100.0
	Total	50	100.0	

Table 14.11: responses from farmers on whether the operators were from their communities or not

	_	Frequency	Valid Percent	Cumulative Percent
Valid	Yes	37	43.5	43.5
	No	39	45.9	89.4
	Not Applicable (logger was not found)*		10.6	100.0
	Total	85	100.0	

The majority of them live outside the communities where they operate; this latter group may create a more protracted or frustrating conflict engagement because it becomes quite difficult to deal with an operator who does not live in the community.

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²⁸ Marfo et al. observed that in 73% of 115 studied cases, timber contractors did not consult farmers before logging. What is not clear is the proportion of loggers who were registered (legal) and unregistered (illegal).

Farmer -operator engagement

Chainsaw operators and farmers agree that there is usually consultation between them before timber is felled on farms; most of the time farmers have been approached by operators before felling is done. According to the farmers, (nearly 80% of them) they have been informed before a tree was ever logged on their farm by the chainsaw operators (Figure 14.8). At least, once before, a farmer has approached an operator to request for a tree to be logged on his/her farm (Table 14.12)

80-60-20-20-00 1,00 2,00 3,00 4,00

No. of times operators have cut trees without farmer's knowledge

Figure 14.8: cutting trees without consultation with farmer

No. of times operators have cut trees without farmer's knowledge

Table 14.12 Number of times farmer has ever asked chainsaw operator to fell tree on his /her farm

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
No. of times farmer has ever asked chainsaw operator to fell tree		.00	10.00	77.00	.9059	2.05069	4.205
Valid N (listwise)	85						

Conflict and settlement

Chainsaw activities that lead to conflict between the farmer and the operator are carried out often without consultation with farmers and/or land owners. After a logging activity that happened without consulting the farmer, most farmers (87%) eventually got to know the operators who did the logging (Table 14.13); about 10% of them are never found. One can expect that if there are unresolved incidents such as is likely to happen in the 10% of unidentified 'culprits' farmers will feel reluctant to protect trees on farms not to mention the unfavourable relations already existing between them and conventional loggers who are reported to pay little or nothing to them for trees harvested and damages caused to crops.

Table 14.13: Farmer familiarity with chainsaw operators

		Frequency	Valid Percent	Cumulative Percent
Valid	Yes	74	87.1	87.1
	No	11	12.9	100.0
	Total	85	100.0	

The study shows that for 58% of farmers, bargaining between the farmer and the operator is the most common method of arriving at a settlement. In a few cases the farmer fixes the price otherwise the operator does so. (Table.14.14)

Table 14.14: Methods of claiming compensation

	-	Frequency	Valid Percent	Cumulative Percent
Valid	Negotiation/Bargain	49	57.6	57.6
	amount fixed by operator alone	4	4.7	62.4
	Amount fixed by farmer alone	5	5.9	68.2
	Not Applicable	27	31.8	100.0
	Total	85	100.0	

If there is no agreement, intervention by other actors may lead to further negotiation to settle the matter amicably. Promises may also be made to settle with agreed amounts and this could also lead to protracted engagement and then even to reneging on the agreement.

Mode of operations

Chainsaw operators scout for trees on farm and purchase them from farmers /land owners for a small fee^{*}). Apart from this, compensation could also be paid where relevant in the case of damage to property. On average operators pay GHC 4 as compensation to farmers for trees felled (Table 14.15). The highest amount reported to have been paid was GHC 70.

Table 14.15: mean amount of compensation paid to farmers

	N	Minimum	Maximum		Std. Deviation	Variance
Compensation paid Valid N (listwise)	85 85	.00	70.00	4.4235	10.42476	108.676

Apart from compensations paid to purchase the tree, there are several other people who receive some payments from operators in course of their operations. Table 14.16 gives a summary. Generally, it is only in 22% of the cases that chainsaw operators actually paid other people in course of their operations. This does not include payments for labour and payments incurred on the road when conveying chainsawn lumber.

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^{*} Unpublished data collected by Adam *et al* 2007 indicated commission payment to farmers as component of variable costs to operators to average about 150 Ghana Cedis per operation. This amount covers cost of tree and compensation for damages.

Table 14.16 people who were paid by chainsaw operators

		Frequency	Valid Percent	Cumulative Percent
Valid	Farmer	2	4.0	4.0
	chief/community leader	5	10.0	14.0
	law enforcement agencies	2	4.0	18.0
	Others	2	4.0	22.0
	Not Applicable/ no other payment?	39	78.0	100.0
	Total	50	100.0	

Extent of settlement

Contrary to observations made in earlier studies, 77% of farmer-operator conflicts were reported to have finally been resolved. According to farmers' claims, 47% of the cases were peacefully resolved even though in about 30% of the cases, force and mediated bargaining were rather used before the conflicts were resolved (see table 14.17). Over 90% of operators also claimed that cases were peacefully settled perhaps not directly with the farmer as this rate is slightly higher that what farmers claim. The wide variance between what farmers say and what operators say may be an indication of some dissatisfaction on the part of owners/farmers.

Table 14.17 farmers' assessment of how conflicts with operators were resolved

ï		Frequency	Valid Percent	Cumulative Percent
Valid	Peaceful bargaining	40	47.1	47.1
	mediated bargaining	15	17.6	64.7
	Force	16	18.8	83.5
	Not Applicable	14	16.5	100.0
	Total	85	100.0	

In cases where there is some engagement and bargaining, 59% of farmers reported that the promised amount was paid. Again this is better compared to 15% (licensed loggers), 17% and 38% settlement rates observed by Marfo (2006), Ardayfio-Schandorf et al. (2007) and Marfo et al. (2006) respectively.

Impact of the conflict

Asked about the length of time taken for conflicts to be resolved, table 14.18 captures the time range reported by operators.

On the average a little of over 60 hours (about 3 full days) are required within which the operators are able to resolve these matters. This is significant and could be frustrating for both farmers and operators.

Table 14.18 Time spent on conflict resolution by operators

	N	Minimum	Maximum	Sum	Mean		Std. Deviation
Operators' response	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Length of time taken to finally resolve the issue (hours)		.00	504.00	3302.00	66.0400	12.86492	90.96870
Valid N (listwise)	50						

Narrative reports during the study indicate that many CSM operations are carried out at night making it dangerous for community members to confront them. In some instances, even though local people know who the operators are within the community, forest officials and the police are said to tacitly refuse to use their information and assistance to arrest the offenders. Local people find this situation very frustrating to efforts made by them to protect the resources in their forests. This is an indication of the corrupt relationships that do exist between officials and operators. For this and a host of other general reasons, cited for instance by Odoom (2005), farmers and communities find no incentive to co-operate with the FC but instead connive with the illegal logger to benefit from a share of the resource.

Other studies have made some observations that have implications for farmers and operators. The finding shows that conflict exists but is probably minimal since communities and farmers are likely to benefit from the operations more than they do from the conventional logging companies as is also reported by Adam et al. (2007a). They also report that most operators (62%) did not have any problems with communities. But about 7% of his respondents in the communities mentioned conflict, vandalism and breakdown in law and order as some of the social costs of the illegal chainsaw operations in their communities. About 8% of the operators said members of the communities use to report them to the authorities and also make monetary demands on them. They also have to obey the customary imperative of taboo days that prevent them from entering the forests or working on farms (Adam et al. 2007b). All these issues do conflict with their interests or activities.

14.4 CONCLUSION

Drawing on the discussion of the results from the study, a number of conclusions can be pointed out with regard to the acceptability and social impact of chainsaw conflicts at the community level. The observations made from the national FSD survey have suggested that the enforcement of the chainsaw ban at the operational level has not been easy and that several social and political interferences come into play.

Chiefs and local elites do not seem to give FSD officials free space to enforce the ban and this is not an issue that can easily be overlooked. Chiefs in particular wield substantial influence in the Ghanaian society and therefore managing their interference is not an easy task for district-level officials. Therefore, to the extent that

^{*} Nutakor 2008, personal communication with farmers in Asubima Forest reserve area.

royal and other elite interference has become part of resource governance, enforcing the chainsaw ban is practically a difficult task.

The study has also observed that the courts have not been very useful to the FSD in enforcing the ban due to delays in passing judgement on cases, adjournments and long period of stay at the courts. In any case, most cases do not even end up in the courts, a situation that undermines the enforcement of the chainsaw law. Therefore, in so far as chainsaw milling remains illegal, it is crucial to deal with the issue of speedy trial of court cases. In this respect, the proposal by the Forestry Commission to the Attorney General to allow FSD to directly prosecute their cases is supported by this study. Short of this the police must be conversant with the forest laws to be able to effectively prosecute the cases with minimal interference from local elites and political office holders from other levels of the larger society.

Third, the issue of community assess to timber within the broad framework of the criminalisation of chainsaw milling and availability of legal timber in the domestic market must be seriously addressed. It is particularly important to clarify the legality of using registered chainsaw to mill timber on farms/communal lands for domestic use, especially for people who have some landownership or tenure right to the land as they seem to dominate those who make official requests for trees. The issue of legal chainsaw lumber is already an existing policy that should be reinforced with compliance to the rules and bearing in mind the fact that the needs of society are dynamic and require equally dynamic policy and legal frameworks to function effectively.

Fourth, though not observed as a significant factor, official FSD staff involvement in chainsaw offences is a reality and measures to improve internal controls of staff activity should be developed and monitored. Incentives that ensure staff performance is important to enable them manage such an overwhelmingly large estate of forest resource

Fifth, there seems to be a high level of acceptance about the need to regularise the ban, even among FSD managers and that any policy dialogue process (such as the MSD) should pay attention to recommendations on other options. District Managers have suggested the need to take a second look at the ban, the need to revise the law to clear ambiguities and the need to experiment integration of chainsaw operators in the formal system to regulate their activities. These suggestions can also be taken up by the multi-stakeholder dialogue process.

Chapter 15

COUNTRY CASE STUDY ON CHAINSAW MILLING IN GHANA: SYNTHESIS, CONCLUSIONS AND RECOMMENDATIONS

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15.1 Illegal Chainsaw milling and the Ghana case study

Illegal chainsaw milling and trade is one of the main forest governance issues that dominate forest policy discourse in Ghana. To those who see chainsaw milling as a struggle by some actors to gain access to forest resources, it can be seen as a conflict rather than as a problem. Be it as it may, chainsaw milling posse's significant challenge to sustainable forest management in Ghana. This is especially so as it is the main source of timber supply to the growing domestic market. Increasingly, the chainsaw issue in Ghana has raised significant public debate. However, the larger public debate has not been matched by a more sophisticated approach as to how to deal with it in policy and in practice. The difficulty has centred on two fundamental paradigms of thought. First, that chainsaw milling is a wasteful and using it to supplement sawmilling will lead to a rapid degradation of the forest resources and the environment. Second, that admitting chainsaw milling will lead to enormous monitoring challenges that the Forestry Commission does not presently have the capacity to deal with. In the face of these two thoughts and against the backdrop of the proliferation of chainsaw milling and trade in the domestic market, developing alternatives taking into consideration the merits of the claims for banning chainsaw operations becomes crucial.

To help achieve this goal within the broader framework of the EU-funded project on developing alternatives for illegal chainsaw milling in Ghana and Guyana through multi-stakeholder process, the research activities presented in the Country Case study report were carried out. Essentially, the following questions defined the contours of the research activities:

- How did chainsaw milling evolve and what has been the policy response over the years?
- What informed the ban of chainsaw operations and to what extent has the enforcement of the ban been successful or otherwise and why?
- What are the key social, political, economic and market drivers of chainsaw milling?
- What is the legal framework and to what extent does this complicate or enhance enforcement?
- What are the advantages or disadvantages of using chainsaw to mill timber in terms of its economic, social and environmental cost, especially in comparison with technologically improved forms of milling?
- How do the overall policy, legal including tenure and access rights and institutional framework affect chainsaw operations?
- What lessons can be learned, especially to inform a multi-stakeholder dialogue process?

The specific research activities to answer these questions have presented as chapters in the Country Case study report. Part I of the report contains three chapters which deal with the general introduction of the project, the evolution of policy, legal and institutional framework and the structure of the chainsaw enterprise in Ghana. The studies presented in Part II of the report provide some insight into the social, political, legal and economic factors that drive chainsaw milling and contribute to ineffective enforcement. The studies set out to investigate drivers for CSM in order to elucidate discussions on the subject. Part III containing 4 chapters broadly dealt with a comparative analysis of chainsaw and sawmilling focusing on employment, supply of lumber to the domestic market, cost of investment and recovery efficiencies.

The studies that were set out to investigate the social, economic and environmental impacts of chainsaw activities have been presented as chapters in Part IV of the report. This chapter attempts to summarise and synthesis the main results and lessons from the various studies and present them to provide a holistic picture that can serve as a quick summary of the main conclusions of the research activities. This is important in many respects. First, it is to provide an abridged version of the entire Country report for quick readers who might want to get the essence of the work but with no time to read through all the individual chapters. Second, it is to provide scientific information to inform the on-going policy dialogue initiatives, especially the Multi-stakeholder dialogue process, which has a focus to develop policy options. This chapter is particularly targeted at policy makers, practitioners, donors and other stakeholders in the Ghanaian forestry sector.

The chapter is structured to provide a brief summary of the results from each research chapter and then draw the main lessons that can be learned. This is followed by a general set of recommendations from the Ghana country case study.

15.2 Summary of results

Chapter 2 has documented the evolution of policies, laws and institutions to govern and control chainsaw logging. It points out that there has been policy and institutional failure in dealing with CSL and that the activity continues to flourish in the face of an illegality regime. Chapter 3 presented the structure of the chainsaw enterprise identifying the supply and market chains, the main actors and networks involved and the geographical extent of the business both within Ghana and outside. Chapter 4 presented analysis of the chainsaw policy and law vis-à-vis access to timber for domestic use. There exist some inconsistencies in sector policies and the laws prohibiting chainsaw milling which complicates enforcement. Particularly, prohibiting chainsaw milling for domestic consumption and using official waybills for chainsawn lumber against provisions on transportation of timber in the face of the law seems contradictory. Labelling chiansawn milling as illegal without attacking the timber markets that sell these 'illegal' products is not pragmatic and consistent. Moreover, prohibiting the supply chainsaw lumber without effectively conforming to the use of TUPs to address community timber needs, enforce the supply of lumber by holders of special permits and the 20% quota by sawmills is inconsistent.

Chapter 5 looked at the social and political environment that drives chainsaw milling.

On social acceptance, most stakeholders recognise that CSM plays an important role both as an employer of rural youth and a supplier of domestic timber. They support regularization of the chainsaw practice, since its eradication could adversely affect the rural economy. It would deprive enterprises directly dependent on the practice for lumber for their activities. It could also reduce employment and income earning opportunities for rural people directly involved in chainsaw operations. Surprisingly, at least 50% of District Forest Managers interviewed agreed to these observations and suggested the need to revisit the ban. Lumber dealers on the market were also of the view that criminalizing chainsaw operations does not only reduce their capital base for trading but also leads to loss of revenue to the state. This is because confiscation of lumber is rampant and illegal monetary payments are made to grease the palms of officials to allow passage to the market.

The study also identified major factors accounting for the ineffective enforcement of the ban. The first top five were corruption among FSD officials, corruption among law enforcement agencies, high rural unemployment, lack of political will and market forces due to the relative cheaper prices of chainsawn lumber. The study also observed that there is significant political intereference in the enforcement efforts; chiefs and local politicians are the most prominent actors. The study identified high transaction cost in terms of FSD personnel time in the courts as a disincentive for prosecuting cases. In any case, a significant number of issues are dealt with by FSD without recourse to the police or the courts. Again, the study observed that a significant number of cases reported to the police never get prosecuted.

Chapter 6 presented the economic factors contributing to the upsurge in chainsaw lumber production and supply to the domestic market. It shows that prices of chainsaw lumber are relatively cheap and was over 40% of the price for lumber from sawmills on the average. Also chainsaw lumbering is on the increase because there is a high demand for lumber locally which is not being met by legal supplies from sawmills and the fact that the practice, although illegal provide a wider range of species and dimensions for local application. Twenty-five different lumber dimensions were recorded although 1x12x14 and 2x6x14 are the most preferred sizes. Also, about 27 species are harvested with three major species Dahoma, Wawa and Ofram being the dominant species supplied to the domestic market. Chainsaw operation is self-financing. This together with the availability of pre-financing from lumber dealers and/or financiers facilitates lumber production and supply. It is noted that processing is done by using the low capital intensive portable chainsaw machine and engaging rural labour at relatively cheaper rates. Trees can also be accessed from multiple sources, irrespective of the nature of terrain. Thus chainsaw lumber is not only cheaper but it is readily available in preferred species and dimensions, contributing to increase in patronage by clients. Chainsaw lumber production has contributed to the emergence of community enterprises, mainly carpentry shops, lumber markets, charcoal production among others and has provided employment for rural people in forest areas.

Chapter 7 examined access and tenure issues related to chainsaw milling. With respect availability of timber trees, 90% of operators admitted that timber is less available and 62% indicated that it is quite difficult to access timber these days. Among other reasons, 72% of operators admitted that unregulated harvesting by both chainsaw operators and sawmills has contributed to scarcity of timber. The study confirmed that

farmlands are the most important sources of timber for chainsaw operators. With about 76% of operators admitting to this, only 2% said they source timber from Forest Reserves. The operators seem they prefer farmlands because they find 'good' timber trees, they are less likely to be arreseted, access routes are already available for conveying lumber and that it opens the land for more farming activities. 70% and 16% of the operators said at least three-quarters and between half and three-quarters of the timber they exploit annually come from farmlands respectively. In conducting their operations, farmers were indentified as the most important contact persons and this is largely influenced by the perception of majority of operators (85%) that farmers are owners of the trees and the practicality of transacting negotiation directly with them (12%). With respect to monitoring, 98% of operators said they had ever been arrested, suggesting that monitoring activities had not been relaxed though the 'punishment' had not been sufficiently punitive to deter them. On knowledge about illegality of the operation, again 98% of operators admitted that they are aware their activities are illegal, suggesting ignorance is not an issue here. On tenure issues, the operators were divided on who should own forest trees even though majority wished to see that they have some form of withdrawal and or management rights over trees.

The three most important roles identified by communities were carrying of boards, loading of boards and involvement in actual milling. The most important partners of operators are predominantly farmers (60% of cases), timber dealers 928%) and individuals including carpenters. Important factors identified to influence site selection were ease of access (nature of terrain), size of trees available and proximity to the road. With respect to possible payment, even though all the operators agreed to pay for trees, they differed in the modalities; about half wanted to pay tax on each timber, about one-third wanted to pay montly permit fees and one-tenth wanted to pay income tax on profits. The specific figures reflecting their willingness to pay for trees they exploit is summarised as:

Quality of tree	Minimum (GHC)	Maximum (GHC)	Average (GHC)	Comparison	with
				stumpage	of
				US\$7.5/m3	(or
				22.5/tree)	
High	5	300	33.9 (\$24)	6% more	
Medium	4	150	17.7 (\$8)	65% less	
low	2	50	9.4 (\$7)	69% less	

The summary suggests that only the average price operators were willing to pay for high quality timber compares favourably with the current stumpage being paid by licensed loggers. With respect the form through which chainsaw activities should be regularised, at least 70% want concessions to be given for registered groups of operators, 18% want individual permits and 6% want small concession for individuals. It seems that most operators were in favour of any system that deals with organised groups.

In part III, Chapter 8 compared the recovery efficiencies of different milling techniques. The comparison was based on data from recent sawmill efficiency study conducted by the Forestry Commission, the ITTO project on processing of log residues using logosal and field experiments involving 4 species using Stihl and Husqvarna chainsaws. The results are summarised as follows:

		Processing efficiency Processing efficiency (%)			
	log	Lumber	Lumber	Fuel	Processing
milling	recovery	recovery (%)	Production	consumption	cost
technique	(%)	range (mean)	rate (m³/hr)	rate (lit/m ³)	(GHC/m ³)
	not				
Sawmill	measured	28-64 (53.9)	-	-	-
Chainsaw with					
attachments		41.38-61.91			
(e.g. Logosol)	67	(49.56)	0.43	10.84	131.64*
Freehand		32.01- 56.68	_		
chainsaw	70	(34.49)	0.52	8.40	88.23

^{*} Only values for Husqvarna-with-attachement was used

Three observations can be made. First, that it is more efficient to use chainsaw with attachments such as Logosol for optimising lumber recovery as it gives a higher processing efficiency by at least 6% over that of free hand chainsaw milling. Second, even though sawmills had the highest mean recovery, followed by chainsaw with attachments and then free-hand chainsaw milling, the minimum and maximum range values suggest that concluding on which of the techniques is most efficient should be made with caution. For example, some sawmill measurements gave as low as 28% recovery compared to the lowest obtained for freehand chainsaw milling of 32% even though sawmills had the highest mean recoveries among the three. Thus in addition to experience of operators, species density and machine efficiency are also important determinants of lumber recovery. Third, using Husqvarna machine for free-hand milling was the most cost efficient even though Husqvarna with attachment turned to be the most inefficient technique in terms of both fuel and total production cost. Logosol was the most fuel efficient technique.

Chapter 9 compared the cost of investment of chainsaw with M7 Logosol, an improved chainsaw-with-attachment machine, using data from the EU-chainsaw and ITTO utilisation of logging residue project sites. Even though the study was not conclusive on which technique had lower investment and operational cost, it can conclude that the revenues generated were not significantly different. This was mainly because the market did not distinguish between logosol and chainsaw lumber in terms of price. It also established that even though chainsaw milling is profitable, the distribution of the profits is skewed towards the urban timber dealers who mostly sponsor the operations.

Chapter 10 looked at patterns of lumber supply to the domestic market, comparing the contribution of chainsaw and sawmill supplies. The assessment was done through desk study and market survey involving 389 respondents involved in lumber retailing, bench sawing and furniture and joinery making. 86% of lumber retailers interviewed obtained their stock of boards from the chainsaw millers as against 14% obtaining supplies from sawmills. The pattern is somehow different with bench saw millers as about 53% got their supply of boards from chainsaw millers as against 47% obtaining supply from sawmills. Supply of boards to Furniture and Joinery shops is sourced

almost equally from chain saw-millers (37%), sawmills (31%) and lumber retailers (29.5%). The study observed that it is not entirely the case to suggest that sawmillers have failed to supply timber products to the domestic market. The study shows that as high as 36% of furniture and joinery shops have had supplies from sawmills. The important customers who patronize chainsaw lumber were individual consumers (41.2%), small scale carpenters (33%), building contractors (29.4) Government institutions (8.6%) and large scale carpenters (13.5%). The study identified 26 species commonly milled species by chain sawyers; Wawa, Dahoma and Mahogany dominate accounting for about 87% of total stock in the studied markets.

Chapter 11 looked at jobs generated through chainsaw activities. The study established that there is a progressive increase in the number of people involved in chainsaw-related operations and trade and the estimated figures stand at 50,000, 77,217 and 92,217 in 2003, 2005 and 2007 respectively. The study confirms that the domestic market demand, poor governance in the form of weak law enforcement and political will to 'crush' established and growing 'illegal' timber markets are incentives that are keeping the jobs safe.

In part IV, the studies on social, economic and environmental impacts of chainsaw milling were presented. Chapter 12 present results from the economic impact study and indicate that indeed chainsaw lumber production contributes to the sustenance of rural economy and livelihoods. Six major economic forms are contributed, namely employment, community benefits, Taxes, lumber, firewood and services. The total value of economic contribution to the rural economy in a sample of communities in the 8 forest districts under study is approximately, GH¢141,000 (USD 100,714). Among the various forms of economic benefits to the rural communities studied, provision of jobs constituted 84%. It must be noted that the majority of the people involved in chainsaw operations are also involved in agriculture or farming and although unemployment rate is generally 20% in most rural areas of the country, chainsaw lumbering tends to be a major lucrative off-farm employment supplementing agricultural incomes rather than an alternative income source. Between 2004 and 2008, some studied communities have also benefited from infrastructure such as school buildings and wells (6.4%) and taxes (4.9%) for community development. Chainsaw operations contribute significantly to household budgets of those involved in this practice in rural areas. More than 50% of those involved in chainsaw activities earn 80% of their household income from this practice.

Building on the results from the various studies, we attempt to make some estimation to assess the social and economic impacts of chainsaw milling. This is done by assessing

- Impact in terms of number of trees felled
- Impact in terms of volume of trees and potential revenue gained by communities and lost by the state
- Impact in terms of volume of trees wasted

Number of people involved in CSM operations at stump site;	40908 people	
average gang size is 6 Number of trees felled by 78 operators (468 people) in one operation	240 trees	This means 3 trees are processed by a gang per operation
Estimated number of	6818 operators	
operational gangs		
Average operational time for processing 1 tree	7.4 hours	This is somehow consistent with figures indicated by operators as this implies about 1 full day for 3 trees
Average period per operation	12 trees processed in 23 working days, meaning about 1 tree takes about 2 working days to complete. So 3 trees per operation will mean 6 days (approx. 1 week) for 1 operation	This takes care of transaction time for traveling, setting up, maintenance, loading etc
Average volume of trees processed	2.97 (approx. 3 m ³)	
Estimate of number of trees	6818 x 52 weeks x 3=	
felled by chainsaw operators in a year	1,063,608 trees	
Volume of trees exploited	$3,190,824 \text{ m}^3$	
Revenue gained by	GHC 12,763,296	This does not take into account
communities/farmers using	(USD 9,116,640)	stolen trees or potential non-
average purchase price of GHC12/tree		payments
Potential volume of round wood that would have been charged stumpage if used by licenced loggers	2,233,577m ³	Use observed average log recovery of 70% from the study
Potential stumpage revenue lost	16,751,826	
by the state at average	,·, 	
recommended stumpage fee of		
of USD 7.5/m ³		
Estimated total volume of wood	$957,247 \text{ m}^3$	Experimental figure gave a
processed by chainsawyers at	•	processing efficiency of 34% of
30% recovery efficiency		log volume

The analysis shows that government is loosing almost 17 million USD per annum as potential stumpage that could have been collected from chainsaw operators. This is far above actual stumpage being collected by the FC from licensed loggers. Between 1999 and 2003, an average of only 9.1 million dollars was collected as stumpage revenue (Adam and Gyamfi, this volume). The FC is known to have the lowest rent collection record in West Africa (Birikorang and Rhein, 2005) and it is reported that between 2000 and 2003, the FC captured less than 50% of revenue that should be accrued to it. Thus, assuming that 40% of the potential stumpage from chainsaw operators could be captured under a regularized regime, this will translate into about 6.7 million dollars. This compares very favourably with the average 2000 to 2008 records.

Currently about 38% of the potential stumpage revenue is paid by chainsaw operators to farmers/landowners as fees for trees. Assuming that the government is willing to pay this amount to farmers/landowners to compensate them for protecting these trees, the Government can still ratain revenue of about 8 million dollars annually. This is the figure that is really lost as chainsaw operators save this because of the absence of a

legal framework for collecting stumpage on trees felled. There are many who have argued to support payment of direct economic benefits to farmers as a way to build state-community partnership to deal with illegal logging (see Marfo 2004; Marfo et al. 2006). Specifically, the argument that the 40% of timber revenue collected by the FC from off-reserve areas could be distributed to communities/farmers as a way to compensate them for tending and managing naturally occurring trees on their lands/farms seems to be supported by the observations in this study. The study has shown that, de facto, farmers are gaining almost this amount through direct payments by chainsaw operators. Chainsaw lumber production has become a key contributor to rural livelihood sustenance. This coupled with the apparent connivance of operators with FSD staff and traditional resource owners signifies the difficulty that the country will face in deciding on its regulation. It may be necessary for the state to consider incentives are that realistically attractive to ensure adequate benefits from tree resources to be paid to especially farmers and landowners.

The most pervasive argument against CSM is its high negative environmental impact. Chapter 13 presented results of the environmental impact assessment of chainsaw milling. It shows that indeed CSM has several negative environmental consequences, at least compared to conventional logging. First, the estimated logging intensity of CSM in one case was 7 trees/ha which exceeds the standard of 2-3trees/ha. Second, some valuable tree species were felled below the recommended minimum sustainable felling limits. Third, it was noted that most chainsaw operators do not practice directional felling which can potentially lead to destruction of young regeneration and agricultural crops. Fourth, the study observed significant invasion of chainsaw operators in ecologically sensitive sites such as GSBAs and convalescent areas of production forest reserves. However, in terms of logging waste and area (soil and canopy) impact, CSM can be said to be relatively less destructive compared to conventional commercial logging. Put these together, the argument that CSM is wasteful and destroying the forest is not fully supported by the study. The problem seems to stem from lack of technical know-how and the illegal framework within which they have been made to operate. In a regularised environment, issues like directional felling, logging intensity and site of operation are administrative and capacity building issues that can be handled. Actual impact in terms of ground area exposed for soil hardening and erosion, canopy gap and recovery volumes observed from the study does not significantly depart from observed figures in conventional logging. Indeed, CSM seems to do better in terms of ground area destruction and size of canopy opening.

The social impact study, as reported in chapter 14 with a focus on conflicts, revealed that CSM is not so negatively perceived by stakeholders as it is usually painted in official discourse. Indeed, the national FSD survey indicated that more than 50% of District Managers favour a review of the ban. Even though significant conflict between operators and farmers exist, they seem to be coping within constructive limits; and therefore cannot be said to have grave social consequences in farming communities. This is not surprising as there is a high incidence of farmer-operator cooperation with regards to chainsaw operations. The intensity of conflict is the same for FSD, even though there were few reported encounters that were quite fatal. In general, one can conclude that the CSM conflicts are semblances of everyday struggle over commercial access to timber. Even though the number of farmers who were paid some compensation was not exceptionally high (59%), it was not worse than figures

indicated by other studies that included licensed loggers. However, the most significant negative social cost of CSM seems to be related to FSD monitoring in terms of time, energy, money and occasional fatal accidents.

The study can conclude that there is a high social acceptance of CSM and that most stakeholders are in favour of regulating the activity rather than maintaining a ban that cannot be enforced. There is therefore the need to approach the policy dialogue on the subject with open mind to think outside the box if one is interested in policies that can work with the participation of key stakeholders. In all cases, how to deal with local elite interests or manage their interference is an important thing to keep in mind. It seems that dealing with sector corruption, particularly within the FSD District-level staff and the police is a fundamental governance factor that needs consideration in designing innovative policy options. It is believed that the interpretation of the applicable laws on CSM given in this study is the closest one to the spirit of the law and one that removes the various ambiguities often encountered by practitioners. It may be useful to subject this interepretation to further public and stakeholder discussion. With specific reference to CSM, the manuals of procedures for harvesting timber need to be revised to accommodate for example modalities for accessing and processing timber for domestic use. Finally, the study supports the observation that securing domestic timber demand is a crucial issue and how it can be supplied with adequate legal timber must be used to assess the viability of any developed policy option. Fundamental to this is the need to investigate the actual size and needs of the domestic market. Unfortunately, information on this is scanty and scattered and there is the need to assemble these and validate them as soon as possible.

15.3 General Conclusions

Drawing from the lessons learned from the 13 research chapters presented, the study concludes that:

- The 1994 Forest and Wildlife policy of Ghana opens political space for all
 possible options that have been suggested by previous study in dealing with
 the chainsaw issue. It supports strict enforcement of the ban as well as a
 possible regularisation and integration of chainsaw milling into mainstream
 forest management.
- However, the legal framework criminalises the use of chainsaw milling and trading for commercial purposes but its enforcement has been fraught with difficulties and some inconsistencies in the interpretation of the law.
- The legal analysis of this study does not support criminalisation of using registered chainsaw to mill timber for domestic use. However, the procedures in the FSD's Manual of Operations do not adequately provide for this opportunity to be realised
- In spite of the ban of chainsaw milling in Ghana, the study has shown that it is highly accepted among the general public and even among stakeholders, except the timber trade associations, especially the GTMO.
- Over 50% of District FSD Managers explicitly agreed to a review of the ban and a possible regularisation of chainsaw operations. This suggests that a more serious attention is paid to the enforcement of the ban.

- The study could not adduce sufficient evidence to support the involvement of FSD staff in chainsaw operations but can conclude that corruption by FSD staff is one of the factors identified as contributing to ineffective enforcement.
- The other significant factors identified as contributing to ineffectiveness of the enforcement include corruption by law enforcement agencies, the cheaper price of chainsaw lumber, lack of political will to enforce the law and high rate of rural unemployment
- The study can conclude that the enforcement of the ban cannot be realised without addressing three key sector governance problems; corruption by FSD District-level staff, corruption by the police and a political will on the part of the executive arm of government.
- The study observes that while the current tenure arrangements hinder access of trees to chainsaw operators, farmers have and continue to play an important role in sustaining operators' access to timber
- The average amount chainsaw operators are willing to pay for high quality trees are at least comparable with current stumpage fees.
- The study can conclude that ignorance about the illegality of chainsaw operation is not a major root cause for the proliferation of chainsaw milling.
- Availability of timber, access routes and proximity to roads are important factors that influence choice of operation site
- Farmlands are by far the most preferred areas for chainsaw operations
- The study can also conclude that without addressing the domestic timber supply issue within the context of the production and supply of legal timber, it may almost be impossible to enforce any ban on chainsaw milling
- The average lumber recovery from logs using chainsaw milling is about 43%. This is lower than improved techniques like Logosol (chainsaw with guide bars attached) which gave a recovery of about 49%. Sawmills were reported to have given average recovery of 53% though as low as 28% recovery was also reported.
- 86% of lumber retailers in the domestic market interviewed receive their supplies from chainsaw operators. Supply of boards to Furniture and Joinery shops is sourced almost equally from chain saw-millers (37%), sawmills (31%) and lumber retailers (30%).
- The study suggests that it is not entirely the case to suggest that sawmillers have failed to supply timber products to the domestic market. The study shows that as high as 36% of furniture and joinery shops have had supplies from sawmills.
- The study concludes that chainsaw milling and trade offer a significant amount of jobs to people. The study estimated total jobs created by chainsaw related activities as between 86,770 and 92217 in 2007 using recovery rates of 34% and 50% respectively.
- The 2005 estimate and 2007 estimate by this study of chainsaw related jobs show an increase of 19% (i.e.14, 636 additional jobs). The study suggests that all things being equal, the trend might go up in 2009.
- Comparing to the conservative estimate of 100,000 jobs provided by the timber industry in Ghana, the study argues that chainsaw milling offer competitive levels of jobs or economic engagements to people.
- Individuals, small-scale carpenters and local contractors are the largest consumers of chainsaw lumber in the domestic market

- On investment in chainsaw milling, the study identified fuel, lubricant and labour costs as the most significant cost items
- The study indicated that, overall, the net revenue for chainsaw operators is positive. However, the profitability of chainsaw operations depended on the extent to which FSD and police task force monitoring activities were prevalent and the price of lumber which differed from to place. Therefore, chainsaw lumber production may not be all that lucrative for the chainsaw operators and members of communities since a significant amount of cost is involved in the form of payment of bribes, labour, fuel and lubricant.
- To enable chainsaw lumber production to improve the well-being of forest fringe communities and encourage them to support the effort of minimizing forest degradation, the economic rent from this activity needs to be redistributed to their greater advantage than all other stakeholders.
- One key challenge to any improved chainsaw milling system is the marketing
 of its lumber at prices that would enable it to break even and be sustainable.
 The lumber from any improved chainsaw milling is likely to face manipulation
 from these dealers and may find it difficult to compete with cheaper chainsaw
 lumber in the local market.
- What may be advisable is for the chainsaw milling to be replaced with the improved chainsaw milling and the local communities and their chainsaw operators empowered to operate the system to their mutual benefit with the state.
- The structure of chainsaw enterprise is generally small scale in nature, and it is generally informal, and loosely structured in its organization.
- Informal in structure as it may be, the chainsaw enterprise has a number of departments or units that operate jointly or independently. These units may be classified as processing or production, transportation, marketing, and end-user arrangements among others.
- Logging of timber is often initiated by local or regional chainsaw operators who hire labourers or by single individuals with one or several assistants.
- Only occasionally, are they organized into a recognized, productive and solidly structured business establishment. This implies that monitoring of their activities to ensure sustainability and efficiency by the authorities can be problematic. This may be explained to be due to lack of proper record keeping for avoidance of tax payment and clandestine operation of its activities due to the ban on chainsaw lumbering in Ghana.
- Results of the financial and market drivers indicate that the economic factors contributing to the upsurge in chainsaw lumber production and supply to the domestic market in the country include the relatively cheaper prices for chainsaw lumber.
- Also chainsaw lumbering is on the increase because there is a high demand for lumber locally which is not being met by legal supplies from sawmills and the fact that the practice, although illegal, provide a wider range of species and dimensions for local application. Also, about 27 species are harvested with three major species, Dahoma, Wawa and Ofram being the dominant species supplied to the domestic market.
- Chainsaw operation is self-financing. This together with the availability of pre-financing from lumber dealers and/or financiers facilitates lumber production and supply. It is noted that processing is done by using the low

- capital intensive portable chainsaw machine and engaging rural labour at relatively cheaper rates.
- Trees can also be accessed from multiple sources, irrespective of the nature of terrain. Thus chainsaw lumber is not only cheaper but it is readily available in preferred species and dimensions, contributing to increase in patronage by clients.
- Chainsaw lumber production has contributed to the emergence of community enterprises, mainly carpentry shops, lumber markets, charcoal production among others and has provided employment for rural people in forest areas.
- The social, economic and environmental impact studies have shown that most of the negative impacts are not inherently linked to the use of chainsaw per se; they are consequences of the structured policy of prohibition with its attendant problems of ineffective monitoring capability. The net effect is that chainsaw operators carry out their unregulated activities in fear and in hurry with the principal aim of milling to meet market demands. Clearly, these observations have serious implications for the broad development goal on poverty alleviation, the current policy on chainsaw ban and the supply of timber to the domestic market.

15.4 General Recommendations

There is a definite need to regulate chainsaw operations either through effective enforcement of the ban or through some means of integrating it into mainstream forest production. It may be useful for policy makers to review the ban in terms of hard empirical data such as those provided in the study. If the fundamental reason for the chainsaw ban was that it has a more adverse environmental impact, then the empirical observations in this study cannot support the claim. Second, as an activity that has high social acceptance, significant economic interests and feed a critical domestic market, maintaining a ban without effective enforcement capability may only enforce connivance and illegality. In effect, the impact study does not have any adverse recommendations against developing other policy models to regulate chainsaw operations.

Based on the conclusions from the study, the following recommendations are made, with particular focus on a policy dialogue process:

15.4.1 Maintaining the ban

- Enforcing the ban will be very challenging unless three critical conditions are simultaneously met:
 - Timber industry prepared to supply wood to the domestic market
 - > FSD procedure streamlined to allow for processing of timber for domestic use in local areas
 - ➤ Significant improvement in resource governance particularly, dealing with corruption within the FSD and law enforcement agencies as well as securing genuine political will
- It is difficult to anticipate that these conditions can be met within the near future and given the rate at which illegal chainsaw sub-sector is growing, it may be useful to institute some immediate interventions to deal with indiscriminate chainsaw milling

• The study is not generally in favour of maintaining the status quo but rather seek for some form of regularisation. The multi-stakeholder approach proposed by the project seems to be a useful platform but needs to be hastened and perhaps short-circuited. Thus the time to take specific policy action on chainsaw milling short be anticipated sooner and perhaps immediately

15.4.2 Regularising chainsaw milling

- ✓ The study supports the suggestion to evolve a possible policy option in dealing with the chainsaw issue using a multi-stakeholder dialogue approach. This is because, the underlying drivers cut across social, political, environmental and economic realms where various stakeholders in the sector have specific interests and influences.
- ✓ We find the six options developed by Adam et al. (2007c) useful to begin the exploration by the multi-stakeholder process. However the options with a complete ban component may have significant challenges to implement unless the necessary political capital can be mobilised to deal with sector corruption, enforcement of sawmill lumber supply and increased monitoring capacity of FSD.
- ✓ Even though there is an increasing call to consider lifting of the ban, the study suggests that this should be approached with some caution as there are still some unresolved tenural, procedural and monitoring capacity issues to be dealt with. Specifically,
 - 1. How do we address the issue of request for timber for domestic purposes by individuals?
 - 2. What specific provisions are needed in the Manual of Procedure for harvesting timber outside reserves to address domestic use of timber using registered chainsaws?
 - 3. What capacity in terms of personnel and logistics of the FSD are needed under a regularised chainsaw milling regime?
- ✓ It seems that approaching the problem from the domestic timber demand side will be a more practical way to go. This would require obtaining information on the exact size of the demand in the domestic market and see whether the statutory percentage to be supplied by sawmill can meet this. It is recommended that the results of the on-going domestic market study by FORIG and TIDD should be analysed to inform the process.
- ✓ It is recommended that any effort to integrate chainsaw operators in mainstream forest operations should seriously consider the issues of using improved technology and organisation of operators; otherwise, monitoring can be cumbersome.
- ✓ Chainsaw operations serve as livelihood support activity and the options of developing alternative should not be ruled out. However, such efforts must be made while addressing the domestic timber supply issue which is fundamental to any successful intervention to deal with chainsaw operations

- ✓ Research should continue to play an important role in the policy dialogue process. This will help stakeholders obtain relevant information in considering options and their potential impacts.
- ✓ Finally, it seems that evolving a strategy to deal with domestic timber supply and chainsaw milling should take place simultaneously and the need to engage stakeholders in this process should be done as early as possible. We argue that the information provided in this country case study can quick-start the dialogue.

REFERENCES

Abroquah, E. Measures to curb chainsaw Lumber production and the degree of success. In: K.S Nketiah, K.S., A. Wieman and K. O Asubonteng (eds). 2004. 'Chainsaw lumber production, a necessary evil? Tropenbos International, Workshop Proceedings 2. Pp.19 and 20.

Acheampong, E. (2003) Sustainable Livelihoods of Forest Fringe Communities: Forests, Trees and Household Livelihood Strategies in Southern Ghana. PhD Thesis (unpublished), University of Hull, UK.

Acquah-Moses, E. E. K. Lumber supply to the local market: from policy to practice. In Nketiah, K. S., A. Wieman and K. O. Asubonteng (eds.) Chainsaw lumber production: a necessary lumber? Tropenbos-International Ghana Workshop proceedings 2

Adam, K. A, Pinard, M. A., Cobbinah, J. R., Damnyag, L., Nutakor, E., Nketiah, K. S., Kyere, B., Nyarko, C. and Marfo E. (2007a) Corruption in the Chainsaw milling and lumber trade in Ghana. Chainsaw milling and lumber trade in West Africa Report No.2. Forest Research institute of Ghana/ Tropenbos International Ghana/ University of Aberdeen.

Adam, K. A, Pinard, M. A., Cobbinah, J. R., Damnyag, L., Nutakor, E., Nketiah, K. S., Kyere, B., and Nyarko, C. (2007b) Socio-economic impact of chainsaw milling and lumber trade in Ghana. Chainsaw milling and lumber trade in West Africa Report No.1. Forest Research institute of Ghana/ Tropenbos International Ghana/ University of Aberdeen.

Afranie, S. (2003) 'The ban on chain sawn lumber in Ghana: review of policy outcomes and lessons', *Ghana Journal of Forestry* 11:71-81.

Agyeman, V. K. (1993) Land, Tree and Forest Tenure Systems: Implications for Forestry Development in Ghana. A Report Submitted to the African Development Foundation, USA. Project grant number GHA. 420.

Agyeman, V. K. (2004) 'Illegal chainsaw operations: impact, constraints, challenges and policy reform'. In: Nketiah, K. S., Wieman, A. and Asubonteng, K. O. (eds.) Chainsaw lumber production: a necessary evil? Tropenbos International – Ghana Workshop proceedings 2, 11 November 2003. Tropenbos International, Wageningen, the Netherlands.

Agyeman, V. K. (2006) Promoting smallholder plantations in Ghana. Plantations and forest livelihoods. AV31 (Arborvitae 31), September 2006.

Agyeman, V. K., Agyeman, F. and Kyere B. 2004. Illegal Chainsaw Operations: Impact, Constraints, Challenges and Policy Reform. In: K.S Nketiah, K.S., A. Wieman and K. O Asubonteng (eds). 2004. 'Chainsaw lumber production, a necessary evil? Tropenbos International, Workshop Proceedings 2. Pp. 32-40.

Agyeman, V. K., Marfo, K. A., Kasanga, K., Danso, E., Asare, A. B., Yeboah, O. M., and Agyeman, F. (2003) Revising the Taungya Plantation System: New Review–Sharing Proposals from Ghana. Report for FAO.

Agyemang, M.M.O. (1996) 'The leaf gatherers of Kwapanin, Ghana', *Forest Participation Series* No. 1, IIED, London, 12p.

Akrasi, P. 1997. Recovery efficiency of chainsaw milling. BSc thesis. University of Science and Technology, Kumasi

Amanor, K. S. 2006. Rural youth and the right to a livelihood in Ghana. *Paper for Conference on Youth and the Global South:Religion, Politics and the Making of Youth in Africa, Asia and the Middle East*, 13-15 October 2006, Dakar, Senegal, CODESRIA.

Amanor, K. S. (2000) 'Farmers, Forestry and Fractured Environmentalisms in Ghana's Forest Zones', In: Cline-Cole, R. and Madge, C. (eds.) *Contesting Forestry in West Africa*, Ashgate Publishing Limited, Aldershot (UK) and Burlington (USA), pp. 307 - 321.

Amanor, K. S. 1996. Managing trees in the farming system: the perspectives of farmers. Forest Farming Series No. 1. Forestry Department, Kumasi Ardayfio-Schandorf, E., P. W. K. Yankson, A. B. Asiedu, S. Agyei-Mensah and E. M. Attua. 2007. Socio-economic perspectives of off-reserve forest management in the Goaso Forest District of Ghana. Woeli Publishing Services, Accra.

Ardayfio-Schandorf, E., Attua, E. M., Agyei-Mensah, S., Yankson, P. W. K, and Asiedu, A. B. (2007) Socio-economic perspectives of off-reserve forest management in the Goaso forest district of Ghana. Woeli Publishing Services, Accra.

Arnold, J. E. M. and Bird, P. (1999) 'Forests and the Poverty-Environment Nexus'. Asare, B. A (1986) A study of indigenous tenures relating to trees and forest in some parts of Ghana. BSc thesis (unpublished). KNUST, Kumasi.

Asiseh, V., Hoeyi, N., Imirhe, T. and Dzirasah, M. (1996), *Ghana, We Mean* available on www.dfid.gov.uk/pubs/ 2008

Bamfo, R. Forestry reforms: How far, which way? In: Tropenbos International, 2005. Reconciling Policy Reforms with Forest Legislation. Proceedings of a workshop held in Elmina, Ghana, on the 4th and 5th of July 2005. Tropenbos International Ghana Workshop Proceedings 5. Wageningen, the Netherlands. Pp.9

Banana, A.Y. and Gombya-Ssembajjwe, W. (1998) 'Successful Forest Management: The Importance of Security of Tenure and Rule Enforcement in Ugandan Forests', In: Gibson, C., McKean, M.A. and Ostrom, E. (eds.) *Forest Resources and Institutions*, FTPP Working Paper No. 3, FAO, Rome, pp. 75-86.

Bilijo, N. The Challenge of moving from Policy to Legislation. In: Tropenbos International, 2005. Reconciling Policy Reforms with Forest Legislation. Proceedings

of a workshop held in Elmina, Ghana, on the 4th and 5th of July 2005. Tropenbos International Ghana Workshop Proceedings 5. Wageningen, the Netherlands. Pp. 27.

Bird, N., Fometé, T., and Birikorang, G. (2006) Ghana's experience in timber verification system design. Verifor Country Case Study 1.

Birgegard, L. (1993) *Natural Resources Tenure: A review of issues and experiences with emphasis on Sub-Saharan Africa*, Rural Development Studies No. 31, International Rural Development Centre (IRDC), Uppsala, 59p.

Birikorang, G. 2001. Ghana Wood Industry and log export ban study. Forestry Commission, Accra.

Birikorang, G. and M. Rhein. 2005. Reforming Ghana's forest fiscal regime. A phase 1 report submitted to the Forest Sector Development Project, Forestry Commission, Accra.

Birikorang, G., Okai, R., Asenso-Okyere, K., Afrane, S. and Robinson, G. (2001) *Ghana Wood Industry and Log Export Ban Study* (final report). DFID, London. 53 pp.

Birikorang, G., Okai, R., Asenso-Okyere, K., Afrane, S., Robinson, G., 2001. Ghana Wood Industry and log export ban study. Forestry Commission report to the Ministry of Lands and Forestry. Forestry Commission, Accra, Ghana. 53 pp.

Blackett H., and Gardette E., 2008: Cross-border flows of timber and wood products in West Africa. EUROPEAN COMMISSION. Contract Reference: 2007/146818, Final Report. HTSPE Ltd

Bradley, P. N. (1992) The Indigenous Woodlands of Zimbabwe and their Role in the Communal Lands Production System. Background Paper prepared for the World Bank - Zimbabwe Forestry Sector Review. World Bank, Washington, Pp 31 - 56.

Brown, D. (1999) 'Principles and Practice of Forest Co-management: Evidence from West-Central Africa', *European Union Tropical Forestry Paper* No. 2, ODI, London.

Brown, D., Malla, Y., Schreckenberg, K. and Springate-Baginski, O. (2002) 'From supervising 'subjects' to supporting 'citizens': Recent developments in community forestry in Asia and Africa', *Natural Resources Perspectives* No. 75, ODI, London, p.1-4.

Bruce, J. (1986) Land tenure issues in project design and strategies for agricultural development in Sub-Saharan Africa. LTC Paper 128. Land Tenure Centre, Wisconsin. *Business: Democratic, Economic and Social Achievements of Focused Government* (1993-1996), Conafric Ghana Limited, Tema, Ghana.

Byron, N. and Arnold, M. (1997) What Futures for the People of the Tropical Forests? Working Paper No. 19, Centre for International Forestry Research (CIFOR), Bogor. (www.cifor.cgiar.org/publications/pdf_files/Wpapers/WP-19.pdf [20/01/2002]).

Cabinet Memo (2002). Approval of Forestry Sector Policy Reforms. July, 2002. Government of Ghana.

Cline-Cole, R. (2000) 'Redefining Forestry Space and Threatening Livelihoods in Colonial Northern Nigeria', In: Cline-Cole, R. and Madge, C. (eds.) *Contesting Forestry in West Africa*, Ashgate Publishing Limited, Aldershot (UK) and Burlington (USA), pp. 36-63.

Constitution of the Republic of Ghana, 1999.

Counsell, S. 2007. For richer, for poorer: Logging and livelihoods in the Congo Basin, Rainforest Foundation, UK

Custom, Excise and Preventive Service (Management) Law 1993, PNDCCL 330

De Lasaux M. J., Spinelli R., Shelley J. R., and Hartsough R. B., 2004.: Using a small-log portable sawmill to reduce fuel reduction treatment cost on small parcels. USDA Forest Service Economic Action Program, 01-DG-11051150-021

DFID (2007) Illegal logging: tackling crime, improving livelihoods. DFID, UK.

DFID 2007 Illegal logging. Tackling crime, improving livelihoods Crime and Persuasion: Tackling Illegal Logging, Improving Forest Governance

DMRWG (2008) Report of the Domestic Market Regulation Working Group (DMRWG) of the Voluntary Partnership Agreement (VPA), Forestry Commission.

Falconer, J. (1992) Non-timber Forest Products in Southern Ghana. Main Report, Republic of Ghana Forestry Department and Overseas Development Administration, Natural Resources Institute (NRI), Chatham, UK.

FAO, 2005: Forest harvesting bulletin: Promoting Environmentally Sound Forest Practices Worldwide, Vol. 15

FD. Piloting Collaborative Forest Management Systems for Off-reserve areas in Southern Ghana. ITTO Project PD 41/95 Rev. 1 (f). Forestry Department Planning Branch, Kumasi-Ghana. June 2000. Pp.5-10, 23.26

Fobih, D. 2003. Keynote address by the Ghana Minister of Lands and Forestry. National AFLEG Consultation Workshop. September 24-25 2003, Akosombo, Ghana.

Forestry Commission (2003) Ghana Forestry Commission at a Glance. FC, Ghana. Forestry Commission Act, 1999 (Act 571).

Forestry Development in Ghana. A Report Submitted to the African Development Foundation, USA. Project grant number GHA. 420.

Forestry Development Master Plan, 1996-2020. Ministry of Lands and Forestry. Accra, Ghana.

Fortmann, L. (1985) 'The Tree Tenure Factor in Agroforestry with Particular Reference to Africa', *Agroforestry Systems* 2(4) 229-251.

Frimpong-Mensah, K. (2004): Chainsaw lumber production is wasteful, fact or myth? A paper presented at a National workshop organized by Tropenbos International – Ghana held in Kumasi on 11th November 2003. Theme: Chainsaw lumber production: A necessary evil? 4pp.

FSD. Forestry Services Division, 2002. Annual Report, Year 2002. Pp. 23 & 24.

FSD. Forestry Services Division, 2006. Quarterly report, April- June, 2006 Pp. 6.

Ghana Statistical Service, 2007. Key social, economic and demographic indicators. www.statsghana.gov.gh/KeySocial.html (Accessed 11/02/09).

Gianna, D. Promoting Alternative Livelihoods: Field Experiences. In: Inkoom, D. K. B., Kisseidu, K. O. Owusu Jnr. B. (eds). 2005. Alternative Livelihoods and Sustainable Resources Management.Proceedings of Workshop held in Akyawkrom, Ghana, on the 1st of April 2005. Tropenbos International Ghana Workshop Proceedings 4. Wageningen, the Netherlands. Pp. 17-26.

GSS and WIEGO, 2005: The Informal Economy in Ghana: A Comparative Perspective. A report on International Conference Co-hosted by the Ghana Statistical Service and WIEGO, La Palm Royal Beach Hotel, Accra, Ghana.

Gyimah, R. and A. Adu-Gmafi. 2009. A pilot study on sawnwood conversion efficiency in selected sawmills in Ghana. A draft report presented at a National workshop in Kumasi, March 2009. 52pp.

Hackett, S. C. 2001. Environmental and Natural Resources Economics: Theory, Policy, and the Sustainable Society, *2nd ed. M.E. Sharpe, New York*.

Hansen, P., Obiri, D. B. and Damnyag, L. 2008. Profits along the chainsaw lumber commodity chain in Ghana. Proposal, FLD-FORIG Project.

Hiller, M. A. 2004. Recent Trends in Illegal Logging and a Brief Discussion of Their Causes: A Case Study from Gunung Palung National Park Indonesia

http://books.google.com/books?id=VZ3oG6uIyxcC&printsec=frontcover&source=gbs_summary_r&cad=0 downloaded 2008

HYDRA, 2006. The potential of chainsaw milling for improving rural livelihoods in Uganda and DR Congo. HYDRA DFID/FRP R8510.

IIED (1994) Study of incentives for the sustainable management of the Tropical High Forest of Ghana.

Intervention: A Review and Synthesis. *Journal of Organisational Behaviour*, Vol. **13**, No. 3, Special Issue: Conflict and Negotiation in Organisations: Historical and Contemporary Perspectives, pp 209-252.

ITTO project PD 431/06: Processing and utilization of trees on farmlands and logging residues through collaboration with local communities. Forestry Research Institute of Ghana (FORIG) -Project Management and Implementation in Ghana.

Journal of Sustainable Forestry Volume: 19 Issue: 1/2/3 ISSN: 1054-9811. Page Range:

Kotey, E. N. A., Francois, J., Owusu, J. G. K., Yeboah, R., Amanor, K. S. and Antwi, L. 1998. Falling into place; Policy that works for forest and people, Series No. 4. International Institute for Environment and Development, London. Pp. 80-94.

Kusimi J. M. 2008. Assessing land use and land cover change in the Wassa West District of Ghana using remote sensing. GeoJournal, 71 (4): 249-259. Springer, Netherlands.

Kyeretwe, O. 2006. Forest Governance in Ghana. An NGO perspective. A report produced for FERN by Forest Watch Ghana, March 2006

Lambini, C. D., Kerstens E., Marfo, E. D., Koduah, H., De Boer, H. B., Bekker J. and Tutu, P. O. (2005). Causes and coping strategies of community-level forest conflicts: a case of compensation conflicts in selected communities in the Asunafo North and South Districts of Ghana. Tropenbos-Ghana Programme Study Report.

Lawry, S.W. (1990) 'Tenure Policy Towards Common Property Natural Resources in Sub-Saharan Africa', *Journal of Natural Resources*, 30:403-404.

Lewicki, R. J., E. S. Weiss and D. Lewin. 1992. Models of Conflict, Negotiation and Third Party

Local Government Act 462 of 1993.

Lomai, C. P. 2001 Environmental and Social Impact Assessment of Logging Operations in the West Coast of Manus Area, Manus Province, Papua New Guinea. summary of a full paper to be presented for the requirements of MA Thesis in Anthropology & Sociology Dept, University of Papua New Guinea. Papua New Guinea.

Marfo E., Acheampong, E. and Osae C. (2006): 'An assessment of compliance with on-farm logging compensation payment regulations in Ghana: Implications for policy interventions'. Ghana Journal of Forestry, 19&~20:~35-44.

Marfo, E. (2006) Powerful relations: the role of actor-empowerment in the management of natural resource conflicts. A case of forest conflicts in Ghana. PhD thesis (published), Wageningen University.

Marfo, E. Coping with illegality: Conflicts over chainsaw lumbering and coping strategies. In: K.S Nketiah, K.S., A. Wieman and K. O Asubonteng (eds). 2004. 'Chainsaw lumber production, a necessary evil? Tropenbos International, Workshop Proceedings 2. Pp. 22-30.

Matose, F. M. (2002) 'Local People and Reserved Forests in Zimbabwe: What Prospects for Co-Management?' Unpublished PhD Thesis, Institute of Development Studies, University of Sussex, Sussex.

Mayers, J. and Kotey, N. A. (1996) 'Local Institutions and Adaptive Forest Management in Ghana'. *Forestry and Land Use Series* 7. IIED, London. MLF. Forest and Wildlife Policy, 1994. Ministry of Lands and Forestry (MLF),

Accra, Ghana, 1994.

Nketiah, K. S., Wieman, A., Asubonteng, K.O. 2003. Chainsaw lumber production: a necessary evil? (Eds). Workshop Proceedings 2. Tropenbos International, Wageningen, the Netherlands

Nutakor E. E. 2004 Managing Natural Resources: The Feasibility of Pluralism as an effective Approach to Managing Conflicting Interests in Protected Areas. M.Phil degree in Silviculture and Forest Management, Kwame Nkrumah University of Science and Technology, Kumasi Ghana 125p

Obiri, D.B., Marfo, E., Damnyag, L., Ohene-Coffie, F., Nutakor, E. and Oduro, K. A. 2007. Domestic demand and supply of lumber in Ghana: A situation analysis. Preliminary data. FORIG

Odoom F. K. 2005: Chainsawing in the natural forests of Ghana. An assessment of the socio-economic impacts of this practice. Food and Agricultural Organization of the United Nations, Rome. Italy

Odoom, F.K. (2005) Chainsawing in the natural forests of Ghana. An assessment of the socio-economic impacts of this practice. FAO FOREST HARVESTING CASE-STUDY 21. FAO, Rome.

Otoo, J. E. (2004) 'Chainsaw lumber production and sustainable forest management'. In: Nketiah, K. S., Wieman, A. and Asubonteng, K. O. (eds.) Chainsaw lumber production: a necessary evil? Tropenbos International – Ghana Workshop Proceedings 2, 11 November 2003. Tropenbos International, Wageningen, the Netherlands. 16 pp.

Owubah, C.E., Le Master, D.C., Bowker, J.M. and Lee, J.G. (2001) 'Forest tenure systems and sustainable forest management: the case of Ghana', *Forest Ecology and Management*, 149: 253-264.

Owusu, A. (2003) Halting Chainsaw Lumber Production: Counting the Cost. Report presented at the workshop organized by TBI on Chainsaw Lumber Production, A Necessary Evil. Workshop Proceedings 2. Tropenbos International, Wageningen, the Netherlands

Owusu, J. G. K., Daasebre Osei Bonsu II, Djokotoe. E. Y., Adam, A. K and Osiakwan, K. 2006. Benefit sharing of revenues derived from natural forest reserves. Executive summary of the Committee's report. Prepared for the Ministry of Lands, Forestry and Mines, July 2006.

Owusu, J.B. and Nketiah, K. S. Alternative livelihood Schemes in Forest Districts of Ghana. A Case Study of Ashanti and Brong-Ahafo Districts. In: Inkoom, D. K. B., Kisseidu, K. O. Owusu Jnr. B. (eds.). 2005. Alternative Livelihoods and Sustainable Resources Management. Proceedings of Workshop held in Akyawkrom, Ghana, on the 1st of April 2005. Tropenbos International Ghana Workshop Proceedings 4. Wageningen, the Netherlands. Pp. 44-62.

Paper prepared for the UNDP/EC Expert Workshop on Poverty and the Environment, Brussels, Belgium, January, 1999. (www.undp.org/seed/pei/publication/forest.html [11/02/02]).

Parren, M. P.E., R. D. Cardoso, E. N.A. Okai, A. A. Eshun and K. E. Haizel. 2007. Review of the domestic timber market with an emphasis on off-Forest Reserve timber production and management in Ghana. VLTP Background Paper No. 2. Forestry Commission, Accra, Ghana

Pasiecznik, N. 2006. The potential of chainsaw milling outside forests. Agro forestry Net, Holualoa, Hawaii. http://www.agroforestry.net/pubs

Peluso, N.L. and Padoch, C. (1996) 'Changing resource rights in managed forests of West Kalimantan'. In Padoch, C. and Peluso, N. L. (eds.) *Borneo in transition:* people, forests, conservation and development. Oxford University Press, Kuala Lumpur.

Philip Sutton (1998 Sustainability: What does it mean? Green Innovations Inc Pondy, L. R. "Reflections on Organizational Conflict" Journal of Organizational Behaviour, Vol. 13, pp. 257-261 (1992)

Pondy, L. R. 1967. Organisational Conflict: Concepts and Models. *Administrative Science Quarterly*, Vol. **12**, No.2, pp 296-320.

Potts, D. (2002):. Project Planning and Analysis for Development, Lyann Rienner Publishers. ODA, 1988, Appraisal of projects in developing countries, A Guide for Economists, London.

Ravenel, R.M. Granoff, I.M.E., 2004. Illegal logging in the tropics: a synthesis of the issues. Journal of Sustainable Forestry 19(1/2/3):351-366.

Richards, M. and Asare, A. (1999) *Economic Incentives for Cocoa farmers to Tend Timber Trees in Southern Ghana*. ODI, London.

Sarfo-Mensah P., 2005: Exportation of Timber in Ghana: The Menace of Illegal Logging Operations. Nota Di Lavoro 29

Scherr, S. J., (1995) Economic factors in farmer adoption of agroforestry: patterns observed in western Kenya. World Dev. 23 (S), 7X7-804.

Schmithüsen, F.2006. Forest utilization contracts on public land in the tropics. Chapter 4: Ghana. FAO www.fao.org/DOCREP/003/AB567E/AB567E02.htm - 63k accessed 12/02/09.

Siebert, U. and Elwert, G. 2004. Combating corruption and illegal logging in Benin, West Africa: recommendations for forest sector reform. Journal of Sustainable Forestry 19(1/2/3/): 239-261

Smith, E. K. 1996. The evolution of policy into practice. A case study of Ghana's forest policy: The Interim Measures to control illegal timber harvesting outside forest reserves. African Forestry Policy Forum, August 29-30, 1996, Nairobi. Pp. 3-22.

Tacconi L.2007. Illegal Logging: Law Enforcement, Livelihoods and the Timber Trade TEDB (Timber Export Development Board) (1995) The Ghana Timber Industry-Basic Information- Facts and Figures, TEDB, Ghana.

The Importance of Security of Tenure and Rule Enforcement in Ugandan Forests', In: Gibson, C., McKean, M.A. and Ostrom, E. (eds.) *Forest Resources and Institutions*, FTPP Working Paper No. 3, FAO, Rome, pp. 75-86.

Thomas, K W. "Conflict and Conflict Management: Reflections and Update" Journal of Organizational Behaviour, Vol. 13, pp. 265-274 (1992)

Timber Resources Management Act, 1997. Act547.

Timber Resources Management Regulation, 1998, L.I 1649.

Townson, I. M. (1995) Incomes from non-timber forest products: patterns of non-timber forest product enterprise activity in the forest zone of southern Ghana. Report of a study carried out as part of the ODA Forestry Research Programme with the Planning Branch of Ghana's Forestry Department. Main Report. Oxford: Oxford Forestry Institute.

Tree and Timber (Chainsaw Operations) Regulations, 1991, L.I 1518.

Trees and Household Livelihood Strategies in Southern Ghana. PhD Thesis (unpublished), University of Hull, UK.

Vanessa, B. 2008. Diagnosis of chainsaw milling in Guyana. Iwokrama International Centre for rain forest conservation and research development. Chainsaw milling project in Guyana research report.

Warner, K. (1993) Patterns of Tree Growing by Farmers in Eastern Africa. Tropical Forestry Paper 27. Oxford Forestry Institute and International Centre for Research in Agroforestry, Oxford and Nairobi.

Wells, A, C. Luttrell, D. Brown, and N. Bird, 2006. Public Goods and Private Rights: Illegal logging Debate and the Rights of the Poor. ODI Forestry briefing Number 9 February 2006

Whiteman, A. Discussion Note: Feasibility of Introducing a Chainsaw Lumber Permit in Liberia. 10 March 2005

Williams, A. 2005 Environmental Change and Security program: Building Partnerships to Reduce Forest Conflict: Downloaded from:

http://www.wilsoncenter.org/index.cfm?topic_id=1413&fuseaction=topics.events&themonth=12&n_owner_id=157361&theyear=2005_downloaded in December 2008

Wily, L. A. (2002) 'The Political Economy of Community Forestry in Africa - Getting the Power Relations Right'. *Forests, Trees and People Newsletter* No. 46, p. 4-12.

<u>Http://www.southalabama.edu/coe/bset/johnson/660lectures/RLF11.doc</u> (cited on 10/04/09). Measuring efficiency.

Yaffee, S.L. (1994) The Wisdom of the Spotted Owl: Policy Lessons for a New Century. Island Press, Washington, D.C.

Yasmi, Y. and H. Schanz. 2007. Conflicts in natural resource management: toward conceptual clarity. Submitted to *Environmental Management*.

ANNEXES

Annex 5.1 Sample of survey questionnaire for estimating level of employment

Chain code	nsaw Operators commun	ity/District:			
2	What is the size of your milling crew				
2	How many boards/beams are you mill/month (m³)				
	Has the size of your crew increase or decrease over the past 3 years	2005	2006	2007	
	Do you have any other job				
	What is the size of the haulage crew				
3b	Do you agree that political influence from Chiefs, politicians and high-level officials has significantly sustained chainsaw operations				
4b	Rank the first three factors in order of	□Corruption by FSD officials			
	importance, which you think have contributed to the ineffectiveness of the enforcement of	☐ Corruption by law enforcement agencies			es
	the ban of chainsaw activities	☐ Low capacity of FSD to mobilise evidence and present convincing case in court			
		☐ Ineffectiveness of the courts			
		□ lack of political will			
		□Unemployment			
		□Lack of education	extensive	consultation	and
		□Lack of a enforce the re		of chiefs to	help
		□Competitiv	e price of cha	ninsaw lumber	
		□Others			
5a	Could you narrate one incidence of chainsaw- related conflict you have been involved	Write narrati	ve		
	Follow narrative to find out causes, actors, management (FC, Police, court, chiefs etc involvement)				
5c	Did you consult the farmer before logging?				
	Did you pay any compensation for tree/crops damaged?				

	If yes, how much?	
	Did the promised amount match what was promised?	3
	How did you arrive at the amount fo compensation?	r
	How would you judge how the case was solved?	S
	How long did it take you to finally resolve the issue?	Peaceful, □emotionally tensed, □physical fight,
	Did you have to pay any other money apar from compensation/	t
	How much on the average?	
	Who receive this money?	
Timber Resaw	r Market studies ers	Market/District:
2a	What is the size of the resaw crew	
2a	What is the capacity of your resaw mill	
2a	Do you do any other job?	
Lumbe	er brokers/traders	Market/District

code		
2a	What is the size of your weekly/monthly stock of lumber	
	How many people are engaged by the broker/seller	
	Has the size of your workers increase or decrease over the last 3 years?	2005 2006 2007
	Do you do any other job?	
4b	Rank the first three factors in order of	□Corruption by FSD officials
	importance, which you think have contributed to the ineffectiveness of the enforcement of the ban of chainsaw	□Corruption by law enforcement agencies
	activities	□Low capacity of FSD to mobilise evidence and present convincing case in court
		☐ Ineffectiveness of the courts
		☐ lack of political will
		□Unemployment
		□Lack of extensive consultation and education
		□Lack of authorization of chiefs to help enforce the regulation
		☐ Competitive price of chainsaw lumber
		□Others
Researc	cher observations	
2a	List the sizes of 10 randomly sampled haulage trucks in each market	
	Market1	
	Market 2	

list the size of the loading crew at each market

Market 3

2a

Market 2	
Market 3	
Annex 5.2: Questionnaire for national FS	D survey, 2008
NATIONAL FSD CH For all Forest Districts in	
It has become important for us to understand the operations and the challenges involved in dealin national survey is to data that can give a nationa on official records at your respective Forest Dist PURELY FOR RESEARCH SO WE KINDLY VERIFIABLE RESPONSE. DATA SHALL BE	ng with it at the various forest districts. This all overview. Please complete this form based tricts. PLEASE NOTE THAT THIS DATA IS REQUEST THAT YOU GIVE TRUTHFUL
Assessment should be made for 2007 or 200 assessment))8 (please underline year selected for
Region	Forest District
Indicate the number of chainsaw offences/cases reported to the district office	
Indicate the number of chainsaw offences/cases reported to the police by the District office	S
Indicate the number of chainsaw offences/ cases prosecuted at the court	S
Indicate the number of hours spend in court per for chainsaw offences/cases	day
Indicate the average days that it takes for prosec	euted

Market 1

chainsaw cases to last in the court

Indicate number of prosecuted chainsaw cases in the court that the outcome has been	1
1. in favour of FSD	1
2. in favour of the 'culprits'	2
Number of chainsaw offences/ cases that are still pending in court.	
	Per week
Indicate average number of times chainsaw offences are observed or reported to the District	Per month
Number of FSD casualties as a result of chainsaw related problems reported	
Number of other casualties as a result of chainsaw related problems reported	
Volume of confiscated lumber (the total annual volume)	
Number of trucks confiscated	
Indicate which external parties (chiefs, DCE, etc) intervened in chainsaw related cases/offences	
Indicate the number of times each of the listed parties (chiefs, local politician, national politician and others) intervened in chainsaw related cases/offences	□ Chiefs,
	□Local politicians/officials (Assemblyman, DCE,etc)
	□National politician (MPetc)

	□Others; specify ()
Number of times FSD staff have been found to be involved in chainsaw offences	
Number of times people have requested for felling timber on farms/off-reserves for domestic use from the District office	
Which people were involved in the demand	□ Chiefs
The people were in our community	☐ Ordinary people
	☐ Lumber dealers
	☐ Others, Specify
Proportion of all forest related conflicts in your	□ 0- 25%
Districts which are related to chainsaw operation	□ 25- 50%
	□ 50-75%
	□ 75- 100%
To what extent do you agree that chainsaw milling should be regularised in order to practically manage	□Don't agree
the chainsaw operation	□agree
	☐Strongly agree
	□Not sure
Please attach a note on any comment you would like to make regarding managing the chainsaw problem, especially specific policy actions you would recommend based on your experience in the field	

Annex 6.1: Questionnaire for primary stakeholders of chainsaw lumber production. August 2008

Forestry Research Institute of Ghana-EU Chain saw Project Developing alternatives for illegal chainsaw lumbering through multi-stakeholders dialogue in Ghana and Guyana Project

The purpose of this survey is to determine the drivers of chainsaw lumber production and its economic impact on our rural and national economy with the view to finding how chainsaw activity can be made more beneficial to you and your community members, the forest, and the nation as a whole

General information

1.	Name of district	
2	Name of village/community	
3	Status/domain of respondent	1. Chainsaw lumber sponsor; 2 Chainsaw owner; 3. Chainsaw operator; 4. lumber carrier/head porter; 3. transport owner/driver 5. Small Scale Sawmiller; 6. Chief; 7.Unit committee member; 8. lumber dealer; 9. Land owner; 10. Sawyer/table top sawmiller; 11. Farmer; 12. FSD/Range supervisor; 13 district manager; 14 Forest guard; 15 lumber consumers

Drivers of chainsaw lumber production

Market and financial environment

- 4. In your estimate, is chainsaw lumber significantly cheaper than similar dimensions and species of sawmill lumber? Yes. No
- 4.1. If yes, do you think the price of lumber is among the main reasons why many people seem to prefer chainsaw lumber to lumber from sawmills? Yes. No.

4.1.1. If yes, please try to explain with figures

Chainsaw lu	umber in 2008		Small scale sawmill lumber in 2008		
Species Dimension unit price			Species	dimension	unit price

- 5. What factors OTHER THAN LOW PRICE are in your opinion responsible for the continuous provision of chainsaw lumber in the local market
- a. Sawmill lumber is not available at all
- b. Sawmill lumber is available but not in sufficient quantity
- c. Sawmill lumber is not available in the preferred species
- d. Other, please explain
- 6. Do you agree with the current legislation that bans the production and transport of chainsaw lumber for commercial purposes? Yes. No.
- 7. If no, indicate the important changes that should be made?
- a. Chainsaw lumber production should be legalized
- Chainsaw operators should be allowed to work off-reserves on the basis of permits issued by the FC
- Chainsaw operators should be allowed to work off-reserves on the basis of permits issued by local chiefs
- d. Chainsaw operators should be allowed to work **off-reserves** on the basis of permits issued by District Assemblies
- Chainsaw operators should be allowed to work off-reserves on the basis of permits issued by individual farmers/land-owners.
- f. Chainsaw operators should be allowed to work on-reserves on the basis of permits issued by the FC
- g. Other arrangements according to which the production of chainsaw lumber could be made legal.
- h. In any case, chainsaw operators should pay stumpage fees to the FC instead of to the police and soldiers.

8. What do you think should be the responsibility of the sponsor/chainsaw operators to the state, resource communities and landowners if the ban on chainsaw lumber production is removed and license are given to chainsaw operators?

Responsibility sponsor/operator	of	state	landowner	Resource communities
sponsor/operator				

- 9. Could anything be done to encourage saw millers to increase their supply to the domestic market? Yes. No
- 10. If yes, what?
 - a. Tax reductions for saw millers
 - b. Strict enforcement of the law that stipulates 20% of the production should be supplied to the domestic market
 - c. Strict control of chainsaw lumbering which will reduce domestic lumber supply and therefore drive the prices of lumber in the domestic market up to a level near export market prices.
 - d. Other, please explain
- 11. If no, why not?
 - a. The higher export market prices will always make saw millers want to export their produce.
 - b. Other, please explain
- 12. Mention the businesses/work that are emerging in your community these days.
- a. Carpentry shops/business
- b. Backyard gardening
- c. Stone quarry
- d. Others
- 13. Has the chainsaw/chainsaw lumbering contributed to the emergence of this community based businesses? Yes. No.
- 14. If yes, please mention how

Type of community based business/work	Contribution of chainsaw to this business/work

- 15. Are these businesses likely to suffer if chainsaw milling is stopped in the community? Yes. No.
- 16. If yes, please mention how

Type of community based business/work	Type of difficulty/suffering		

Annex 6.2: Stakeholders comparison of 2008 chainsaw and sawmill lumber prices in study forest districts

1. Co	1. Comparison of chainsaw and small scale sawmill lumber in 2008 in Assin Fosu Forest District							
Chainsaw lumber price in 2008			Saw mill lumber price in 2008			Price differences		
Species	Dimension	Unit price (GH¢)	Species	Dimension	Unit price (GH¢)	between sawmill & chainsaw lumber in 2008 (GH¢)	% Price difference in 2008	
Asanfina	1x12x14	5.0	Asanfiana	1x12x14	8.0	3.0	38	
Dahoma	1x12x14	4.5	Dahoma	1x12x14	8.0	3.5	44	
Dahoma	2x6x14	3.7	Dahoma	2x6x14	6.3	2.7	42	
Danta	2x6x14	3.0	Danta	2x6x14	5.0	2.0	40	
Danta	4x12x14	7.0	Danta	4x12x14	12.0	5.0	42	
Emire	2x6x14	4.0	Emire	2x6x14	8.0	4.0	50	
Esa	2x6x14	1.2	Esa	2x6x14	7.0	5.8	83	
Odum	1x12x14	4.8	Odum	1x12x14	8.0	3.3	41	
Odum	2x6x14	5.0	Odum	2x6x14	10.0	5.0	50	
Ofram	1x12x14	4.0	Ofram	1x12x14	7.0	3.0	43	
Ofram	4x12x14	4.0	Ofram	4x12x14	9.0	5.0	56	
Otwese	2x6x14	1.2	Otwese	2x6x14	5.0	3.8	76	
Wawa	1x12x14	3.0	Wawa	1x12x14	6.0	3.0	50	
Wawa	2x12x14	2.8	Wawa	2x12x14	12.0	9.3	77	
District average		3.8			8.0	4.2	52	

2. Co	mparison of cl	nainsaw an	d small scale s	awmill lumbe	r in 2008 i	n Begoro Forest Distric	et
Chainsaw L	Lumber in 2008	3	Small Scale	sawmill in 200)8		
Species	Dimension	Unit price (GH¢)	Species	Dimension	Unit price (GH¢)	Price differences between sawmill & chainsaw lumber in 2008 (GH¢)	% Price difference in 2008
Akasa	4x12x16	6.0	Akasa	4x12x16	9.0	3.0	33
Asanfina	4x12x16	5.0	Asanfina	4x12x16	9.0	4.0	44
Chenchen	1x12x14	2.5	Chenchen	1x12x14	3.0	0.5	17
Chenchen	1.5x12x14	3.0	Chenchen	1.5x12x14	6.0	3.0	50
Dahoma	2x6x14	3.0	Dahoma	2x6x14	4.0	1.0	25
Dahoma	4x6x14	6.0	Dahoma	4x6x14	9.0	3.0	33
Dahoma	6x12x14	4.0	Dahoma	6x12x14	6.0	2.0	33
Ednam	1x9x14	2.3	Ednam	1x9x14	3.0	0.8	25
Ednam	1x12x14	4.0	Ednam	1x12x14	6.0	2.0	33
Emire	1x12x14	4.0	Emire	1x12x14	5.0	1.0	20
Emire	2x6x14	3.2	Emire	2x6x14	4.2	1.0	24
Mahogany	1x12x14	5.0	Mahogany	1x12x14	6.0	1.0	17
Nyamedua	1x12x14	2.8	Nyamedua	1x12x14	3.7	0.8	23
Odum	2x4x14	1.5	Odum	2x4x14	4.8	3.3	69
Odum	2x6x14	6.0	Odum	2x6x14	8.0	2.0	25
Odum	4x12x14	6.0	Odum	4x12x14	7.0	1.0	14

Ofram Sapale	2x6x14 1x12x14	3.0	Ofram Sapale	2x6x14 1x12x14	4.0 8.0	1.0	25 63
Sapale Sapale	2x6x14 4x12x8	6.0 5.0	Sapale Sapale	2x6x14 4x12x8	9.0 10.0	3.0 5.0	33 50
Watapuo	2x6x14	2.5	Watapuo	2x6x14	3.5	1.0	29
Wawa	1x12x14	2.9	Wawa	1x12x14	4.0	1.1	28
District average		3.9			6.0	2.0	32

3. Co	mparison of cl	nainsaw a	and small sca	le sawmill lum	ber in 20	008 in Goaso Forest Distric	t
Chainsaw lu	mber		Sawmill lum	ıber		Price differences between	% Price
Species	Dimension	Unit Price	Species	Dimension	Unit Price	sawmill & chainsaw lumber in 2008	difference in 2008
Dahoma	2x6x14	1.6	Dahoma	2x6x14	4.5	2.9	64
Dahoma	5x7x14	7.0	Dahoma	5x7x14	14.0	7.0	50
Esa	2x6x14	2.3	Esa	2x6x14	4.5	2.3	50
Kusia	5x7x14	7.0	Kusia	5x7x14	14.0	7.0	50
Mahogany	1x12x14	2.5	Mahogany	1x12x14	5.2	2.7	52
Mahogany	1x12x16	1.5	Mahogany	1x12x16	3.0	1.5	50
Mahogany	2x6x16	3.0	Mahogany	2x6x16	7.0	4.0	57
Ofram	1x12x14	1.9	Ofram	1x12x14	4.8	2.9	61
Ofram	1x12x16	4.1	Ofram	1x12x16	7.1	3.0	42
Ofram	2x2x14	1.0	Ofram	2x2x14	1.5	0.5	33
Ofram	2x3x14	1.0	Ofram	2x3x14	1.5	0.5	33
Ofram	2x4x14	1.2	Ofram	2x4x14	2.4	1.2	49
Ofram	2x6x14	3.3	Ofram	2x6x14	5.3	2.0	38
Ofram	2x14x16	2.0	Ofram	2x14x16	4.0	2.0	50
Ofram	5x13x16	7.0	Ofram	5x13x16	12.0	5.0	42
Wawa	1x12x10	2.0	Wawa	1x12x10	3.0	1.0	33
Wawa	1x12x14	1.4	Wawa	1x12x14	3.5	2.1	59
Wawa	1x12x16	3.0	Wawa	1x12x16	6.0	3.0	50
District average		2.9			5.7	2.8	47.9

4. Comparison of chainsaw and small scale sawmill lumber in 2008 in Juaso Forest District										
Chainsaw Lumb	er in 2008		Small Scale	sawmill in 200)8	Price differences	% Price			
Species	Dimension	Unit price (GH¢)	Species	Dimension	Unit price (GH¢)	between sawmill & chainsaw lumber in 2008 (GH¢)				
Abako	1x12x14	4.0	Abako	1x12x14	6.0	2.0	33			
Aprokuma	4x12x14	5.0	Aprokuma	4x12x14	18.0	13.0	72			
Dahoma	6x4x14	5.0	Dahoma	6x4x14	12.0	7.0	58			
Ednam	3x3x14	2.5	Ednam	3x3x14	3.0	0.5	17			
Esa	2x6x14	2.4	Esa	2x6x14	12.0	9.6	80			
Esa	6x4x14	4.5	Esa	6x4x14	10.0	5.5	55			

District average		3.3			10.5	7.1	59
Wawabima	2x6x14	2.5	Wawabima	2x6x14	13.0	10.5	81
Wawa	1x12x14	3.0	Wawa	1x12x14	5.5	2.5	45
Wawa	2x4x14	1.5	Wawa	2x4x14	2.5	1.0	40
Oprono	4x12x14	5.0	Oprono	4x12x14	20.0	15.0	75
Okro	2x6x14	2.5	Okro	2x6x14	13.5	11.0	81
Ofram	1x12x14	3.0	Ofram	1x12x14	7.5	4.5	60
Ofram	2x4x14	1.5	Ofram	2x4x14	2.0	0.5	25
Nyamedua	1x12x14	2.4	Nyamedua	1x12x14	12.0	9.6	80
Mahogany	4x12x14	5.0	Mahogany	4x12x14	20.0	15.0	75

5. Co i	mparison of cl	nainsaw	and small sc	ale sawmill lu	mber in 20	008 in Kade Forest Distric	et
Chainsaw Lumber in 2008			Small Scale	e sawmill in 20	008	Price differences	
Species	Dimension	Unit price (GH¢)	Species	Dimension	Unit price (GH¢)	between sawmill & chainsaw lumber in 2008 (GH¢)	% Price
Asanfina	2x6x14	3.8	Asanfina	2x6x14	5.0	1.2	24
Dahoma	2x6x14	2.2	Dahoma	2x6x14	4.7	2.4	52
Emire	1x12x14	4.0	Emire	1x12x14	5.0	1.0	20
Emire	2x6x14	1.8	Emire	2x6x14	4.2	2.3	56
Esa	2x6x14	2.7	Esa	2x6x14	5.0	2.4	47
Odum	2x6x14	2.3	Odum	2x6x14	4.8	2.5	52
Otwese	2x8x14	1.8	Otwese	2x8x14	4.0	2.2	55
Wawa	1x12x14	2.3	Wawa	1x12x14	4.2	1.9	45
District average		2.6			4.6	2.0	44

6. Co ı	6. Comparison of chainsaw and small scale sawmill lumber in 2008 in Nkawie Forest District											
Chainsaw Lumber in 2008		Small Scale	sawmill in 200	08	Price differences							
Species	Dimension	Unit price (GH¢)	Species	Dimension	Unit price (GH¢)	between sawmill & chainsaw lumber in 2008 (GH¢)						
Dahoma	2x6x16	2.0	Dahoma	2x6x16	7.0	5.0	71					
Dahoma	4x6x14	3.9	Dahoma	4x6x14	8.8	4.9	56					
Dahoma	4x12x14	5.0	Dahoma	4x12x14	15.0	10.0	67					
Emire	2x4x14	1.4	Emire	2x4x14	2.8	1.4	50					
Mahogany	2x6x16	4.0	Mahogany	2x6x16	9.0	5.0	56					
Ofram	2x3x14	1.4	Ofram	2x3x14	2.8	1.4	50					
Twepapa	1x9x14	10.0	Twepapa	1x9x14	18.0	8.0	44					
Wawa	1x12x14	2.5	Wawa	1x12x14	15.0	12.5	83					
Wawa	3x12x17	5.5	Wawa	3x12x17	12.5	7.0	56					
Wawa	4x12x16	5.0	Wawa	4x12x16	7.0	2.0	29					
District average		4.1			9.8	5.7	56					

7. Comparison of chainsaw and small scale sawmill lumber in 2008 in Oda Forest District

Chainsaw Lu	ımber in 2008		Small Scale s	sawmill in 200	8	Price differences	
Species	Dimension	Unit price (GH¢)	Species	Dimension	Unit price (GH¢)	between sawmill & chainsaw lumber in 2008 (GH¢)	% Price difference in 2008
Asanfina	1x12x14	8.0	Asanfina	1x12x14	15.0	7.0	47
Asanfina	4x12x8	14.8	Asanfina	4x12x8	19.0	4.3	22
Ceda	2x6x14	5.0	Ceda	2x6x14	9.0	4.0	44
Ceda	4x12x8	12.0	Ceda	4x12x8	15.0	3.0	20
Chenchen	2x6x14	2.8	Chenchen	2x6x14	4.0	1.2	30
Chenchen	4x12x14	2.8	Chenchen	4x12x14	4.0	1.2	30
Dahoma	2x6x14	3.3	Dahoma	2x6x14	5.2	1.9	37
Dahoma	2x6x16	2.2	Dahoma	2x6x16	4.0	1.8	45
Dahoma	6x12x14	8.0	Dahoma	6x12x14	15.0	7.0	47
Danta	1x12x14	5.0	Danta	1x12x14	8.0	3.0	38
Danta	2x6x14	5.0	Danta	2x6x14	9.0	4.0	44
Danta	4x12x8	15.0	Danta	4x12x8	18.0	3.0	17
Ednam	1x12x14	5.5	Ednam	1x12x14	11.0	5.5	50
Emire	1x12x14	3.5	Emire	1x12x14	7.5	4.0	53
Emire	2x6x14	2.8	Emire	2x6x14	5.0	2.2	44
Emire	2x6x16	1.8	Emire	2x6x16	3.5	1.7	49
Emire	4x12x14	8.0	Emire	4x12x14	15.0	7.0	47
Esa	2x6x14	3.9	Esa	2x6x14	5.9	2.0	34
Esa	4x12x14	3.5	Esa	4x12x14	5.0	1.5	30
Mahogany	4x12x8	15.0	Mahogany	4x12x8	18.0	3.0	17
Nyamedua	1x12x14	2.3	Nyamedua	1x12x14	5.0	2.8	55
Nyamedua	2x6x14	2.4	Nyamedua	2x6x14	3.5	1.1	31
Nyamedua	4x12x14	3.2	Nyamedua	4x12x14	5.5	2.4	43
Odum	2x6x14	3.7	Odum	2x6x14	6.3	2.6	41
Odum	4x12x8	15.0	Odum	4x12x8	18.0	3.0	17
Ofram	1x12x14	3.5	Ofram	1x12x14	5.0	1.5	30
Ofram	2x6x14	3.2	Ofram	2x6x14	5.1	1.9	37
Ofram	2x6x16	1.8	Ofram	2x6x16	3.5	1.7	49
Ofram	4x12x14	4.5	Ofram	4x12x14	7.0	2.5	36
Okuo	2x6x14	4.5	Okuo	2x6x14	8.0	3.5	44
Sapale	4x12x8	15.0	Sapale	4x12x8	18.0	3.0	17
Wawa	1x12x14	2.8	Wawa	1x12x14	5.6	2.7	49
Wawa	1x12x14	3.5	Wawa	1x12x14	7.0	3.5	50
Wawa	2x6x14	2.5	Wawa	2x6x14	6.0	3.5	58
Wawa	4x12x14	3.5	Wawa	4x12x14	6.0	2.5	42
	7314314	ال.ال	wawa	7314314	0.0	۷.J	74
District		5.7			8.7	3.0	38
average		3.1			0.7	3.0	J0

8. Con	8. Comparison of chainsaw and small scale sawmill lumber in 2008 in Sunyani Forest District										
Chainsaw Lumber in 2008			Small Scale	sawmill in 2008	Price differences between sawmill						
Species	Dimension	Unit price (GH¢)	Species	Dimension	Unit price (GH¢)	& chainsaw lumber in 2008 (GH¢)	11.00				
Chenchen	1x12x14	4	Chenchen	1x12x14	7.5	3.5	47				
Chenchen	1.5x12x14	3.5	Chenchen	1.5x12x14	6	2.5	42				
Dahoma	2x6x14	5	Dahoma	2x6x14	8	3	38				

Mahogany	1x12x14	4	Mahogany	1x12x14	6	2	33
Mahogany	2x6x14	5	Mahogany	2x6x14	8	3	38
Nyamedua	1x12x14	2.8	Nyamedua	1x12x14	6	3.2	53
Odum/Iroko	2x4x14	2	Odum/Iroko	2x4x14	3.5	1.5	43
Odum/Iroko	2x6x14	4.8	Odum/Iroko	2x6x14	6.3	1.5	24
Ofram	1x9x14	4	Ofram	1x9x14	7.5	3.5	47
Ofram	2x4x14	1.5	Ofram	2x4x14	3	1.5	50
Ofram	2x6x14	2	Ofram	2x6x14	4	2	50
Ofram	2x7x17	3.8	Ofram	2x7x17	6.8	3	44
Onyina	1x12x14	3	Onyina	1x12x14	6	3	50
Onyina	1.5x12x14	2.4	Onyina	1.5x12x14	5	2.6	52
Otie	2x7x17	2.7	Otie	2x7x17	6	3.3	55
Wawa	1x12x14	3.5	Wawa	1x12x14	7	3.5	50
Wawa	1x12x18	6	Wawa	1x12x18	10	4	40
Wawa	1x12x16	0.8	Wawa	1x12x16	5.7	4.9	86
Wawa	1.5x12x14	3.8	Wawa	1.5x12x14	8	4.2	53
Wawa	4x12x14	4.5	Wawa	4x12x14	9.9	5.4	55
District							
average		3.5			6.5	3.1	47

Annex 6.3: List of species and lumber dimensions across study districts

Forest District	Species	Dimension	Unit Price (GH¢)	Species	Dimension	Unit price (GH¢)
Begoro	Chenchen	1.5x12x14	3.0	Chenchen	1.5x12x14	6.0
Sunyani	Chenchen	1.5x12x14	3.5	Chenchen	1.5x12x14	6.0
Sunyani	Onyina	1.5x12x14	2.4	Onyina	1.5x12x14	5.0
Sunyani	Wawa	1.5x12x14	3.8	Wawa	1.5x12x14	8.0
Goaso	Wawa	1x12x10	2.0	Wawa	1x12x10	3.0
Assin Fosu	Asanfina	1x12x14	5.0	Asanfiana	1x12x14	8.0
Assin Fosu	Dahoma	1x12x14	4.5	Dahoma	1x12x14	8.0
Assin Fosu	Odum	1x12x14	4.8	Odum	1x12x14	8.0
Assin Fosu	Ofram	1x12x14	4.0	Ofram	1x12x14	7.0
Assin Fosu	Wawa	1x12x14	3.0	Wawa	1x12x14	6.0
Begoro	Chenchen	1x12x14	2.5	Chenchen	1x12x14	3.0
Begoro	Ednam	1x12x14	4.0	Ednam	1x12x14	6.0
Begoro	Emire	1x12x14	4.0	Emire	1x12x14	5.0
Begoro	Mahogany	1x12x14	5.0	Mahogany	1x12x14	6.0
Begoro	Nyamedua	1x12x14	2.8	Nyamedua	1x12x14	3.7
Begoro	Ofram	1x12x14	3.9	Ofram	1x12x14	4.8
Begoro	Sapale	1x12x14	3.0	Sapale	1x12x14	8.0
Begoro	Wawa	1x12x14	2.9	Wawa	1x12x14	4.0
Goaso	Mahogany	1x12x14	2.5	Mahogany	1x12x14	5.2
Goaso	Ofram	1x12x14	1.9	Ofram	1x12x14	4.8
Goaso	Wawa	1x12x14	1.4	Wawa	1x12x14	3.5
Juaso	Abako	1x12x14	4.0	Abako	1x12x14	6.0
Juaso	Nyamedua	1x12x14	2.4	Nyamedua	1x12x14	12.0
Juaso	Ofram	1x12x14	3.0	Ofram	1x12x14	7.5
Juaso	Wawa	1x12x14	3.0	Wawa	1x12x14	5.5

Kade	Emire	1x12x14	4.0	Emire	1x12x14	5.0
Kade	Wawa	1x12x14	2.3	Wawa	1x12x14	4.2
Nkawie	Wawa	1x12x14	2.5	Wawa	1x12x14	15.0
Oda	Asanfina	1x12x14	8.0	Asanfina	1x12x14	15.0
Oda	Danta	1x12x14	5.0	Danta	1x12x14	8.0
Oda	Ednam	1x12x14	5.5	Ednam	1x12x14	11.0
Oda	Emire	1x12x14	3.5	Emire	1x12x14	7.5
Oda	Nyamedua	1x12x14	2.3	Nyamedua	1x12x14	5.0
Oda	Ofram	1x12x14	3.5	Ofram	1x12x14	5.0
Oda	Wawa	1x12x14	2.8	Wawa	1x12x14	5.6
Sunyani	Chenchen	1x12x14	4.0	Chenchen	1x12x14	7.5
Sunyani	Mahogany	1x12x14	4.0	Mahogany	1x12x14	6.0
Sunyani	Nyamedua	1x12x14	2.8	Nyamedua	1x12x14	6.0
Sunyani	Onyina	1x12x14	3.0	Onyina	1x12x14	6.0
Sunyani	Wawa	1x12x14	3.5	Wawa	1x12x14	7.0
Goaso	Mahogany	1x12x16	1.5	Mahogany	1x12x16	3.0
Goaso	Ofram	1x12x16	4.1	Ofram	1x12x16	7.1
Goaso	Wawa	1x12x16	3.0	Wawa	1x12x16	6.0
Oda	Wawa	1x12x16	3.5	Wawa	1x12x16	7.0
Sunyani	Wawa	1x12x16	0.8	Wawa	1x12x16	5.7
Sunyani	Wawa	1x12x18	6.0	Wawa	1x12x18	10.0
Begoro	Ednam	1x9x14	2.3	Ednam	1x9x14	3.0
Nkawie	Twepapa	1x9x14	10.0	Twepapa	1x9x14	18.0

Forest			Unit Price			Unit price
District	Species	Dimension	(GH¢)	Species	Dimension	(GH¢)
Assin Fosu	Wawa	2x12x14	2.8	Wawa	2x12x14	12.0
Goaso	Ofram	2x14x16	2.0	Ofram	2x14x16	4.0
Goaso	Ofram	2x2x14	1.0	Ofram	2x2x14	1.5
Goaso	Ofram	2x3x14	1.0	Ofram	2x3x14	1.5
Nkawie	Ofram	2x3x14	1.4	Ofram	2x3x14	2.8
Begoro	Odum	2x4x14	1.5	Odum	2x4x14	4.8
Goaso	Ofram	2x4x14	1.2	Ofram	2x4x14	2.4
Juaso	Ofram	2x4x14	1.5	Ofram	2x4x14	2.0
Juaso	Wawa	2x4x14	1.5	Wawa	2x4x14	2.5
Nkawie	Emire	2x4x14	1.4	Emire	2x4x14	2.8
Sunyani	Odum/Iroko	2x4x14	2.0	Odum/Iroko	2x4x14	3.5
Sunyani	Ofram	2x4x14	1.5	Ofram	2x4x14	3.0
Assin Fosu	Dahoma	2x6x14	3.7	Dahoma	2x6x14	6.3
Assin Fosu	Danta	2x6x14	3.0	Danta	2x6x14	5.0
Assin Fosu	Emire	2x6x14	4.0	Emire	2x6x14	8.0
Assin Fosu	Esa	2x6x14	1.2	Esa	2x6x14	7.0
Assin Fosu	Odum	2x6x14	5.0	Odum	2x6x14	10.0
Assin Fosu	Otwese	2x6x14	1.2	Otwese	2x6x14	5.0
Begoro	Dahoma	2x6x14	3.0	Dahoma	2x6x14	4.0
Begoro	Emire	2x6x14	3.2	Emire	2x6x14	4.2
Begoro	Odum	2x6x14	6.0	Odum	2x6x14	8.0
Begoro	Ofram	2x6x14	3.0	Ofram	2x6x14	4.0
Begoro	Sapale	2x6x14	6.0	Sapale	2x6x14	9.0
Begoro	Watapuo	2x6x14	2.5	Watapuo	2x6x14	3.5
Goaso	Dahoma	2x6x14	1.6	Dahoma	2x6x14	4.5
Goaso	Esa	2x6x14	2.3	Esa	2x6x14	4.5

Goaso	Ofram	2x6x14	3.3	Ofram	2x6x14	5.3
Juaso	Esa	2x6x14	2.4	Esa	2x6x14	12.0
Juaso	Okro	2x6x14	2.5	Okro	2x6x14	13.5
Juaso	Wawabima	2x6x14	2.5	Wawabima	2x6x14	13.0
Kade	Asanfina	2x6x14	3.8	Asanfina	2x6x14	5.0
Kade	Dahoma	2x6x14	2.2	Dahoma	2x6x14	4.7
Kade	Emire	2x6x14	1.8	Emire	2x6x14	4.2
Kade	Esa	2x6x14	2.7	Esa	2x6x14	5.0
Kade	Odum	2x6x14	2.3	Odum	2x6x14	4.8
Oda	Ceda	2x6x14	5.0	Ceda	2x6x14	9.0
Oda	Chenchen	2x6x14	2.8	Chenchen	2x6x14	4.0
Oda	Dahoma	2x6x14	3.3	Dahoma	2x6x14	5.2
Oda	Danta	2x6x14	5.0	Danta	2x6x14	9.0
Oda	Emire	2x6x14	2.8	Emire	2x6x14	5.0
Oda	Esa	2x6x14	3.9	Esa	2x6x14	5.9
Oda	Nyamedua	2x6x14	2.4	Nyamedua	2x6x14	3.5
Oda	Odum	2x6x14	3.7	Odum	2x6x14	6.3
Oda	Ofram	2x6x14	3.2	Ofram	2x6x14	5.1
Oda	Okuo	2x6x14	4.5	Okuo	2x6x14	8.0
Oda	Wawa	2x6x14	2.5	Wawa	2x6x14	6.0
Sunyani	Dahoma	2x6x14	5.0	Dahoma	2x6x14	8.0
Sunyani	Mahogany	2x6x14	5.0	Mahogany	2x6x14	8.0
Sunyani	Odum/Iroko	2x6x14	4.8	Odum/Iroko	2x6x14	6.3
Sunyani	Ofram	2x6x14	2.0	Ofram	2x6x14	4.0
Goaso	Mahogany	2x6x16	3.0	Mahogany	2x6x16	7.0
Nkawie	Dahoma	2x6x16	2.0	Dahoma	2x6x16	7.0

Forest			Unit Price			Unit price
District	Species	Dimension	(GH¢)	Species	Dimension	(GH¢)
Oda	Dahoma	2x6x16	2.2	Dahoma	2x6x16	4.0
Oda	Emire	2x6x16	1.8	Emire	2x6x16	3.5
Oda	Ofram	2x6x16	1.8	Ofram	2x6x16	3.5
Sunyani	Ofram	2x7x17	3.8	Ofram	2x7x17	6.8
Sunyani	Otie	2x7x17	2.7	Otie	2x7x17	6.0
Kade	Otwese	2x8x14	1.8	Otwese	2x8x14	4.0
Nkawie	Wawa	3x12x17	5.5	Wawa	3x12x17	12.5
Juaso	Ednam	3x3x14	2.5	Ednam	3x3x14	3.0
Assin Fosu	Danta	4x12x14	7.0	Danta	4x12x14	12.0
Assin Fosu	Ofram	4x12x14	4.0	Ofram	4x12x14	9.0
Begoro	Odum	4x12x14	6.0	Odum	4x12x14	7.0
Juaso	Aprokuma	4x12x14	5.0	Aprokuma	4x12x14	18.0
Juaso	Mahogany	4x12x14	5.0	Mahogany	4x12x14	20.0
Juaso	Oprono	4x12x14	5.0	Oprono	4x12x14	20.0
Nkawie	Dahoma	4x12x14	5.0	Dahoma	4x12x14	15.0
Oda	Chenchen	4x12x14	2.8	Chenchen	4x12x14	4.0
Oda	Emire	4x12x14	8.0	Emire	4x12x14	15.0
Oda	Esa	4x12x14	3.5	Esa	4x12x14	5.0
Oda	Nyamedua	4x12x14	3.2	Nyamedua	4x12x14	5.5
Oda	Ofram	4x12x14	4.5	Ofram	4x12x14	7.0
Oda	Wawa	4x12x14	3.5	Wawa	4x12x14	6.0
Sunyani	Wawa	4x12x14	4.5	Wawa	4x12x14	9.9
Begoro	Akasa	4x12x16	6.0	Akasa	4x12x16	9.0

Begoro	Asanfina	4x12x16	5.0	Asanfina	4x12x16	9.0
Nkawie	Wawa	4x12x16	5.0	Wawa	4x12x16	7.0
Begoro	Sapale	4x12x8	5.0	Sapale	4x12x8	10.0
Oda	Asanfina	4x12x8	14.8	Asanfina	4x12x8	19.0
Oda	Ceda	4x12x8	12.0	Ceda	4x12x8	15.0
Oda	Danta	4x12x8	15.0	Danta	4x12x8	18.0
Oda	Mahogany	4x12x8	15.0	Mahogany	4x12x8	18.0
Oda	Odum	4x12x8	15.0	Odum	4x12x8	18.0
Oda	Sapale	4x12x8	15.0	Sapale	4x12x8	18.0
Begoro	Dahoma	4x6x14	6.0	Dahoma	4x6x14	9.0
Nkawie	Dahoma	4x6x14	3.9	Dahoma	4x6x14	8.8
Goaso	Ofram	5x13x16	7.0	Ofram	5x13x16	12.0
Goaso	Dahoma	5x7x14	7.0	Dahoma	5x7x14	14.0
Goaso	Kusia	5x7x14	7.0	Kusia	5x7x14	14.0
Begoro	Dahoma	6x12x14	4.0	Dahoma	6x12x14	6.0
Oda	Dahoma	6x12x14	8.0	Dahoma	6x12x14	15.0
Juaso	Dahoma	6x4x14	5.0	Dahoma	6x4x14	12.0
Juaso	Esa	6x4x14	4.5	Esa	6x4x14	10.0

Annex 7.1: Sample questionnaire for Chainsaw millers/operators

(3) Juaso

District: (1) Nkawie (2) Goaso

Co	mmunity:
So	cio-demographics
1.	Number of dependants:
	tent of timber resources and their availability to chainsaw operators now and in the near ure:
2.	Do you think that the availability of timber resources has changed since you entered into this enterprise? (one response only) (a) Timber resources are less available today (b) Timber resources are more available today (c) No change in availability (d) Not sure
3.	If timber resources are less available today, what are the reasons for this? (response may be more than one reason). (a) Uncontrolled harvesting by Chain sawyers (b) Over-harvesting of forest resources by timber companies (c) Destructive harvesting practices (d) Forest fires (e) Clearance of forest areas for agriculture (f) Increase in population (g) Other
4.	Which of these areas is the most important source of timber for chainsaw operators? (One response only) (a) Forest Reserves (b) fallow areas (c) farms (d) water courses (e) Other (specify)
1h	Why?

.....

5.	How difficult is it for you to access timber resources from these areas? (a) Very difficult (b) Difficult (c) Not difficult (d) Very easy
6.	Do you agree that timber resources are difficult to come by or have become scarce? (a) Strongly agree (b) Agree (c) Don't agree (d) Cannot tell/Not sure
7.	What proportion of trees milled over a year come from the following sources? (a) Plantation (b) forest reserves (c) farm-lands (d) other areas (e.g. fallows)
	tent to which the current system of tree tenure influence accessibility to timber by chainsaw erators:
8.	Who do you contact to get access to trees for your milling operations? (one response only) (a) Farmers (b) chiefs (c) Assemblyman (d) other operators (e) Forestry staff (f) No person/ No one (g) Forest guards (h) other
9.	Why do you contact this person?
10	Have you ever been arrested by the FSD for harvesting timber? (a) Yes (b) No
11.	Do you think you have the right to harvest timber trees from your own land or farm? (a) Yes (b) No
12.	Why?
	Do you know that you need a permit from government to fell any tree no matter where it occurs? Yes (b) No
(a) (b) (c) (d) (e)	a. If yes, why do you operate without a license? (one response only) because I still need trees for my business (employment) because it was sold to me because I was requested to do it No money for TUC/permit Difficult to get permit Other
14	b. If no, how would you respond now that you know?(a) stop chainsaw operation(b) continue(c) not sure
15	If you would continue, why?
	Which of the following rights will encourage you to stop chainsaw operations if conferred on you local communities? (select one only)
	(a) Access: the right to use (but not harvest) forest resources.(b) Withdrawal: the right to both access forest resources and withdraw resource units (harvest).(c) Management: the right to manage the use, maintenance, and monitoring of forest resources.(d) Exclusion: the right to determine the rules governing who can and cannot use forest resources.
	(e) Alienation: the right to sell timber trees.(f) All the above rights.

- (g) Not sure
- 17. Would you like to see a change in the way timber trees and forests are owned/ managed in Ghana? (a)Yes (b) No.

18a. If Yes, how?

18b. Give reasons:

- 19. Are you willing to pay to harvest timber if chainsaw lumbering is regularised or legalized? (a) Yes (b) No (c) not sure/undecided
- 20. If yes, what form should the payment take? (please select only one)
 - (a) All payments that licensed loggers pay
 - (b) Only Tax on income accrued from chainsaw lumbering (income tax).
 - (c) Only Tax on each timber tree harvested (product tax).
 - (d) Monthly or Annual fee for the number of trees allocated
 - (e) Others (specify).....
- 21. How much are you willing to pay for
 - (a) high quality trees like Odum...., not sure ()
 - (b) medium quality trees like Wawa and Dahoma..... not sure ()
 - (c) low quality trees like Ceiba not sure ()
- 22. If chainsaw lumbering is to be regularised/ legalized, what form should the timber harvest right/licence/permit take? (select one only)
 - (a) Chainsaw operators should be attached to an existing TUC holder.
 - (b) Small concessions for individual operators.
 - (c) Concessions for registered groups of operators.
 - (d) Individual permits to harvest individual trees (permit per tree harvest).
 - (e) Others (specify).....

Strategies chainsaw operators use to access timber and how they get accepted in the communities in which they operate

- 23. How do chainsaw operators get accepted in the communities that they operate? (response may be more than one).
 - (a) Some community members are involved in chainsaw lumbering
 - (b) Prompt payment of benefits to landowners and forest fringe communities.
 - (c) Provide cheap source of wood for local communities.
 - (d) Because of current system of timber tree tenure in the communities.
 - (e) Connive with law enforcement agencies.
 - (f) Connive with chiefs.
 - (g) Observe customs in the local communities (e.g. pay "drink money" to chiefs)
 - (h) Chainsaw operators help community development
 - (i) Others
- 24. What strategies do they use to spot timber trees in your areas of operation? (Response may be more than one).
 - (a) Operator personally scout for trees
 - (b) Use community members
 - (c) On invitation by community members
 - (d) Others (specify).....
- 25. How often do you use members of a community when operating in an area?
 - a) sometimes
 - b) almost always
 - c) not at all

- 26. What specific roles do community members normally play in your operations? (response may be more than one) (a) assisting bush milling (b) carrying boards from the bush (c) loading boards to vehicles (d) transporting boards to towns (e) others (specify)..... Factors that influence the selection of site of operations by chainsaw operators 27. What factors influence the choice of site of operations by chainsaw operators? (response may be more than one) (a) Accessibility to site in terms of terrain(ease of access to site) (b) Type of tree species available at site (c) Nearness of site to the road (d) Size of trees available at site of operation (diameter) (e) Number of trees available for harvesting (f) Cost involved in accessing the site (g) Sites where there will be less crop damage (h) Ouality of stem (bole length or form) (i) Trees located on farmland (i) Trees located off-reserve (k) Others (specify) 27a. Which of these factors is always considered as a first priority in your decision? 28. How far from main roads do you concentrate your operations? (a) 5km or less, (b) 6-10km, (c) 11 – 15km (d) 16 – 20km (e) 21 – 25km (f) other 29. What do you think limit your accessibility to timber trees for your operation? (response may be more than one) a. Competition from the conventional sawmill activities increased enforcement of the ban on chainsawn operations c. Restrictive forest and tree tenure arrangement. d. Depletion of timber resources e. Increased number of operators involved in chainsaw lumbering f. Long distances due to scarcity g. Others (specify)..... Extent to which the activities of chainsaw operators impact on the interest of other land uses/resources 30 How are the activities of chainsaw operators impacting farming activities? (response may be more than one) (a) Damage to crops on farm. (b) Encourage farming activities by opening up the forest. (c) Remove shade trees from farms thereby improving crop yield. (d) Give farmers money which could be invested in their farm business. (e) Chainsaw operators harvest farmers' crops while engaging in milling.
- 31. Have you ever damaged crops in the process of harvesting timber? (a) Yes (b) No

(f) Others (specify).....

- 32 .If yes, did you pay compensation to the farmer for crop damage? (a) Yes (b) No
- 33. Did you consult the farmer before harvesting? (a) Yes (b) No

- 34. How often do you damage farm crops through timber harvesting activities? (a) Very often (b) Often (c) Occasionally (d) Seldom (e) Other (specify)......
- 35. What category of people normally invite you to cut trees for them? (response may be more than one)
 - (a) Farmers
 - (b) Charcoal burners
 - (c) Chiefs
 - (d) Timber dealers
 - (e) Building contractors
 - (f) Individual builders
 - (g) Carpenters
 - (h) Others

Constraints to Chainsaw lumbering/milling

- 36. What are the constraints facing chainsaw operations or chainsaw lumbering? (response may be more than one)
 - (a) Enforcement of the law on ban of Chainsaw lumbering
 - (b) Weather conditions
 - (c) Declining stock of preferred species in the forests.
 - (d) Arrest by the FSD
 - (e) Confiscation of lumber by the FSD
 - (f) Marketing of lumber
 - (g) Payment of bribes in order to access timber (to Assemblymen, FSD Officials, etc)
 - (h) Reporting of chainsaw activities by members of communities.
 - (i) Others (specify).....

Annex 8.1: Physical description of the species used for the study

Sno.	Timber species	No. of tree	Discription
		felled	
1	Freehand with stihl	8	
A	Dahoma	2	
В	Danta	2	
С	Emire N	2	
D	Emire P	1	
Е	Teak	1	
2	Freehand with Husqvarna	9	
	395X		
Α	Dahoma	2	
В	Danta	2	
С	Emire N	2	
D	Emire P	1	
Е	Teak	2	
3	Husqvarna 395X with	5	
	attachment		
A	Dahoma	2	
В	Danta	1	
С	Emire N	1	
D	Teak	1	
4	Logosol attachment with	9	
	Stihl MS 880		
A	Dahoma	3	
В	Danta	2	
С	Emire N	1	
E	Teak	3	

Annex 10.1: List of timber species harvested/supplied to the domestic market

No.	Local name	Scientific name
1	Abako/Baku	Tieghemella heckelii
2	Akasa	Chrysophyllum subnudum
3	Aprokuma	Antrocaryon micraster
4	Asanfina	Aningeria altissima
5	Ceda	
6	Chenchen	Antiaris africana
7	Dahoma	Piptadeniastrum africanum
8	Danta	Nesigordina papaverifera
9	Ednam	Entandophragma angolenses
10	Emire	Teminalia ivorensis
11	Esa	Celtis mildbraedii
12	Kusia	Nauclea diderrichii
13	Mahogany	Khaya spp.
14	Nyamedua	Alstonia boonei
15	Odum	Milicia excelsa
16	Ofram	Terminalia superba
17	Okoro	Albizia zygia
18	Okuo	Zanthoxyllum gilletii
19	Onyina	Ceiba pentandra
20	Oprono	Mansonia altissima
21	Otie	Pycnanthus angolensis
22	Otwese	
23	Sapale	Entandophragma cylindricum
24	Twepapa	-
25	Watapuo	Cola gigantea
26	Wawa	Triplochiton scleroxylon
27	Wawabima	Sterculia rhinopetala

Annex 9.1: Processing and marketing information on chainsaw and M7 logosol machine lumber production ${\bf m}$

Table 8: Gross revenue distribution in Juaso forest for the most recent chainsaw operation in 2008

undertaken by 6 chainsaw operators in this district

individual		no of standing	no of	unit	1	total	overall
operator	species	trees	lumber	price	dimension	amount	total
1	wawabima	2	100	5	5x8x14	500	
	Aprokuma	1	60	5	5x8x14	300	
	emire	1	65	5	5x8x14	325	
	ofram	1	60	5	5x8x14	300	1425
2	Aprokuma	3	14	5.5	4X12X14	77	
	Akasa	2	180	5.5	4X12X14	990	
	esa	1	40	4.5	4X12X14	180	
	Oyonfour	1	60	5	4X12X14	300	
	Okro	1	68	4.5	4x6x14	306	1853
3	Okro	11	111	3.5	2x6x14	388.5	
	wawabima	4	60	13	2x6x14	780	
	Esa	7	70	12	2x6x14	840	
	Nyamedua	6	96	12	1x12x14	1152	3160.5
4	Aprokuma	5	20	5	4X12X14	100	

	Oprono	4	40	5	4X12X14	200	
	Mahogany	3	60	5	4X12X14	300	
	esa	5	60	4.5	4X12X14	270	
	Dahoma	8	100	5	6x12x14	500	1370
5	Ofram	1	100	3	1x12x14	300	
	Wawa	1	175	3	1x12x14	525	
	Emire	1	150	3	1x12x14	450	1275
6	Wawa	2	300	5	1x12x14	1500	
	Okro	2	150	5	4x12x8	750	2250
7	Esa	5	100	5	4x6x14	500	
	Kyere	3	60	5	2x12x8	300	800
8	Wawabima	2	84	5	4x6x14	600	600

Annex 9.2: Gross revenue distribution in Begoro forest for the most recent chainsaw operation in 2008 undertaken by 19 chainsaw operators in this district

Gross revenue distribution in Begoro forest for the most recent chainsaw operation in 2008 undertaken by 19

chainsaw operators in this district

		no	of						
individual		standing			of			total	overall
operator	species	trees		lumber		unit price	dimension	amount	total
1	Mahoganny	1		40		3	2x6x14	120	
	wawa	1		100		3	1x12x14	300	
	ofram	1		80		4	1x12x14	320	740
2	Mahoganny	1		100		5	1x12x14	500	500
3	ofram	2		150		3	1x12x14	450	
	Nyamedua	1		60		3	1x12x14	180	
	Emire	2		45		3	2x6x14	135	765
4	ofram	2		200		4	2x6x14	800	
	Emire	1		100		4.5	2x6x14	450	
	awiemfoasmina	1		150		4.5	2x6x14	675	1925
5	wawa	4		70		4	1x12x14	280	
	ofram	2		85		5	1x12x14	425	
	Mahoganny	3		40		5	2x6x14	200	905
6	wawa	1		85		3	4x12x14	255	255
7	Dahoma	1		45		2.5	2x6x14	113	113*
8	Onyina	2		220		2.1	1x12x14	462	
	Emire	2		140		3	2x6x14	420	
	Chenchen	3		90		3	1x12x14	270	
	ofram	3		120		3	4x12x14	360	
	abeko	4		440		6	1x12x14	2640	4152
9	wawa	1		43		3	1x12x14	129	
	Emire	1		70		3	2x6x14	210	
	Mahoganny	1		43		6	1x12x14	258	597*
10	Mahoganny	1		110		5	4x6x14	550	550*
11	Otie	1		50		4	1x12x14	200	200
12	Emire	1		40		2	2x6x14	80	
	Ednam	1		35		2	1x12x14	70	150
13	Dahoma	1		240		4	6x12x14	960	
	Emire	4		180		3.5	2x6x14	630	
	wawa	10		320		3	1x12x14	960	
	Mahoganny	7		230		6	1x12x14	1380	
	Chenchen	2		250		2.5	1x12x14	625	4555
14	Mahoganny	1		100		6	4x12x14	600	-
· ·		-				-			

	wawa	1	100	4.4	1x12x14	440	
	Otie	1	130	3.8	2x6x14	494	
	Emire	1	90	4.5	1x12x14	405	1939
15	Dahoma	1	80	0.6	2x6x14	48	48
16	Odum/Iroko	6	150	6	4x12x14	900	
	wawa	10	145	1	4x12x14	145	
	Mahoganny	12	180	6	4x12x14	1080	
	Emire	4	45	6	4x12x14	270	
	Asanfina	10	200	6	4x12x14	1200	3595
17	wawa	1	30	5	1x12x14	150	
	Sapale/Penkwa	1	15	6	1x12x14	90	240
18	Waterpool	5	120	2.5	2x6x14	300	
	Onyina	1	200	1.5	1x12x14	300	
	Emire	2	80	2.5	2x6x14	200	800*

Annex 9.3 Gross revenue distributions in Kade forest district for the most recent chainsaw operation in 2008 undertaken by 20 chainsaw operators in this district

Gross revenue distribution in Kade forest district for the most recent chainsaw operation in 2008 undertaken by

20 chainsaw operators in this district

individual		no of standing	no of	unit		total	overall
operator	species	trees	lumber	price	dimension	amount	total
1	Odeye	1	4	1.5	2x6x12	60	60*
2	Ofram	1	128	1.5	4x12x14	192	192*
3	Wawa	5	150	3.5	5x11.5x14	525	
	Ofram	2	80	3.5	1.5x12x14	280	
	Mahogany	3	120	3.7	3x11.5x14	444	1249
4	Nyamedua	3	150	1.5	1x12x14	225	
	Ednam	1	40	1.5	2x6x14	60	
	Waterpool	2	113	1.5	2x6x14	170	455
5	Otwese	1	200	1.8	2x6x14	360	
	Nyamedua	1	60	1.5	1x12x14	90	
	Onyinakoben	3	400	1.5	2x6x14	600	
	Wawa	1	65	1.6	1x12x14	104	
	Okuo	1	400	1.6	1x12x14	640	1794
6	Akasa	2	400	8	2x6x14	3200	
	Oprono	3	300	10	2x6x14	3000	
	Wawa	2	400	3.5	1x12x14	1400	7600
7	Wabeli	1	40	1.5	1x12x14	67.5	
	Odum	1	45	1.8	4x12x14	81	148.5
8	Denya	1	488	1.5	2x6x14	732	732
9	kyere/koto	1	128	1.7	1x12x14	217.6	
	emire	1	70	1.8	2x6x14	126	
	Dahoma	1	170	2.5	2x6x14	425	768.6
10	Dahoma	1	100	4.8	2x6x14	480	
	Ednam	1	70	4	2x6x14	280	
	Wawa	1	50	4	1x12x14	200	
	Ofram	1	120	4	2x12x14	480	
	Danta	1	70	4	2x12x14	280	1720
11	wawa	5	460	1.5	1x12x14	690	
	Ofram	2	200	1.5	4x12x14	300	990
12	Odum/roko	1	55	1.8	4x12x14	99	
	dua dokrono	1	47	1.5	1x12x14	70.5	

	Ofotoma	1	29	1.5	4x12x14	43.5	213
13	Ofram	1	150	2	2x6x14	300	
	Wawa	1	220	3	1x12x14	660	
	Nyamedua	1	300	3	1x12x14	900	
	odum/iroko	1	150	5	2x12x14	750	2610
14	emire	2	70	5	4x12x14	175	175
15	Waterpool	2	350	3.7	2x6x14	1295	
	Otie	3	600	3.7	2x8x14	2220	
	Nyamedua	2	300	3.7	1x12x14	1110	4625
16	Nyamedua	1	150	3.7	1x12x14	355	
	Dua dokrono		90	3.7	1x12x14	333	
	Esa		150	4	2x6x14	600	
	Dahoma		300	6	2x6x14	1800	3088
17	Wawa	4	200	3.5	1x12x14	700	
	Dahoma	1	80	4.2	2x6x14	335	
	Odoum	3	30	3	2x6x14	90	
	Otie	6	300	3.2	1x8x14	960	2085
18	Denya	1	524	1.8	2x6x14	943	943
19	Esa	1	300	1.8	2x6x14	540	_
	Emire	2	100	1.8	2x6x14	180	
	Ofram	2	120	1.8	2x6x14	216	
	Wawa	3	250	1.8	1x12x14	450	
	Dahoma	3	300	2	2x6x14	600	1986
20	Nyame dua	4	100	1.6	1x12x14	160	
	Danta	2	80	2	2x6x14	160	
	Wawa	3	90	2	1x12x14	180	500

Annex 9.4 Gross revenue analyses Sunyani for the most recent chainsaw operation in 2008

Gross revenue analysis Sunyani for the most recent chainsaw operation in 2008

Individual	Species	number of standing trees	Number of pieces	Price per pieces	Dimension	Total amount	Overall
1	Onyina	2	310	3	2x12x14	930	
	Ofotoma	3	50	4	2x6x14	200	1130
2	Onyina	1	220	2.4	1.5x12x14	528	528
3	emire	5	90	4	1x9x14	360	
	Ofram	6	350	4	1x9x14	1400	
	Wawa	7	80	5	1x12x14	400	
	mahogany	4	97	9	3x7x14	873	3033
4	Mahogany	1	200	5	2x6x14	1000	1000
5	Nyame dua	5	220	3	1x12x16	660	
	Onyina	2	210	2.7	1x12x16	567	1227
6	Waterpool	3	160	3.5	2x6x16	560	
	Akonkoma	2	50	2.5	1x12x16	125	685
7	Chenchen	4	105	2.8	1x12x16	294	
	Waterpool	17	57	2.7	2x6x16	153.9	
	Nyame dua	2	40	2.8	1x12x16	112	
	Wawa	5	60	3	1x12x16	180	739.9
8	Onyina	1	200	2.3	1x12x16	460	560
9	Wabeli	6	160	3	2x6x16	480	

	Onyina	2	40	2.4		96	576
10	Ceda	1	200	2.8	1x12x16	560	560
11	Ofram	3	210	2.5		525	
	Chenchen	1					525
12	Wawa	12	420	5.2	1.5x12x14	2184	2184

Annex 9.5 Gross revenue analyses in Nkawie for most recent operation in 2008

Gross revenue analysis in Nkawie for most recent operation in 2008

Individual	Species	Number of trees standing	Number of pieces	Prices per piece	Dimension	Total amount	Overall
1	Dahoma	20	500	7	4x12x14	3500	
	Wawa	10	600	4.5	3x12x17	2700	
	Otwese	1	200	4	3x6x17	800	
	Ceda	2	500	4	3x6x17	2000	9000
2	Denya	1	120	8	4x6x14	960	960
3	Dahoma	1	120	5	4x6x14	600	600
4	Wawa	5	600	6	4x12x14	3600	3600
5	odum						
	sapele/penkv	va					
	abeko						
	mahogany						
	Wawa						
6	Mahogany	4	200	4.5	3x6x17	900	
	Ofram	1	45	4.5	4x12x14	202.5	1102.5
7	Wawa		170	7	3x12x17	1190	
	Sapele		230	6	3x6x14	1380	2570
8	Dahoma	1	230	7	4x6x14	1610	1610
9	Wawa	3	230	7	3x12x17	1610	1610
10	Wawa	1	250	9	3x12x17	2250	
	Mahogany	1	150	9	4x12x8	1350	3600
11	Wawa	1	108	5.5	4x12x8	594	594
12	Dahoma	1	110	5.5	4x6x14	605	605

Annex 9.6 Oda Revenue analyses for the most recent chainsaw operation in 2008

Oda Revenue analysis for the most recent chainsaw operation in 2008

			Number	Prices			
		Number of trees	of	per		Total	
Individual	Species	standing	pieces	piece	Dimension	amount	Overall
1	Wawa	5	300	2	1x12x14	600	
	Nyamedua	8	150	1.8	1x12x14	270	
	Chenchen	9	220	2	1x12x14	440	1310
2	Emire	1	99	1	2x6x14	99	
	Wawa	1	20	0.8	1x12x14	16	
	Dahoma	1	100	1.5	2x6x14	150	
	Ofram	1	150	1.5	1x12x14	225	490
3	Dahoma	3	60	4	1x12x14	240	

	Odum	2	40	8	1x12x14	320	
	Konkoma	1	20	1.5	1x12x14	30	590
4	Nyamedua	2	150	2.5	1x12x14	375	
	Esa	2	100	3.5	2x6x14	350	
	Wawa	2	300	3.5	1x12x14	1050	1775
5	Webeli	3	300	3.5	1x12x14	1050	
	Ofotoma	5	112	2.7	2x6x14	302.4	
	Wawa	3	68	3	1x12x14	204	1556.4

Annex 9.7 Goaso revenue analyses for the most recent chainsaw operation in 2008

Goaso revenue analysis for the most recent chainsaw operation in 2008

		Number					
		of trees	Number	Prices		Total	
Individual	Species	standing	of pieces	per piece	Dimension	amount	Overall
1	Ofram	4	50	1	2x4x14	50	
	Wawa	4	50	1.5	1x12x14	75	
	Mahogany	6	50	1.4	2x4x14	70	195
2	Ofram	4	70	6.5	5x13x14	455	
	Wawa	2	25	6	5x13x14	150	
	Mahogany	1	18	7	5x13x14	126	731
3	Ofram	3	40	6	5x13x16	240	
	Mahogany	4	40	6	5x13x16	240	
	Sepale	2	20	6	5x13x16	120	600
4	Ofram	4	100				
	Mahogany	3	70	9	1x12x14	630	
	Wawa	4	90	5	1x12x14	450	
	Awiemfoasmina	2	60	7	2x6x14	420	
	Dahoma	1	70	7	2x6x14	490	
	Danta	6	150	7	2x6x14	1050	3040
5	Ofram	5	100	6	5x13x16	600	
	Mahogany	3	50	6.5	5x13x16	325	
	Wawa	3	80	6	5x13x16	480	
	Dahoma	1	80	5	5x7x14	400	1805
6	Ofram	3	25	7	5x13x16	175	
	Wawa	7	20	7	5x13x16	140	
	Kyere	6	70	5	5x12x8	350	
	Wawabima	4	20	7	7x7x16	140	
	Ednam	2	60	3	1.5x12x14	180	985
7							
8	Ofram	3	480	6.5	1x12x14	3120	
	Dahoma	2	250	6	2x6x14	1500	
	Esia	2	290	6	2x6x14	1740	6360
9	Ofram	10	650	7	1x12x14	4550	4550
10	Wawa	1	150	4.5	1x12x16	675	
	Ofram	2	210	5.2	1x12x16	1092	1767

Annex 9.8 Gross revenue analyses in Assin Fosu for the most recent operation in 2008

Gross revenue analysis in Assin Fosu for the most recent operation in 2008

	•		<u> </u>	
		Number	Prices	
		of trees Number	per Tota	al
Individual	Species	standing of pieces	piece Dimension amo	ount Overall

Ceda	6	350	4	1.5x12x14	1400	
Ofram	8	520	3.5	1.5x12x14	1820	
Esa	4	225	3	2x6x14	675	
Kwabohoro	3	98	4	1.5x12x14	392	
Wawa	7	182	3.5	1.5x12x14	637	4924
Nyamedua	3	33	1.75	2x12x14	57.75	
Wawa	2	16	3.5	5x12x14	56	
Chenchen	2	30	3.5	5x12x14	105	218.75
Nyamedua		280	3.7	1x12x14	1036	
Wawa		340	4	1x12x14	1360	
Dahoma		600	5.5	2x6x14	3300	
Emire		112	4	2x6x14	448	6144
Wawa		50	4	1x12x14	200	_
Odum		40	5	2x6x14	200	
Dahoma		80	4	2x6x14	320	
Emire		60	4	2x6x14	240	960
Danta	1	100	5	4x12x14	500	500
Dahoma	2	100	4	2x6x14	400	
Konkoma	1	30	4	2x6x14	120	
Esa	1	28	4	2x6x14	112	632
	Ofram Esa Kwabohoro Wawa Nyamedua Wawa Chenchen Nyamedua Wawa Dahoma Emire Wawa Odum Dahoma Emire Danta Dahoma Konkoma	Ofram 8 Esa 4 Kwabohoro 3 Wawa 7 Nyamedua 3 Wawa 2 Chenchen 2 Nyamedua Wawa Dahoma Emire Wawa Odum Dahoma Emire Danta 1 Dahoma 2 Konkoma 1	Ofram 8 520 Esa 4 225 Kwabohoro 3 98 Wawa 7 182 Nyamedua 3 33 Wawa 2 16 Chenchen 2 30 Nyamedua 280 Wawa 340 Dahoma 600 Emire 112 Wawa 50 Odum 40 Dahoma 80 Emire 60 Danta 1 100 Dahoma 2 100 Konkoma 1 30	Ofram 8 520 3.5 Esa 4 225 3 Kwabohoro 3 98 4 Wawa 7 182 3.5 Nyamedua 3 33 1.75 Wawa 2 16 3.5 Chenchen 2 30 3.5 Nyamedua 280 3.7 Wawa 340 4 Dahoma 600 5.5 Emire 112 4 Wawa 50 4 Odum 40 5 Dahoma 80 4 Emire 60 4 Danta 1 100 5 Dahoma 2 100 4 Konkoma 1 30 4	Ofram 8 520 3.5 1.5x12x14 Esa 4 225 3 2x6x14 Kwabohoro 3 98 4 1.5x12x14 Wawa 7 182 3.5 1.5x12x14 Nyamedua 3 33 1.75 2x12x14 Wawa 2 16 3.5 5x12x14 Chenchen 2 30 3.5 5x12x14 Nyamedua 280 3.7 1x12x14 Wawa 340 4 1x12x14 Dahoma 600 5.5 2x6x14 Emire 112 4 2x6x14 Wawa 50 4 1x12x14 Odum 40 5 2x6x14 Dahoma 80 4 2x6x14 Emire 60 4 2x6x14 Danta 1 100 5 4x12x14 Dahoma 2 100 4 2x6x14 Konkoma	Ofram 8 520 3.5 1.5x12x14 1820 Esa 4 225 3 2x6x14 675 Kwabohoro 3 98 4 1.5x12x14 392 Wawa 7 182 3.5 1.5x12x14 637 Nyamedua 3 33 1.75 2x12x14 57.75 Wawa 2 16 3.5 5x12x14 56 Chenchen 2 30 3.5 5x12x14 105 Nyamedua 280 3.7 1x12x14 1036 Wawa 340 4 1x12x14 1360 Dahoma 600 5.5 2x6x14 3300 Emire 112 4 2x6x14 448 Wawa 50 4 1x12x14 200 Odum 40 5 2x6x14 200 Dahoma 80 4 2x6x14 240 Dahoma 2 100 4

Annex 9.9 Using M7 logosol machine to process lumber in Ankaasie community in Asangragwa in the Western Region between August and November 2008

Using M7 logosol machine to process lumber in Ankaasie community in Asangragwa in the Western Region between August and November 2008

species	dimension	quantity	Unit price	Total revenue
Sapele	1x12x16	100	5.5	550
•	1x12x14	56	5	280
•	1x9x16	25	3	75
•	2x6x14	66	3	198
•	1x12x14	40	3	120
•	2x6x16	7	5.5	38.5
1	1x12x10	31	3	93
•	2x6x10	9	3	27
•	1x12x10	10	3	30
,,	1x12x10	18	3	54
,,	1x12x10	5	3	15
,,	1x12x16	55	5.5	302.5
,,	2x6x14	1	5	5
	Total	423		1788
Odum	2x6x16	81	6	486
Odum	2x6x10	9	6	54
Odum	2x6x14	9	6	54
	Total	99		594
Ofram	1x12x16	15	2.5	37.5
Ofram	1x12x14	29	2.5	72.5
Ofram	1x12x16	36	2.5	90
Ofram	1x12x14	136	2.5	340
Ofram	1x9x16	9	2.5	22.5
Ofram	1x12x10	11	2.5	27.5
Ofram	2x4x14	10	2.5	25
Ofram	1x12x16	6	2.5	15
Ofram	1x12x10	8	2.5	20

Ofram	1x12x16	146	2.5	365	
	Total	406		1015	
Edinam	1x12x16	16	5.5	88	_
Edinam	1X12X16	55	5.5	302.5	
Edinam	2x6x16	7	5.5	38.5	
	Total	78		429	
Wawa	1x12x14	7	6	42	
			Total	4868	

Source: Processing and marketing records of ITTO project, 2008

Annex 11.1 List of participants of the PASDIA workshop held at FORIG on 18th September 2009

Name Affiliation

Henry Coleman TIDD/FC, Takoradi

James Ware FSD, Kumasi

Charles Nyarko GIMO, Kumasi

F.X.T Armah Police

Emmanuel Torsu Chainsaw operator, Juaso

Amoako Dankwa Chainsaw operator, Juaso

O.K. Boateng-Poku GTA

Nana O. Wontumi II Timber Industry

B.I Ahmed TIDD

Dickson A. Sakyi FSD, Sunyani

L. Damnyag FORIG

F.U.Akowuah FAWAG

Chris Dadzawa FAWAG

Alex Asare RMSC

Samuel Larbi FORIG

Rebecca Banning Darko ADM,ODA

A. Addai Bosompem Techiman

Isaac Sintim Yabbey ADM, Nkawie district

Mark Fiador TIDD

Emmanuel Kwegyirom Coleman TIDD

Osei FSD

Kwao Adams M. FSD, ODA

Dominic Fobi Boamah FSD, ODA

Ahmed Seidu

Daniel Forson

Emmanuel Marfo

Dosu Ayivi

Kwaku Suka

Foster Ofori

Seidu Nuhu

Osei Owusu

FORIG

FORIG

FORIG

WAG

Wood Worker Association of Ghana

Sawn Timber seller Association.

TSA

Sawn Timber seller Association.

Annex 11.2 List of identified SWOT elements by PASDIA participants

Strengths (S)

- Lack of clear rules for identifying chainsaw lumber
- Cheap and easy training of apprenticeship
- Connivance of FSD and law enforcement agency in transportation of lumber to the market
- No law to restrict the importation and sale of chainsaw machine
- Non –payment of fees and taxes
- Farmlands and OFRs: Chiefs and farmers readily setting out timber to chainsaw operators
- Lack of clear operational rule
- Ready yawning market
- Ignorant of the immediate communities in the effects of desertification and deforestation.
- High unemployment rate
- Lack of political will to enforce the law
- Logistic constraint to fight chainsaw operations according to the FSD and poor enforcement capability

Weaknesses (W)

- Lack of formal training
- Fear of imprisonment when caught
- Lack of cooperation from some transport owners
- High cost of chainsaw operations
- Uncertainty in financing
- No formal registration
- Unfavourable terrain thy operate in
- Lack of cooperation from certain communities/chief and FC officials
- Rivalry/competition among chainsaw operators
- Unfaithfulness on the part of same operators
- Use of old technology
- Dwindling resources

Opportunities (O)

- Favourable factors for growing adequate supply of timber (plantation)
- Strong desire to reduce conflict in chainsaw business
- Possibility of building capacity and introducing improved portable rills
- Non availability of alternatives
- Global environmental desire (climate change, etc) and desire to support/sponsor projects/programmes on foreign
- Management/ownership framework and private woodlots in off reserve areas
- High cost/non availability of sawmills lumber
- Ready market and sponsorship (prefinancing) of products/operation

Threats (T)

- Activities of environmentalists e.g. climate change
- Improved supply of milled lumbers (tendency)
- Increasing alternative sources of employment
- Improved standard of living of individuals (oil revenue) tendency
- Activities of security agency
- Awareness from chainsaw lumber users obtained quality
- Activities of VPAS
- Legality criminalization
- Dwindling resource base
- Strict monitoring operations of FC personnel

Annex 12.1 Questionnaire for primary stakeholders of chainsaw lumber production. August 2008

The purpose of this survey is to determine the economic impact of chainsaw milling on our rural and national economy with the view to finding how chainsaw activity can be made more beneficial to you and your community members, the forest, and the nation as a whole

General information

1.	Name of district	
2	Name of village/community	
3	Status/domain of respondent	1. Chainsaw lumber sponsor; 2 Chainsaw owner; 3. Chainsaw operator; 4. Lumber carrier/head porter; 3. Transport owner/driver 5. Small Scale Sawmiller; 6. Chief; 7.Unit committee member; 8. Lumber dealer; 9. Land owner; 10. Sawyer/table top sawmiller; 11. Farmer; 12. FSD/Range supervisor; 13 district manager; 14 Forest guard; 15 lumber consumers

Economic impact of chainsaw milling

4. What are the forms and quantity of economic contributions by you as an actor in chainsaw milling chain to the nation and rural communities (employment, Taxes, provision of infrastructure etc)

• THE	terres rester e commissiones	(emprejment, runes	, pro distoir or	11111 000 01		-)
Type of actor	Form of econs contribution(employment, taxes	Quantity of contribution	Money value	Year	Nation	Rural economy
	etc					

Are we measuring impact in terms of economic gain or benefit? (browse the parameters for the measurement of economic impact of an intervention)

Type of economic gain & corresponding quantity or value

Opportunity cost of the economic gain, i.e. what gain would have been made from an alternative enterprise/livelihood activity. Is this comparatively higher or better and if so why wouldn't the stakeholder switch to this alternative?

5. What are the benefits accruing to you as an actor in the CSM chain? How do these benefits compare with their inputs (Your time, money, expertise, and risk/energy)

with their imputs (Four time, money, expertise, and instructing)								
Type of Actor	Form of benefit	quantity of	inputs of	Mention the type	Year			
		benefit	actor(time, money,	of alternative				
			expertise)	work				

Note:

Time and expertise to be calculated in terms of equivalent values of other work/job prevailing in community where survey is done. e.g. porter/carrier of lumber for a fee, the benefits is the money/fee he is paid for carrying. His time and energy is put into carrying, which could have been used in doing an equivalent job in the community, estimate how much he could have earned in that equivalent job as his time put into the carrying.

17. Contribution of chainsaw milling to household budget

Indicate your sources of CASH income for you and your household upkeep. Indicate how much income you have received from each source this year 2008

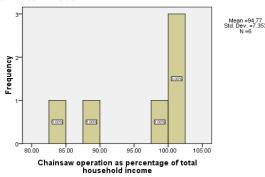
much meonic you have receive	d from cach source this year 2006					
Sources of income	Gross amount earned from each	% share of each gross				
	source in 2008	source of income(office				
		use)				
a. Farming						
b. Chainsaw operation						
c. Saw milling operation						
d. Livestock rearing						
e. Carpentry						
f. Collection and sale of products						
from the wild (bush snails,						
mushrooms, wild fruits, bush meat,						
chewing sticks, etc.)						
g. Petty trading						
h. Paid work						
Total amount of gross income						

Annex 12.2 Economic contribution of chainsaw lumber production to the rural economy

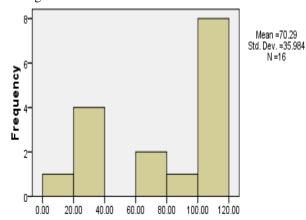
Name of Districts	N	Year	Total Mone y Value (GH¢)	Com y Be	munit nefit	Taxes	1	Empl	oyment	Servi	ces	Provof	vision vood	Lun Woo	nber/ od
				%	Value (GH¢)	%	Value	%	Value	%	Value	%	Valu e	%	Valu
Goaso	17	2007/200 8	34255. 0	8.3	2835. 0	2.5	870.0	89.2	30550.0	-	-	-	-	-	
		2004/200 6	12831. 0	7.6	975.0	15.5	1990.0	73.0	9360.0	1.2	150.0	2.8	356.0	-	
Oda	18	2007/200	-	-	-	-	-	-	_	-	-	_	_	_	
		2004/200 6	14491. 0	0.3	40.0	0.0	1.0	61.4	8900.0	0.4	50.0	-	-	38. 0	5500
Kade	6	2007/200 8	-	-	-	-	-	-	-	-	-	-	-	-	
Nkawie	9	2007/200 8	8010.0	21. 0	1680. 0	0.4	30.0	78.7	6300.0	-	-	-	-	-	
Sunyani	14	2007/200 8	57902. 0	4.4	2522. 0	6.9	4000.0	88.7	51340.0	0.1	40.0	-	-	-	
Assin- Fosu	7	2007/200 8	8314.0	8.6	714.0	-	-	91.4	7600.0	-	-	-	-	-	
Begoro	13	2007/200 8	4746.0	4.1	196.0	1.2	55.0	94.2	4470.0	0.5	25.0	-	-	1	
Total monetary value			14054 9		8962		6946		118520		265		356		55(

Annex 12.3: Contribution of chainsaw operation to household annual budget in study forest districts

1. Assin Fosu

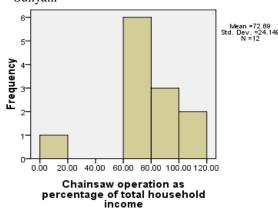


2. Begoro

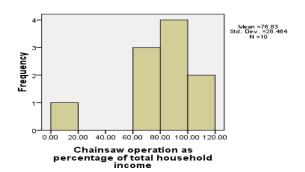


Chainsaw operation as percentage of total household income

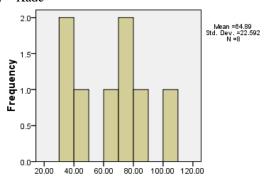
3. Sunyani



4. Goaso

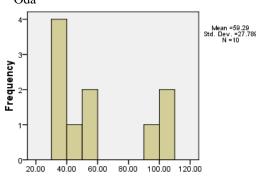


5. Kade



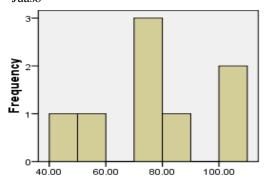
Chainsaw operation as percentage of total household income

6. Oda



Chainsaw operation as percentage of total household income

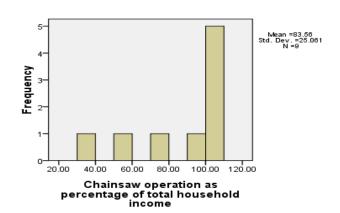
7. Juaso



Chainsaw operation as percentage of total household income

8. Nkawie

Mean =76.69 Std. Dev. =20. 695 N =8



Annex 12.4: Benefits stakeholders derive from chainsaw lumber production in study forest districts (fill in 6 more from Lawrence)

Benefits stakeholders derive from chainsaw lumber production in Begoro

				Quantity of benefit	Input of		
Individuals	Types of actor	Form of Benefit		(GH¢)	actor (GH¢)	Year	
		Money	for	, , ,	, , ,		
1	Chainsaw owner	livelihood		60	5	2007	
		Money	for				
2	Lumber carrier	livelihood		120	70	2008	
3	Chainsaw owner	Money livelihood	for	2000	300	2008	
4	Lumber carrier	Farmland		110	200	2000	
	Zumeer currer	Money	for	110	200		
5	Chainsaw owner	livelihood	101	50	200	2008	
		Money	for				
6	Chainsaw operator	livelihood		500	250	2008	
		Money	for				
7	Chainsaw owner	livelihood		9500	6000	2008	
		Money	for				
8	Chainsaw owner	livelihood		1300	600	2008	
		Money	for				
9	Chainsaw operator	livelihood	-	250		2008	
10		Money	for	100	25	2000	
10	Chainsaw operator	livelihood	<u> </u>	100	25	2008	
1.1	Clarian	Money	for	200	100	2000	
11	Chainsaw operator	livelihood	C	300	100	2008	
12	Chainsaw owner	Money livelihood	for	500	200	2008	
12	Chamsaw Owner	Money	for	300	200	2006	
13	Chainsaw operator	livelihood	101	300	700	2008	
13	Chamsaw operator	Money	for	300	700	2008	
14	Chainsaw operator	livelihood	101	480		2006	
	Chamban operator	Money	for			2000	
15	Farmer	livelihood	101	280	450	2008	
		Money	for				
16	Chainsaw operator	livelihood		800	4000	2007	
	•	Money	for				
17	Chainsaw operator	livelihood		230	80	2007	

Benefits stakeholders derive from chainsaw lumber production in Kade

			Quantity of	Inputs of	Net	Type of	
		Form of	benefit	actor	benefit	alternative	
	Type of actor	benefit	(GH¢)	(GH¢)	(GH¢)	work	Year
1	chainsaw owner	money	5000	2000	3000	farming	2007
		money	6000	1500	4500	farming	2008
2	chainsaw owner	money	3000	2000	1000	farming	2008
		money	4000	2000	2000	farming	2007
3	chainsaw operator	money	500	1500	-1000	Farming	2008
4	chainsaw operator	money	20000	10000	10000	Farming	2008
5	Lumber carrier	money	8	1130	-1122	Farming	2008
6	chainsaw owner	money	2500	1000	1500	Farming	2008
7	lumber dealer	money	3900	2500	1400	Teaching	2008