

# The role of timber-trees in the livelihood strategies of farmers in Ghana's high-forests zone

**Bernd Slesazeck BSc**

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Wageningen University and Research Centre (WUR)  
Chairgroup Forest and Nature Conservation Policy (FNP)



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# **The role of timber-trees in the livelihood strategies of farmers in Ghana's high-forests zone**

**A thesis within the EU-project on chainsaw lumbering in Ghana and Guyana**

Bernd Slesazeck BSc  
Student number: 810509-766-040

Wageningen University and Research Centre (WUR)  
Chairgroup Forest and Nature Conservation Policy (FNP)

Tropenbos International (TBI), Netherlands  
Tropenbos International (TBI), Ghana

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## Summary

This thesis is the result of research on timber exploitation by Ghanaian farmers. In four off-reserve forest areas in southern Ghana, surveys were conducted to gain insight in the activities of largest group of people involved in timber exploitation; farmers. These farmers use chainsaw lumbering for timber exploitation illegally. Limited knowledge exists about the farm households' perspectives and activities related to timber exploitation and harvesting on farmlands, a topic which is essential for considering whether the existing laws are feasible and contribute to justice in distributing benefits of forest resources.

The objective of this study is: *“To gain insight in the livelihood strategies of farm households and the role of timber-trees in their livelihoods, in order to understand the actual and potential role of farm households in the off-reserve timber exploitation in Ghana.* The concept of livelihood strategies is used for assembling farm households' perspective on their overall livelihood activities and the related role of timber extraction. This study regards livelihood strategies to be more than the combination of all livelihood activities; livelihood strategies are the vision of the households behind the livelihood activities. The livelihood strategy aims at reaching the livelihood goal which in turn is strongly determined by the households' perspective on their welfare status. The objective was further made operational in the following research questions: What overall livelihood strategies are prevalent? What is the role of timber exploitation on farmlands in the livelihood systems? And, what are the activities and motives of farmers' to use timber-trees?

The results indicate that all farm households adopted the diversification strategy. Households with this strategy aim at ensuring a minimal income level by investing in diverse sources of livelihood income. Households with a specialization strategy aim at optimizing income sources by focussing on a highly profitable income source, resulting in intensification of a cash crop on farmlands which excludes on-farm timber exploitation. Households with a survival strategy aim at reducing persistent shortages and can not invest in future income sources such as timber resources. Based on the data collected neither the survival nor the specialization strategy could be identified. A fourth strategy described in the literature, the coping strategy, was found not to be an overall strategy related to long-term perspectives but rather a temporarily strategy. Temporarily exception were not researched, hence this strategy could not be identified.

When timber extraction has a role in livelihoods of farmers (57%), this role is minor but significant. The role is minor because hardly any time is spent on this activity and income is very small, only 7% of all households indicated to gain small amounts of money from timber exploitation. Despite the small role of timber exploitation in livelihood income, chainsaw lumbering on farmlands is the main source of timber for domestic use for 82% of the households. Like the livelihood strategies only structural roles were researched. A temporarily risk-avoiding related to a coping strategy could co-occur next to the identified roles. None of the respondents did however mention this motive when asked after motives for their specific activities related to timber-trees.

Several activities related to timber extraction on farmlands are taking place, in most of them farmers are involved. Exceptions are timber extraction by concessionaires (38%), and chainsaw lumbering without farmers' consent (6%). Timber is also extracted by chainsaw

operators with consent of farmers (41%), or by farmers themselves by hand (2%). Related to timber extraction is the protection of at least some saplings by 46% of the farm households. On the other extreme, 6% of the farmers destroy all timber-trees actively.

Avoiding damage to crop productivity is the farmers' main motive for undertaking timber-tree related activities. Damage worried about is either caused by light competition (100%) or by damage from legal logging (20%). Secondary motives are; using trees to provide shadow for young cocoa plants (61%), using trees to meet household demand for construction timber (56%), or for generating extra income (16%).

Identifying the livelihood strategies of farm households helped understanding the motives for farmers to conduct the timber-tree related activities found. Households with an overall diversification strategy are capable and willing to exploit timber now and in the future, if timber is an added income source. Therefore the diversification strategy is in potential the optimal strategy for high levels of on-farm timber production. Currently only timber for domestic use is accessible at low risks, hence this is done by roughly half of the farm households. At the same time increased timber exploitation is avoided, the risk of decreased income from other more profitable sources is too likely. Under the overall strategy households are not exploiting timber to cope with poverty, e.g. by cooperating with chainsaw operations. This study did not regard short-term exceptions on the overall livelihood strategy and livelihood activities. These exceptions might occur but most activities will be related to the overall livelihood strategy.

Currently a large amount of timber in Ghana is produced in off-reserve areas, which mainly consist of farmlands. The role of farm households themselves in timber production in off-reserve forests is however low. Half of the farmers are not involved, the other half is only involved in logging less than one tree every few years. This can be explained by low benefits and high costs related to timber exploitation. Benefits are low as little money can be earned and households demand is small, one tree every few years at the most. High costs are caused by decreased productivity of crops due to light competition and damage from legal and illegal logging. The current situation will result in a decreasing production timber in off-reserve areas as farmers have no good reasons to stimulate timber productivity on their lands. Only for household consumption few trees will be looked after. This situation can only change when firstly the costs decrease, by avoiding or compensating logging damage, and secondly when benefits increase, by increased profits from timber compared to other agricultural crops produced on farmlands.

Adapting the measurements identified in this study can trigger farmers to use their influence to increase timber productivity, rather than minimizing timber production in order to cope with the current legal benefit sharing schemes which cause damage to farmers when they invest in the growth of timber-trees on their lands.

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# Content

- 1 Introduction .....7**
  - 1.1 Introduction..... 7
  - 1.2 Contextual background..... 9
  - 1.3 Justification..... 14
  - 1.4 Problem statement..... 15
- 2 Theoretical Framework .....16**
  - 2.1 Livelihoods..... 16
  - 2.2 Livelihood strategies..... 1
  - 2.3 Role of timber exploitation in farmers' livelihood systems ..... 23
  - 2.4 Role of timber-trees in different livelihood strategies..... 24
  - 2.5 Conceptual framework of the study ..... 28
- 3 The Research Objective and Questions.....29**
  - 3.1 Objective of the research..... 29
  - 3.2 Research question..... 29
- 4 Research Methodology .....30**
  - 4.1 Research design..... 30
  - 4.2 Selection of research location ..... 30
  - 4.3 Selection of respondents ..... 31
  - 4.4 Methods for data collection..... 32
  - 4.5 Data analysis ..... 33
- 5 Results .....34**
  - 5.1 Social-economical status..... 34
  - 5.2 Livelihood strategies..... 35
  - 5.3 Role of timber exploitation in livelihoods..... 36
  - 5.4 Activities and decisions related to timber-trees ..... 42
  - 5.5 Conclusion ..... 45
- 6 Discussions .....48**
  - 6.1 Empirical relevance ..... 48
  - 6.2 Theoretical approach..... 51
  - 6.3 Reflection on research methodology ..... 52
- 7 Conclusion.....54**
  - 7.1 Final conclusions ..... 54
  - 7.2 Recommendations..... 55
- Literature list.....57**

# ANNEX

- Annex 1: Questionnaire .....59**
- Annex 2: Proposed questionnaire .....61**

## List of Tables

Table 1: Benefit sharing of timber revenues (Tropenbos International 2004) .....	13
Table 2. Livelihood strategies and their characteristics (after Shackleton et al, 2008) .....	20
Table 3. The role of forests in livelihoods (after Byron and Arnold, 1999) .....	23
Table 4. The role of timber exploitation in farmers' livelihoods .....	24
Table 5. Role of timber exploitation (after Byron and Arnold, 1999) in different livelihood strategies (after Shackleton et al, 2008).....	25
Table 6. Background information of informant in the five regions .....	34
Table 7. The role of timber exploitation in livelihoods of farm households .....	37
Table 8. Timber-trees presence on farmlands, timber exploitation on farmlands, sources of timber. ....	38
Table 9. Risk level for farmers whom cooperate with chainsaw operators . ....	40
Table 10. Sources of timber for household use.....	40
Table 11. Shortages of timber for household use.....	41
Table 12. Timber-tree related activities on farm-lands .....	42
Table 13. Reasons behind timber-tree related activities on farmlands .....	43
Table 14. Timber-tree related activities on farm-lands .....	44
Table 15. Livelihood strategies and the role of timber exploitation in livelihoods.....	46

## List of Figures

Figure 1. Livelihood Framework.....	17
Figure 2. Livelihood Strategies.....	19
Figure 3. Conceptual framework of the study.....	28
Figure 4: High-forest zone of Ghana and the research locations in southern Ghana .....	31

## Abbreviations

AAC	Annual Allowable Cut
DFID	Department for International Development
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FNP	Forest and Nature Conservation Policy Group
FORIG	Forestry Research Institute of Ghana
GDP	Gross Domestic Product
TBI	Tropenbos International
VPA	Voluntary Partnership Agreements
WUR	Wageningen University and Research Centre

# **1 Introduction**

The introduction consists of the introduction of this study (1.1) and thesis outline (1.1.1), followed by the contextual background (1.2) and the justification of this study (1.3).

## ***1.1 Introduction***

This study is an extension of my internship at Tropenbos International (TBI) where I worked on the EU project on chainsaw lumbering. This study was carried out together with TBI and with the chairgroup of forest and nature conservation policy at Wageningen University.

This internship was an opportunity to provide more insight in the role of, and the consequences for farmers related to chainsaw milling activities in Ghana. Chainsaw lumbering is the common term in Ghana for illegal logging, as this method is used by most all illegal operators. Chainsaw lumbering plays a large role in the depletion of timber resources in Ghana. Timber resources are mainly found in the high-forest zone in southern Ghana. The high-forest zone consists of forest reserves and off-reserve forests. The off-reserve forests are largely farmlands which produce a significant part of the total timber production in Ghana and an even larger share of the illegally produced timber. Farmers are key-actors in the process of depleting timber resources as they control the vegetation which grows in large parts of the off-reserve forest areas. Farmers also influence the occurrence of illegal lumbering taking place on their lands.

Additional information on overexploitation and illegal exploitation of timber in Ghana was rapidly found. I got the opportunity to talk with many people involved in these issues; researchers, policy makers and employees of the Forest Service Department, farm households, lumber brokers and lumber operators. Informants and documentation consistently mentioned chainsaw lumbering to be of main importance for the national timber market for the following reason: legal wood is largely exported and is too expensive for the national market, while illegal wood is affordable and accessible on markets in Ghana. The presence of chainsaw lumber in Ghana is triggered by the demand. The supply of an alternative is possible because timber resources are present in large areas, including farmlands. On farmlands legal timber extraction is perceived to cause damage to crops, where illegal operations usually compensate for damage and also share benefits from timber extraction with the farmers. In contrast with chainsaw operations cooperating with farmers, farmers are looking negatively at chainsaw operations that operate without farmers consent or in forest reserves. Due to the demand, the lack of affordable legal timber, the presence of timber resources, illegal access to timber resources and damage inflicted by legal production farmers have two options: cooperate with illegal operations to ensure access to timber or earn additional income, or get rid of timber-trees before legal operations start exploiting them and cause damage.

Even though the facts presented above seem common understanding, the underlying reasons for farm households to make specific decisions regarding the exploitation and nurturing of timber-trees are researched to a limited extend. This study will therefore focus on

the context of the decisions farm households make regarding livelihood income regeneration and the related role of timber exploitation on farmlands. Timber exploitation refers to the conversion of trees to timber. This study focuses on timber exploitation by farmers in order to understand what activities related to timber-trees take place on farmlands. To understand these activities the general welfare status and basic attitude regarding income regeneration is research.

### 1.1.1 Study outline

This study has the following outline:

1. Next to the introduction (1.1) the first chapter provides the contextual framework (1.2) of this study on which justification (1.3) and problem statement are based (1.4).
2. The second chapter formulates the theoretical framework used to address the identified problem. The decisions of farm households regarding timber exploitation are researched. Derived from the livelihood framework (2.1) the livelihood strategies are further elaborated (2.2) as this concept is used for classifying and understanding the motives behind decisions households make regarding their activities. How the role of timber exploitation for farm households can be classified is described thereafter (2.3). The link between livelihood strategies and the role of timber exploitation is described in (2.4). Based on this link, the conceptual framework is presented (2.5).
3. Based on the theory and problem statement the research objective (3.1) and research questions (3.2) are developed.
4. Chapter four describes the type of research conducted (4.1), the selection of the locations (4.2) and the respondents (4.3), the methods used for data collection (4.4) and methods used for analyzing the results (4.5).
5. The results are presented according to the research questions in chapter five. The social-economical status of the farm households is described first (5.1), followed by the livelihood strategies (5.2), the role of timber exploitation in the livelihoods of farm households (5.3) and the actual activities, motives and limiting factors farm households perceive regarding timber exploitation on farmlands (5.4). The chapter is finished with the conclusions of the results based on the sub-research questions (5.5).
6. Chapter six discusses the empirical relevance of the results (6.1) the theoretical approach (6.2) and the research methodology (6.3).
7. The conclusion is divided in three parts. First the main conclusions of the research (7.1) are stated. Thereafter recommendations for further research (7.2) and implications for policies and projects (7.3) are formulated.

## 1.2 Contextual background

The contextual background starts with a portrayal of the Ghanaian forestry sector (1.2.1). The economical importance, size and geographic distribution of timber exploitation and the main developments of the sector are described in the first paragraph. The forestry sector is characterized by overexploitation of which illegal exploitation is an important component, in this context this paragraph looks deeper into four related issues.

First the national timber market is described (1.2.2), a market which is largely supplied by illegal timber. Second the Ghanaian timber regulations are described (1.2.3). These regulations focus on export but fail to facilitate sustainable and legal production for the national market. Hence this paragraph looks at the focus of general timber regulations and the regulations related to illegal lumbering. Finally the legal benefit sharing schemes are described including the reasons for most stakeholders to consider these schemes unfair. The last topic the contextual background deals with is the role of farm households in timber exploitation (1.2.4).

### 1.2.1 General characteristics of forestry sector in Ghana

This section describes the current status of the forestry sector in Ghana concerning the economic importance of the forestry sector and the size and distribution of timber exploitation. This information shows that the forestry sector is an important economical activity in Ghana and that this position is under threat due to overexploitation.

Timber is an important component of Ghana's economy, making up approximately six per cent of the GDP. It is the fourth largest foreign exchange earner, having provided around twelve per cent of Ghana's foreign exchange between 1990 and 2000. Employment in the timber sector in Ghana was estimated at 104,000 people in 1999 on a total population of roughly 20 million (Bird et al, 2006).

The high-forest zone of Ghana consists of 34% of the total land, around 80,000 km<sup>2</sup> out of the total area of Ghana which is 238,500 km<sup>2</sup>. Forest reserves cover 20% of the high-forest zone in Ghana. Most of the forest reserves are exploitation areas. The other 80% of the high-forest zone is called the 'off-reserve forests'. The off-reserve forest areas are mostly farmlands. The annual allowable cut estimated in 1997 was 1 million m<sup>3</sup>. This number will be lower at this moment considering the current market demand for commercial species and the decreasing standing volume of these species (Bird et al, 2006).

Over the last decade roughly half of the timber was produced in the off-reserve areas. The total amount of wood harvested in Ghana in 1999 is estimated at 3.7 million m<sup>3</sup>; chainsaw lumbering accounts for an estimated 1.7 million m<sup>3</sup> of timber, illegal logging for 0.9 million m<sup>3</sup>, and legal harvest for 1.1 million m<sup>3</sup> (Tropenbos International, 2004). Illegal logging has been predominant in off-reserve forest areas, where it is associated with chainsaw milling (Bird et al, 2006). Most of the illegal lumber is sold on the national market (Odoom, 2005).

Overexploitation is caused by both high levels of legal timber exploitation and illegal timber exploitation. In both cases poor governance is a main driving factor (Bird et al, 2006). Illegal timber exploitation is caused by a combination of poor governance, the demand for illegal timber and high poverty and vulnerability of rural people. In a situation with poor governance and the demand for illegal timber, illegal operations create economic incentives, employment opportunities and accessible supply of lumber for national markets FORIG (2007).

### **Developments in the forestry sector**

The described situation in the forestry sector in Ghana shows that:

- timber resources are overexploited in both forest reserves and off-reserve forest areas;
- illegal exploitation is thriving;
- illegal exploitation occurs mainly off-reserve on farmlands;
- illegal timber is sold mainly on the national market.

As a reaction on this development several projects and incentives are emerging. The EU Voluntary Partnership Agreement (VPA) is one of these incentives. The mandate of this program is to support improved governance within the forestry sector. The EU-project on chainsaw lumbering addresses the more specific issue of developing alternatives for illegal timber exploitation (Bird et al, 2006).

Both projects include an approach of developing sustainable forest management by including considerations for livelihoods for local people. FORIG (2007) mentions this approach is getting more emphasis, moving away from the traditional governmental approach in Ghana of law compliance. In this context it is necessary to understand the social and economical factors which, amongst others, influence illegal logging activities in Ghana.

This paragraph argues that overexploitation is the dominant development in the forestry sector in Ghana and that illegal timber exploitation is a large component of this issue. Illegal timber exploitation is caused by combination of poor governance, the demand for illegal timber and poverty and vulnerability of rural people. The situation regarding governance is described by the forest regulation (2.1.2). The demand of illegal timber mainly concerns the national market, hence information is provided on this topic (2.1.3). Concerning the role of rural people more information is provided on the role of farm households in timber exploitation, as farm households are the largest group within the rural community and they are the stakeholder directly involved in managing timber resources on farmlands, the main source of illegal timber (2.1.4).

#### **1.2.2 National timber market**

Discouraging wood exploitation outside forest reserves and focussing on producing export quality wood caused a gap between the demand and exploitation for the local market. This gap occurs in many tropical wood exporting countries and is enlarged by the growing national demand for timber. Timber demand is driven by the merge of a 'timber vacuum' created by the development of urban centres and timber-deficient regions in all parts of Africa. Despite national tax regimes and other legislations, timber trade within African regions

appears to be a case of simple supply and demand in an unregulated 'open' market (Samuel et al, 2007).

Legal sawmill producers are obliged to produce 20% of their total production for the national market. If these numbers are met they should produce 0.12 million m<sup>3</sup> of timber for the national market. In reality these numbers are not met. The national timber demand is estimated around 0.5 million m<sup>3</sup> (FORIG, 2007). The difference between legal supply and estimated demand is filled by illegal chainsaw lumber (FORIG, 2007). Chainsaw operations are the main source for lumber on the local market, providing 72% of the lumber on the local market in 1999 and 2002 (Odoom, 2005).

### **Chainsaw lumbering sector**

A large part of the timber exploitation in Ghana is conducted by chainsaw operations. The previous section described chainsaw lumbering as the sector which fills the gap between national demand and the low amount of legal timber exploitation for the national market. This section looks deeper into the economical importance in context of job opportunities.

Chainsaw operations employ eight per cent of the people in forest communities, which is twice the amount employed by the legal sawmills and concessionaires. The total sector generates an estimated total of 50,000 jobs, carpenters being the largest group of employees (FORIG, 2007)). The main jobs in the chainsaw milling sector are:

- 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, builders) who buy lumber from the timber markets or directly from the chainsaw operators.

Each link in this chain employs thousands of people, together counting up to 50,000 employers. The total number of people working in different parts of the wood sector is researched at the moment by FORIG.

### **1.2.3 Forestry regulations**

In this paragraph several issues regarding forest regulation are clarified. The first focus lays on the export market which is associated with legal overexploitation, and the illegal status of the domestic timber market. Secondly the regulations concerning benefit sharing are described, followed by the perception of involved stakeholders on the current benefit sharing scheme. Finally the focus is on the regulations concerning chainsaw lumbering.

## **Focus of legislations**

Forest regulations in Ghana focus on the intercontinental export of wood. The government aims at optimizing income from wood by focussing on export markets. Export quality is more expensive hence the percentage the government takes is worth more money. In forest reserves the government has a 50% share of the logging profits and in off-reserves forest areas this figure is 40% (Tropenbos International, 2004). Increasing the annual allowable cut (AAC), increases tax income for the government. High profit making in the forestry sector during the 1990s led to a doubling of installed capacity of the wood processing sector in this period. This installed capacity is five times the annual allowable cut of one million m<sup>3</sup> estimated in 1997 (Bird et al, 2006).

The next paragraph looks at the regulations concerning the illegal timber exploitation.

## **Chainsaw lumber regulations**

Most illegal harvested timber is chainsaw lumbered. Chainsaw lumbering is nothing more than sawing the felled log on the felling site using a chainsaw. In Ghana 'chainsaw lumbering' refers to freehand milling, though this term can also be used for other forms of chainsaw milling. Chainsaw lumbering is banned by the government.

At first the government tried to regulate chainsaw milling because it recognised the social-economical importance of the sector. In 1991, District Assemblies were authorized to give permits for felling trees in conjunction with District Forestry Officers. This resulted in uncontrolled tree felling causing environmental degradation. In reaction to this development chainsaw lumbering production for commercial purposes was banned in 1997.

The ban on chainsaw lumbering has not been effective. The five main reasons for illegal logging in general mentioned by the Food and Agricultural Organisation of the United Nations (FAO) (FORIG, 2007), are:

- flawed policy and legal framework;
- minimal enforcement capacity;
- insufficient data and information about the forest resource and illegal operations;
- corruption in the private sector and in the government;
- high demand for cheap timber.

According to FORIG (2007), corruption of the various institutions entrusted with managing the control of timber harvesting is the main reason for the failing execution of the chainsaw lumbering ban. Other reasons mentioned are the shortage of saw mill timber for local markets, the low price of chainsaw timber, low employment opportunities in rural areas and unclear tenure of trees on farms.

## **Benefit sharing**

In order to understand the relation between timber exploitation and the role of rural people, this paragraph looks at the distribution of benefits from timber exploitation. The benefit sharing scheme is constructed by the national government.

In Ghana the legal basis for sharing timber revenues from both on and off-reserve forest areas allocates benefits to five groups. They are the Forestry Commission for managing

forest resources; the District Assembly for development of the community, and the Office of the Administrator of Stool Lands, to cover administrative expenses. The other beneficiaries are the Stool Land Owner, responsible for the maintenance of the Stool in keeping with its status, and the Traditional Council. The distribution of benefits from timber revenues are shown in table 1:

**Table 1. Benefit sharing of timber revenues (Tropenbos International, 2004)**

<b>Timber resources</b>	<b>Forest reserve (%)</b>	<b>Off-reserve (%)</b>
Forestry Commission	60	40
Office of the Administrator of Stool Lands	4	6
District Assembly	20	30
Traditional Council	7	11
Stool landowner	9	14
<b>Total Government take</b>	<b>84</b>	<b>76</b>

In this situation stakeholders identify the following concerns about shortfalls in the present scheme.

- Nurturing of trees on farms in off-reserve areas is not captured in the current benefit sharing scheme;
- Timber firms refuse to pay adequate compensations to farm households for damage caused to farms when harvesting timber;
- Forest fringe communities do not receive any benefits for their role in protecting forests;
- Community members believe that chiefs do little to ensure that communities benefit from timber revenue;
- Farm households, traditional authorities and forest fringe communities believe that district assemblies use their share for other purposes rather than the development of the areas where timber is harvested;
- Traditional authorities, forest professionals and NGOs described the approach leading to the establishment of current benefit-sharing scheme as not consultative enough. In their eyes, the process lacked transparency because some key stakeholders were not consulted.

#### **1.2.4 The role of farm households in Ghana's forestry sector**

The role of farm households in the forestry sector is based on the occurrence of timber exploitation, which takes place for a significant part on farmlands. Farm households have influence on two levels of timber exploitation; growth of timber-trees and the occurrence of illegal operations. Influence and reasons for choices made regarding these influences are described hereafter.

##### **Farm households and illegal timber exploitation**

FORIG (2007) shows that most chainsaw lumber originates from fallow lands and cacao farms, followed by food crop farms and secondary forests. Forest reserves are hardly ever the source of chainsaw lumber and no cases were found of chainsaw lumbering along water courses.

This study also showed that half of the chainsaw operators were farmers before changing their main job.

FORIG (2007) also included a survey among rural communities in Ghana in areas where timber exploitation was occurring. This survey showed that more people profited from chainsaw operation than from conventional timber exploitation. Respectively 53% and 78% of the respondents mentioned to have no benefits from either of the two activities.

### **Role of farm households in growing timber-trees**

In the multiple activities to generate income, farm households make choices that effect the growth of timber-trees on their lands. For instance farm households decide:

- if saplings of timber-trees are cut or nurtured and grown to harvestable sizes;
- if they invite chainsaw operators to cut trees or they simply destroy them by burning or debarking or take the risk of legal operations to cut trees knowing they usually do not compensate for damage and that the legal system does not provide benefits for the resource managers;
- if and how long shadow trees are kept on cacao farm and if shadow trees are timber species.

In short, farm households determine what grows on farmlands. Secondly, illegal harvesting is influenced strongly as farm households can both guard timber-trees or invite illegal operators. Because timber exploitation on farmlands is a big part of the total timber exploitation in Ghana, farm households influence the forestry sector to a large extent.

## ***1.3 Justification***

The timber sector in Ghana is characterised by overexploitation and a poor level of governance (Bird et al, 2006). This study focuses on the exploitation of timber in off-reserve forest areas in Ghana, because they produce roughly half of the countries timber and most of the timber is for domestic use. Off-reserve timber exploitation is largely done by illegally chainsaw operators. Chainsaw operators indicate that most of the timber they produce comes from fallow lands, cacao plantations and food crop lands; which are all farmlands (FORIG, 2007). By determining what grows on farmlands, farm households have a influence in the amount of timber which is produced on farmlands. Further, farm households can influence illegal operations as they can both attract and obstruct the occurrence of illegal operations on their farmlands.

FORIG (2007) indicated, amongst others, that there is a call for improved governance and that the popular view on achieving this has shifted to an approach in which livelihoods of stakeholders receive a bigger role in developing sustainable forest management practises.

In the current situation resources managers do not receive benefits for taking care of timber resources (Tropenbos International, 2004). Farm households, the biggest group of resources managers in off-reserve forest areas, do not receive any benefits from the legal benefit sharing scheme. Illegal exploitation does provide benefits. No wonder that rural communities indicate they receive more benefits from chainsaw operations than from legal timber

exploitation FORIG (2007). In this example it is obvious that there is a big gap between sustainable forest management based on livelihoods of stakeholders and current legislations. In the context of developing sustainable forest management it makes sense to increase the understanding of the role of timber exploitation in the livelihoods of farm households. The VPA program shows that the government of Ghana is making serious steps in developing sustainable forest management systems. Livelihoods of rural communities are identified as an essential factor for including in the developing sustainable forest management FORIG (2007).

This study focuses on timber exploitation on farmlands by farm households. Hence several related issues are only regarded sideways because they can influence timber exploitation of farm households. The role of timber exploitation in the livelihoods of farm households includes: farm households' perspective on timber exploitation on their land; farm households' activities regarding timber exploitation; and farmer's involvement in preventing or cooperating with illegal operations.

Timber exploitation or any livelihood mode is related to the broader social-economical environment of the farm households involved. Concerning this topic, Shackleton et al (2008) mentions there is a gap in studies between to the broader social-economical environment and how this influences natural resource use and trade, as well as the role of these products within overall livelihoods. Hence, this study will focus on the overall livelihood situation as an indicator for the social-economical environment of the households. Secondly the study will look specifically at the role of timber exploitation, as this one of the natural resources households have access to.

#### *1.4 Problem statement*

Based on the background information and the justification this study's problem statement was formulated. Timber resources in Ghana are depleting. This development is related with failing measures to control timber exploitation. Consequently a call can be heard for improved forest governance, including the control of timber resources can be heard (Bird et al, 2006, Tropenbos International, 2004). Nevertheless, the present discussions on forest governance are mostly focussed on forest reserves, and still little systematic attention is given to the fact that much timber is produced on farmlands. Limited knowledge exists about the farm households' perspectives and activities related to timber exploitation and harvesting on farmlands, a topic which is essential when developing sustainable forest management practices (FORIG, 2007).

## **2 Theoretical Framework**

The problem statement in this chapter clarifies why the role of farm households in timber exploitation in Ghana is the topic of this study. The following perspective is used to understand the role of farm households in timber exploitation; “the use of timber-trees is determined by farm households’ livelihood strategies and the role of timber exploitation in their livelihoods”. This perspective requires the understanding of two theoretical approaches. First, four livelihood strategies are identified (2.2) based on the livelihood framework (after DFID, 1999) and adaptations made by Burgers (2004) and Shackleton et al (2008) (see paragraph 2.1).

Second, the role of forests in poor-people livelihoods as presented by Byron and Arnold (1999) is adapted to categorize the role of timber exploitation in farm households’ livelihoods (2.3) and shows the characteristics of timber exploitation to fulfil each role. The relation between the livelihood strategies and the role of timber exploitation in farm households’ livelihoods is discussed (2.4) which provides the basis for the conceptual framework (2.5).

### ***2.1 Livelihoods***

While considering the farm households’ perspectives and activities related to the exploitation of timber on farmlands, it is useful to take their livelihoods as starting point. Ellis (2000) defines a livelihood as ‘the activities, the assets, and the access that jointly determine the living gained by an individual or households’.

This chapter first elaborates on the relevance of the livelihood approach in studying timber exploitation (2.1.1). Next it presents the framework for analyzing livelihoods (2.1.2). Within this framework livelihood strategies form an important component. This concept is elaborated in the next paragraph (2.2).

#### **2.1.1 Relevance of the livelihood approach**

The relevance of the livelihood approach is advocated by Shackleton et al (2008) as follows: “A livelihoods approach starts off by focusing on people, their assets and their activities, rather than on sectors and their performance”. The latter is generally the conventional entry point, and the approach is widely adopted in natural resource commercialisation studies. The exploitation of forest products often forms only one component of farm households’ livelihoods, such exploitation is often an additional activity to crop cultivation. Much of the forest products research to date has tended to focus on products and their management, rather than on the complex and dynamic livelihood systems of which forest products commercialisation forms just one part. This need for a more holistic approach is supported by the argument that the “application of the pro-poor livelihoods approach to examining and understanding individual and household economies” has forced forest managers and development practitioners to move away from sectoral perspectives towards a much broader view that encompasses “the importance of the various economic activities that make up the livelihood portfolios of forest margin communities” (Shackleton et al, 2008).

## 2.1.2 Livelihood framework

In order to understand the nature of rural livelihoods, use can be made of the livelihood framework (DFID, 1999). In its simplest form, the framework views people as operating in a context of vulnerability. Within this context, people have access to certain assets or poverty reducing factors. These factors gain their meaning and value through the prevailing social, institutional and organisational environment. This environment also influences the livelihood strategies – ways of combining and using assets – that are open to people in pursuit of beneficial livelihood outcomes that meet their own livelihood objectives. The livelihood framework with the elements named above is shown in figure 1:

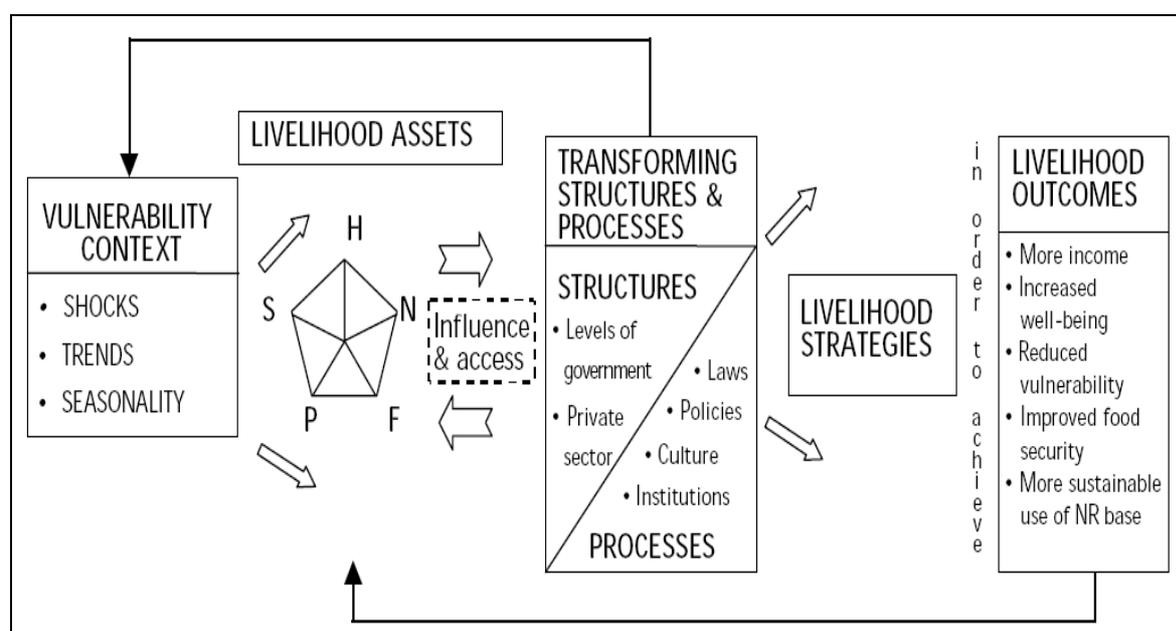


Figure 1. Livelihood Framework (DFID, 1999)

The various components of the framework can be elaborated as follows:

### a) Vulnerability context

The vulnerability context frames the external environment in which people exist. People's livelihoods and the wider availability of assets are fundamentally affected by critical trends as well as by shocks and seasonality – over which they have limited or no control (DFID, 1999). In this study the vulnerability context is solely the household members' perception on their vulnerability. The decisions people make is based on their own perspective, not on how others would indicate their situation. Angelsen and Wunder (2003) mention that only people themselves can indicate their welfare status.

### b) Livelihood assets

The livelihoods assets are the five types of capital upon which livelihoods are built, namely human, natural, financial, social and physical capital (DFID, 1999).

### **Influence and access to assets**

The access to assets describes the livelihood activities which are possible for a household to conduct. The possible activities are determined by the livelihood assets and the transforming processes and structures.

#### **c) Transforming structures and processes**

Transforming Structures and Processes within the livelihoods framework are the institutions, organisations, policies and legislation that shape livelihoods. They effectively determine:

- access to various types of capital, to livelihood strategies and to decision-making bodies and sources of influence;
- the terms of exchange between different types of capital;
- returns (economic and otherwise) to any given livelihood strategy. In addition, they have a direct impact upon whether people are able to achieve.

#### **d) Livelihood strategies**

DFID (1999) defines livelihood strategies as the range and combination of activities and choices that people make/undertake in order to achieve their livelihood goals. Several authors have further modified the concept of livelihood strategies. Burgers (2004) argued that livelihood strategies are more than the activities and choices themselves, it includes the vision of a household on the way to reach their goal or the livelihood outcome. A livelihood strategy provides a frame for households to select the potential livelihood activities which are considered most beneficial. The livelihood strategy provides insight in the reason certain possibilities are regarded as opportunities and used, and why other possibilities are not utilized.

The main types of activities to gain income are an important part of the livelihood strategies, the proposed term for this element of the livelihood strategies is 'livelihood modes'. Livelihood goals are the other element determining the livelihood strategy of a household.

### **Livelihood modes**

Livelihood modes are the types of activities of a household to gain income (Burgers, 2004). This concept is added to the original livelihood framework and is directly related to the livelihood strategies of a household. Examples of livelihood modes are small-scale logging, farming and hunting.

The importance of different sources of livelihood modes can be considered fixed by the status of the household and its environment. But this undermines the potential of households to select other sources of income when conditions or the livelihood strategy changes. A household can choose from livelihood modes it has access to. The potential role of livelihood modes like timber exploitation is reflected by 'access to assets'. The livelihood strategy determines which potential livelihood modes are used, and hence what activities to generate income will take place.

## Livelihood goals

The livelihood goal is the livelihood outcome people aim at, examples are 'reducing vulnerability' and 'increasing income'. The livelihood goal is added to the framework as it grasps the perception of the household regarding the goal of their livelihood activities. The livelihood goal of a household is strongly related with the perception of the vulnerability of the households. The goal to reduce risks would not exist if the household does not perceive risks, and there is no need to aim at minimizing the impact of livelihoods shocks when there are no livelihood shocks.

Livelihood goals are the abstract indicator of a livelihood strategy, livelihood modes are the more concrete aspect of the livelihood strategy. Together with they determine the livelihood strategy of the households and hence what decision they make and activities they conduct.

## e) Livelihood outcomes

Livelihood outcomes are the results of the activities households carry out in order to gain their livelihood income. Depending on the livelihood strategy and access to assets, certain activities are carried out or not. The results of the livelihood modes are reflected by the livelihood outcomes. They directly influence the livelihood status of a household. Part of the livelihood outcomes result from the exploitation of timber-trees on farm-lands.

## 2.2 Livelihood strategies

As explained above, the concept livelihood strategies relates to the vision behind the choices and activities of a household in order to reach a livelihood goal. This chapter describes different types of livelihood strategies and their main characteristics.

As indicated in (figure 2) a livelihood strategy can be characterized by the livelihood goal of a household and the composition of the livelihood modes. These two characteristics are interrelated. The potential livelihood modes influence the goals a household can have, just as the goal of a household determines what livelihood modes are selected. Both the livelihood goal and the composition of livelihood modes are indicators for the livelihood strategy. Table 2 identifies four strategies with the related livelihood goal and composition of livelihood modes. The perceived vulnerability context, related to each livelihood goal is mentioned. Reasons for changing livelihood modes and

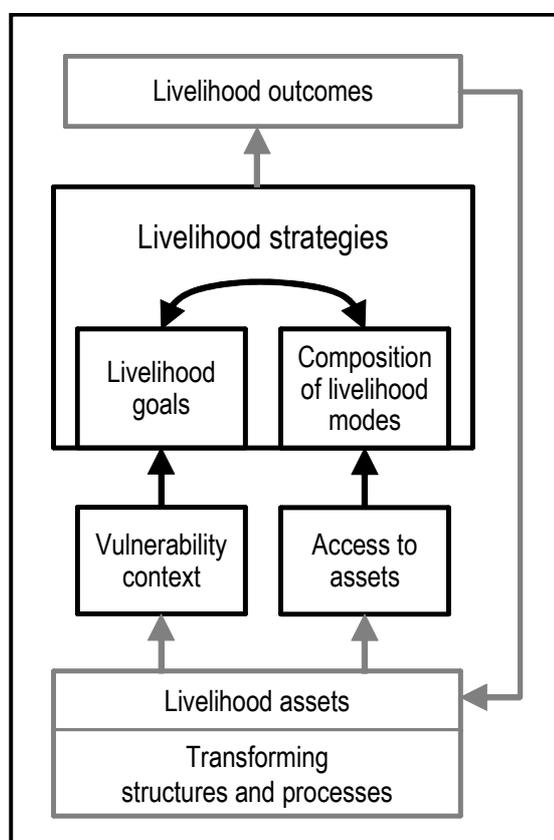


Figure 2. Livelihood Strategies

willingness to conduct risky activities are mentioned as indicators for the kind of livelihood mode composition.

Shackleton et al (2008) identified four basic types of livelihood strategies. The strategies and their indicators are shown in table 2:

**Table 2. Livelihood strategies and their characteristics (after Shackleton et al, 2008)**

	<b>Survival</b>	<b>Coping</b>	<b>Diversification</b>	<b>Specialization</b>
<b>Livelihood goals</b>	Secure food and prevent poverty	Adverse impacts of livelihood shocks	Spread income sources to reduce vulnerability	Increasing welfare by improved access to capital and markets
<b>- Shortages</b>	Persistent	Short term / limited	Risk felt	No risk felt
<b>Livelihood mode composition</b>	Divers, unstable	Divers, temporarily changes	Divers, stable	One mode
<b>- Changing livelihood mode in order to</b>	Increase short term income level	Increase short term income and minimize decrease of long term income level	Increased income without decreasing number of income sources, or increased number of income sources	Gain more income and replace existing mode
<b>Risk taking in order to</b>	Increase income	Increase short term income, but minimizing risks for the long term	Risks are not minimized, on long and short term	Enter more profitable but risky sources of livelihood income

Each strategy is linked with a specific livelihood goal. Livelihood goals are linked with the vulnerability perception of a household which can be expressed in the perception on (potential) shortages.

The relation between livelihood mode compositions is related to a strategy, as are the reasons to change livelihood modes and the willingness to take risks while generating household income when conducting specific livelihood modes.

Based on the characteristics of each livelihood mode, the role of timber exploitation is delineated. Timber exploitation can be important in different specific livelihood modes. The role of timber exploitation in livelihoods is therefore the last indicator for livelihood modes.

Hereafter the role of timber exploitation within each strategy is elaborated, as are the general characteristics and selected indicators of each strategy:

### **Survival strategy**

The household suffers from persistent shortages of basic needs. People are hence willing to take a lot of risks and conduct activities which cause the decline of future available income sources. People start livelihood activities when risks from shortages are bigger than risk for harvesting timber. Long term effects can not be taken into account due to pressure inflicted by urgent shortages.

General characteristics:

- Goal - prevention of destitution by using safety nets;
- No other choice than to rely on safety nets;
- Households are unable to live from their own existing livelihood activities, households have a shortage of livelihood assets at the given time;
- Associated with short and long term sacrifices;
- Reactive and defensive strategy.

Indicators of this strategy are:

- Consequences for livelihood modes - shifting, opportunity seeking, diverse;
- Reason to change livelihood modes - replace modes that do not provide enough income on short term;
- Risks; need to take risks if they result in increased income.

### **Coping strategy**

Due to temporarily events the regular livelihood income sources are not sufficient to generate the required income. Safety-nets will be used to cope with the impact of limited and/or temporarily shortages. Long term effects can be considered, but only to a limited extend. Safety nets will be selected to reduce the impact of temporarily shortages. These livelihood modes which function as safety net are chosen when this is the safety net with most benefits and least costs for the long term. Using this safety net can cause new risks or decrease future productivity of the land.

General characteristics:

- Goal - minimize impact of livelihoods shocks, such that future livelihood capacity is not seriously weakened;
- Response of households to adverse the impact of livelihood shocks, as households are under the threat of increased stress on their livelihood assets;
- Households have few alternatives for gaining livelihood income;
- Defensive strategy which mitigates poverty rather than reduces it.

Indicators of this strategy are;

- Consequences for livelihood modes - diverse composition which is opportunity seeking and hence shifting;
- Reason to change modes - temporarily shift towards livelihood mode which increases income on short term;
- Risks - associated with taking risks on short term but security on long term.

### **Diversification strategy**

When a livelihood mode broadens the sources of income, this is considered valuable by the household, even when absolute income becomes a bit less or more time is needed for the same level of absolute income. People want to avoid risk, not only by diversifying but also by avoiding risk from activities, associated with illegal activities or high injury changes.

General characteristics:

- Goal - decreasing risks by diversifying income, often to generate additional income that can be used for special household expenditures;
- Existing livelihood is just enough to support minimum level of livelihood income;
- Trend to diversify to decrease risks for getting under the minimum;
- Proactive and positive strategy.

Indicators of this strategy are:

- Consequences for livelihood modes - diverse, stable;
- Reason to change modes - additional income source, not decreasing current income activities;
- Risks - limiting risks to all extents, short and long term as the household has a buffer to prevent poverty.

### **Specialisation**

People with this strategy will only opt for a livelihood mode when it is a profitable activity on the long term. Risks can be taken, but only when there is no direct risk of falling into poverty. Households will only shift when a new livelihood mode is expected to generate higher livelihood income levels.

Indicators of this strategy are:

- Consequences for livelihood modes - one source of livelihood income;
- Reason to change modes - other sources become more profitable and can replace current activity;
- Risks - willingness to choose for (highly profitable) activities with variable income levels, but as people have enough buffers they are not harmed by a period of low income or failure.

General characteristics:

- Goal - increase income;
- One dominant household mode, either production or manufacturing;
- Access to capital, by reinvesting surpluses from existing livelihood activities;
- Access to markets;
- Proactive and positive strategy.

## 2.3 Role of timber exploitation in farmers' livelihood systems

### The role of forests in livelihoods

As discussed above, when considering farm households' livelihood strategies, not only their basic goals are of importance, but also their livelihood modes. Livelihood modes related to forest products, such as the timber exploitation mode, can play a variety of roles in the multiple activities of farm households' livelihood systems. Shackleton et al ( 2008) provided a general indication of the role of forest products in each of the four livelihood strategies identified by her. This classification can only be made properly when there is an extended insight in the livelihood activities of the targeted households. The classification of Byron and Arnold (1999) focuses purely on the role of forest resources in livelihoods. The advantage of there classification is that the status and context of other livelihood activities are not relevant. The importance of timber exploitation becomes clear. The classification of Shackleton is better suited to understand the context of timber exploitation within all the livelihood activities. Therefore a link is made between both classifications in paragraph 2.4.

Byron and Arnold (1999) classified five different roles that forest resources can play in livelihood systems, and provides general characteristics for each of them (table 3).

**Table 3. The role of forests in livelihoods (after Byron and Arnold, 1999)**

Role	Characteristic
<b>Central fundamental</b>	- Forest-dwelling hunter gatherer - Shifting cultivations
<b>Major important</b>	- Substantial share of household inputs; important supplementary role; - Basis for livelihood enhancement
<b>Minor but significant</b>	- Improved palatability of diets; - Opportunities/windfall source of inputs/income - <sup>1</sup> Diversifies household input base;
<b>Risk limitation</b>	- Buffer in hard times, safety net/ last resource source of income;
<b>Declining</b>	- Items falling out of household consumption patterns; - Unprofitable activities being abandoned as better alternatives become available.
<b>Note:</b>	<sup>1</sup> mentioned in Byron and Arnold (1999) under risk limitation

The original identification of the 'roles' identified by Byron and Arnold (1999) was further adopted. 'Diversifying household input base', is not regarded as exemplar for a risk limiting role but for a minor but significant role. The reason for this adaptation is that diversification of household input base is a proactive measure to prevent suffering from risks. A risk limiting role occurs in a situation where shortages are a reality. Sources of livelihood income used to reduce shortages are referred to as safety nets. A safety net is a source of emergency sustenance in times of hardship, or a fallback option in the absence of alternatives (Shackleton et al, 2008).

Timber exploitation is just one livelihood mode in which timber-trees play a role. Timber-trees can also play a role in farming of e.g. crops that need shadow or trees to climb in. These issues will be briefly mentioned in this study. As mentioned in the justification, this study will focus on the livelihood modes where timber exploitation plays a central role.

### The role of forests in farmers' livelihoods

The five characteristics identified in table 3 can be elaborated with respect to the role of timber exploitation for farm households (table 4). One adaptation to the roles of Byron and Arnold is that I consider a declining role not as a separate role, but a role that coexists with another role; a major role can decline, just as a risk limiting role can decline. Secondly the 'zero' option is added in order to show how many people are actually not using timber-trees in their livelihoods.

**Table 4. The role of timber exploitation in farm households' livelihoods**

<b>Role</b>	<b>Timber exploitation on farmlands (based on Byron and Arnold, 1999)</b>
<b>Central fundamental</b>	- Farm households own large lands where timber exploitation is major source of livelihood income
<b>Major important</b>	- Large part of income comes from timber exploitation - Large part of time is put in timber exploitation
<b>Minor but significant</b>	- Optimal source of timber - Source of extra income - Timber is one of many income sources, significant in size or in its' niche
<b>Risk limitation</b>	- Only accessible source of timber - Timber-trees are used for additional income in time of need
<b>None</b>	- trees do not grow - timber exploitation does not fit livelihood strategy
<b>Declining</b>	- As farm households specialize and/or intensify land use less space for growing timber-trees is available

## 2.4 Role of timber-trees in different livelihood strategies

Both the basic livelihood strategies and the role of timber in the livelihood systems are of paramount importance, when aiming at understanding the perspectives and activities of farm households regarding timber exploitation. This relation clarifies the impact of the livelihood strategies of farm households on the potential role they can fulfil in timber exploitation on farmlands.

This paragraph will explain the relation between each livelihood strategy, how they are related with the different roles of timber exploitation in livelihoods (based on Byron and Arnold, 1999). Table 5 summarizes the relation between these two factors. This interaction is summarized in the conceptual framework presented in the next paragraph (3.5).

**Table 5. Role of timber exploitation (based on Byron and Arnold, 1999) in different livelihood strategies (after Shackleton et al, 2008)**

Role	Livelihood strategies			
	Survival	Coping	Diversification	Specialization
<b>Central fundamental</b>	Only temporarily, to decrease shortages	-	-	Most profitable livelihood mode
<b>Major important</b>	Idem	-	One of many constant income sources	-
<b>Minor but significant</b>	Idem	-	Idem	-
<b>Risk limitation</b>	Idem	Optimal safety-net	-	-
Declining	Most likely	Possible	Possible	Possible
None	Possible	Possible	Possible	Possible

This table shows the linkages between the roles and strategies. The characteristics of timber exploitation within each strategy can be explained based on this relation. In the following section the relations are elaborated.

### Survival strategy

Households with a survival strategy have to use their safety-nets in order to cope with persistent shortages until all are gone, or persistent shortages disappear and they can adapt another strategy. In this situation timber exploitation is an activity which decreases the level of shortages. As long as the household maintains the survival strategy, timber resources will be overexploited and land might be sold in order to gain short term income to cope with shortages.

'Central fundamental' refers to a long term fundamental role which is not possible as people in a survival strategy have to overexploit or sell land in order to cope with persistent shortages. Timber exploitation can, temporarily, be of minor or major importance. It is more appropriate to call this a risk limiting role. This situation can occur when households start increasing timber exploitation as other, better, safety nets are available anymore. For instance risks of conducting illegal activities might be considered worthwhile when demand for cash is very urgent. On the long run people with survival strategy will stop producing timber on there land as they will finish timber resources and might even sell their land.

### Coping strategy

For households with a coping strategy the same principle counts as for people with a survival strategy. There is one big difference. Shortages are limited and/or present for just a short period. Hence people only use their safety nets to a limited extend or for a short period. Households with a coping strategy will start producing timber as soon as they can generate

any income from timber exploitation, unless other safety net contain less risks on short (penalties) or long term (income from farming).

A central fundamental role is not possible as this implies a long term commitment to timber exploitation as the central source of livelihood income. This can not be when in time of shortages safety nets need to be used, either by increasing production to unsustainable levels depleting the resources or by turning to other sources.

When timber exploitation is of minor or major importance, it might be spared as other safety nets are present. This occurs when timber exploitation is a relatively high profitable livelihood activity.

When timber exploitation on own land is the only accessible source of construction materials the role is also likely to be of minor but significant importance. It is they only way to cope with the demand for wood, even if this means conducting risky activities what timber exploitation is in many conditions.

When timber exploitation is a safety net, there might be enough recovery time between times of shortages for timber-trees to recover and enable future exploitation. Timber exploitation will be a safety net when it is profitable but not significant.

Characteristics of timber exploitation make it difficult for people with a coping strategy to maintain timber exploitation on the long term. Angelsen and Wunder (2003) state that anti-poor characteristics of timber exploitation usually prevail over the pro-poor characteristics. Reasons mentioned are the need for a long time horizon and high capital investments, but also the cash-crop characteristic of trees. Timber is a source of cash, finished in time of need and replaced by farming activities that provide food, an asset of higher urgency especially in times of stress. These characteristics make it most likely that the role of timber exploitation will usually decline for households with a coping strategy.

### **Diversification strategy**

The main goal of households with a diversification strategy is to reduce risks by differentiation of their income sources. Hence timber exploitation will be adapted as livelihood mode when this activity broadens the income basis. Timber exploitation will be a constant and significant source of livelihood income of minor or major importance. Timber-trees will be removed when risks from these trees are larger than the decreased vulnerability risk of maintaining these trees. Trees are an additional source of income and of cheap timber worth maintaining. Nonetheless, when the benefits are less than the perceived risk from damage due to light competition and/or unwanted harvesting by concessionaires, trees are not nurtured but reduced.

People with a diversification strategy have multiple income sources. A focus on one activity, which takes place when timber exploitation plays a central fundamental role in livelihood income, can not be combined with the characteristic of households with a diversification strategy. Timber exploitation can be of major or minor significance when timber exploitation is a profitable source of income. A minor significant role also occurs when timber from farm land is the only accessible source of timber for the household. Timber exploitation might also

be regarded as a security measure to avoid poverty in times of stress. For people that maintain a diversification strategy timber exploitation never has a risk limiting role. When timber exploitation is used as a risk reducing activity, the livelihood strategy has shifted towards a coping strategy because this strategy is proactive and prevents shortages and hence the need to respond to the risk of actual poverty.

When timber exploitation is suitable for any of the roles mentioned above, people are likely to maintain timber growth. A declining role is possible when other income sources become relative more profitable. Compared to the survival and coping strategies, people are better capable to stick to timber exploitation for risk limitation or for significant income. Compared to a specialization strategy, households with a diversification strategy are less secure to maintain out of poverty and are hence less willing to stop timber exploitation when this activity does not provide the highest profits.

### **Specialization strategy**

People with this strategy will only opt for timber exploitation when this activity generates the highest profits. Income must be high and therefore access to markets must be guaranteed. Risks can be taken, but only when there is no direct risk of falling into poverty. Furthermore the future income is expected to be higher than current levels. People will decrease the tree density if this increases the income of the main livelihood mode.

When people specialize they have one source of livelihood income. Therefore timber exploitation is either all they do, or they don't do it all. A central fundamental role is possible, but most households will have another income source. Timber exploitation will be decreased when it is present.

## 2.5 Conceptual framework of the study

The above discussed theories and concepts were used to construct a conceptual framework for this study, see figure 3.

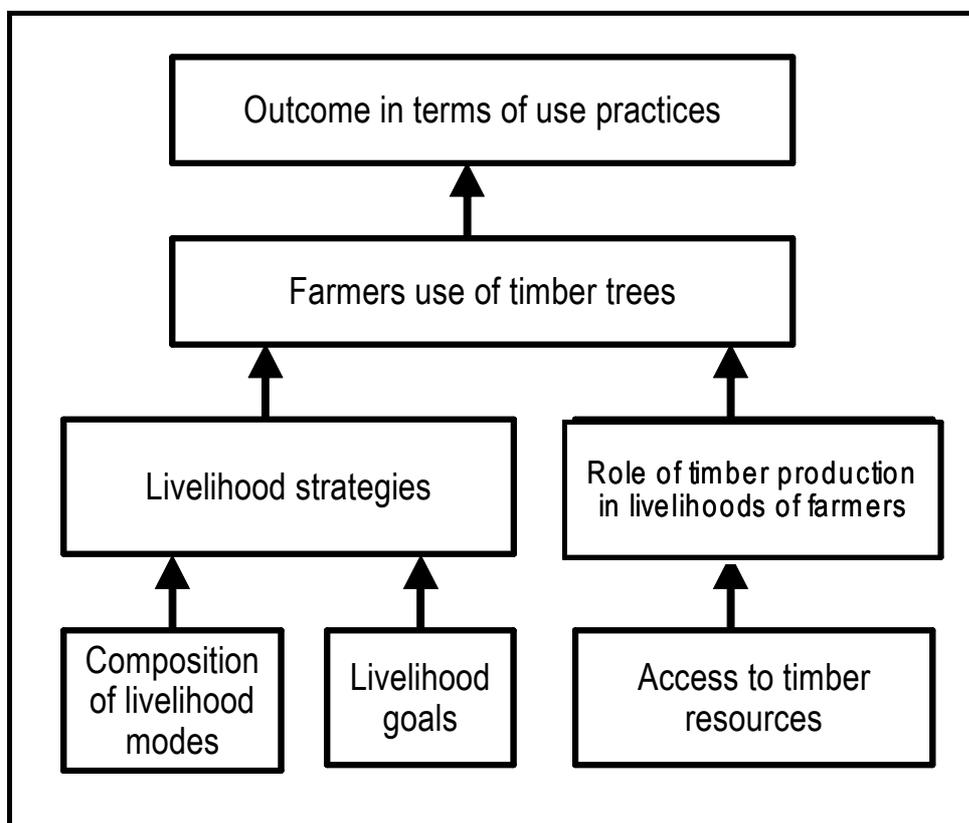


Figure 3. Conceptual framework of the study

The conceptual framework focuses on the use of timber-trees by farm households. Livelihood strategies and the role of timber in farm households' livelihoods clarify why households use timber-trees.

The livelihood strategy clarifies the vision of farm households when selecting specific livelihood activities. The role of timber-trees in farm households' livelihoods clarifies the importance of timber exploitation within the livelihoods of households. Together they provide insight in how and why timber is important.

Resulting from the livelihood strategy and the role of timber exploitation, specific use practices are conducted by farm households, each with its own practical reasons.

### **3 The Research Objective and Questions**

#### ***3.1 Objective of the research***

The objective of this study is based on the problem statement (1.4) and the elaborated theory. The objective is: "To gain insight in the livelihood strategies of farm households and the role of timber-trees in their livelihoods, in order to understand the actual and potential role of farm households in the timber production in off-reserve forest areas in Ghana."

In a larger context this information will increase the understanding of the development of wood exploitation and the occurrence of illegal logging and lumbering in the off-reserve forests in Ghana.

#### ***3.2 Research question***

The objective is made operational by the following overall research question: "What is the role of timber-trees in the livelihoods of farm households in the off-reserve forest areas in Ghana?"

In order to understand the role of timber exploitation the study focuses on three issues; farm households' livelihood strategies, the role of timber exploitation in farmers' livelihoods, and the actual activities households conduct. These topics are most closely related to the role of farm households in timber exploitation as shown by the conceptual framework (2.5). Based on these three topics the three main questions and the related sub-questions are formulated. Together they represent the seven key elements of the conceptual framework.

1. What livelihood strategies are prevalent?
  - 1.1. What is the composition of the livelihood modes?
  - 1.2. What are the basic livelihood goals of timber producing farm households?
2. What is the role of timber exploitation on farmlands, in the livelihoods systems?
  - 2.1. How is access to timber exploitation characterized in terms of; presence of timber-trees, access to timber exploitation?
  - 2.2. How can the access to timber for households use be described in terms of sources and shortages?
3. What are the activities and motives of farmers to use timber-trees?
  - 3.1. What kind of practices related to timber-trees are taking place?
  - 3.2. What are the motives for farm households to conduct specific activities?
  - 3.3. What are the limiting factors for farmers to exploit timber?

## **4 Research Methodology**

The research design of the study is described first (4.1). Based on the design the methods are elaborated. The following issues are indicated: the selection of the study sites (4.2) and the informants (4.3), followed by the methods for data collection (4.4) and data analysis (4.5).

### ***4.1 Research design***

This study aims at 'gaining insight in the livelihood strategies of farm households and the role of timber-trees in their livelihoods'. This includes a focus on farmers' livelihood strategies (or 'strategy') and the role of timber exploitation within on their overall livelihoods (or 'role').

The goal of the research design was to identify farm households' selection of: livelihood strategies, role of timber exploitation in livelihoods of farm households, and the actual activities related to timber-trees. In Ghana still little information exists on these issues, and therefore the study had an explorative character. For data-collection a survey was carried out. The explorative character of the survey is reflected by the inclusion of semi-open questions the survey. These semi-open questions enable data collection about the context of the answer provided in the closed questions.

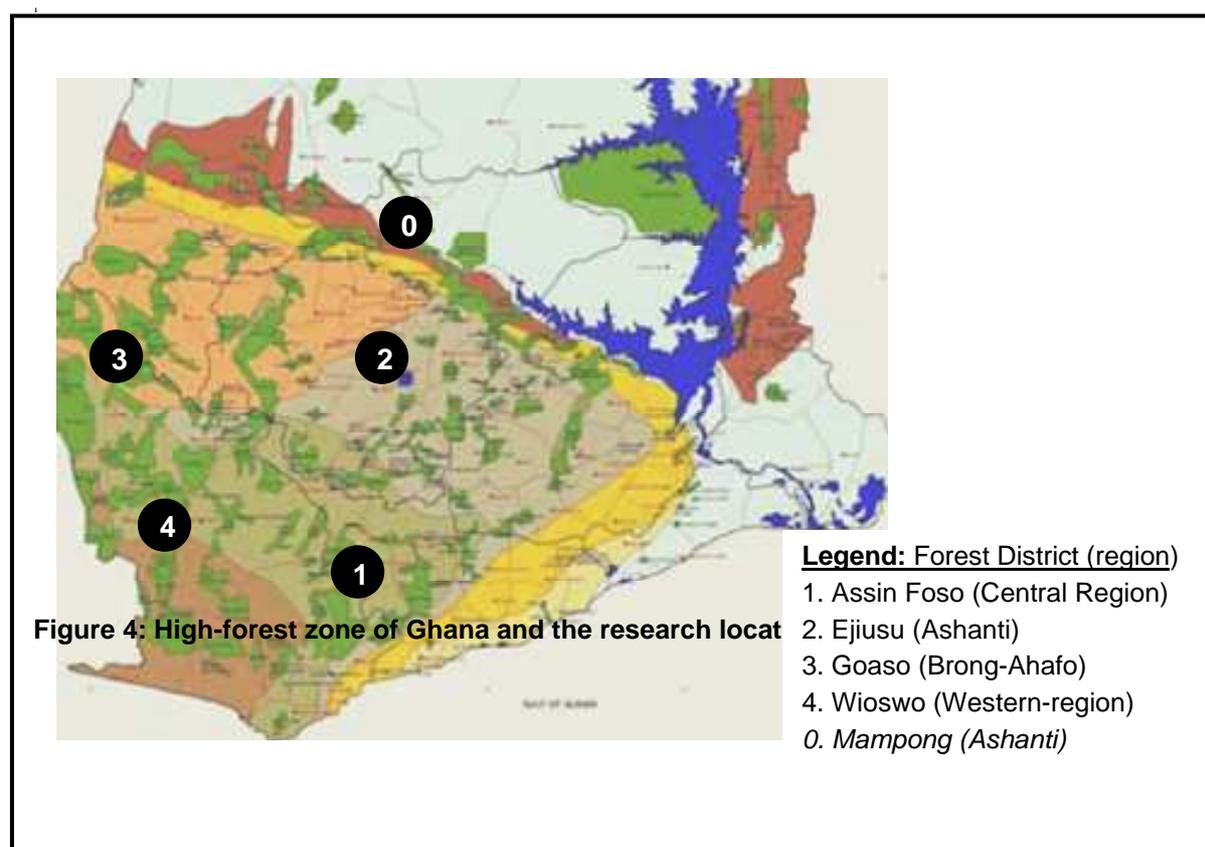
A survey enabled data collection from a large group of informants on different locations, hence enabling comparison between groups of farm households. Regional and/or social-economical differences might influence the conditions of timber exploitation on farmlands.

### ***4.2 Selection of research location***

The goal of the survey was to obtain information from a representative group of farm households in the off-reserve forest areas in Ghana. The studies focus on off-reserve forest areas in the high-forest zone in Ghana. The high-forest zone in Ghana covers seven regions, in four of these regions interviews were conducted so as to reflect different geographic areas. Location was indicated as potential factor influencing the use of timber-trees on farmlands. Therefore five different areas (figure 4) were researched within four regions in Ghana, resulting in a total number of informants of 102.

A location consisted of one, two or three communities. The location was named after the forest district. The main criterion for selecting communities was the presence of legal and/or illegal timber exploitation currently or recently. One site, Kade in the Ashanti region, was selected for its close distance to the large timber markets of Kumasi.

Mampong in Ashanti region is located the transition zone between high-forest and savannah. As all natural forest was gone and natural regeneration of timber-trees did not occur, this location is not included in the general analysis of this research. General analysis was done based on the remaining 81 interviews.



### 4.3 Selection of respondents

Within each research location twenty respondents were selected at random. Informants are people within a household which uses farming as one of their sources of livelihood income. This group includes; men and woman and tenant farmers and farmers owning land. Tenant farmers might have less to say about the use of trees and choice of crops, they do at least influence weeding and control of farmland, and are hence included in the respondent selection.

Informants were single persons who provided answers representative for their complete household. Most times other household members were present, sometimes giving comments on the questions. Occasionally other than household members were present, but they hardly ever commented on questions.

In spite of the aim to select a representative group of farmers by at random selection, some factors caused the over or under representation of some groups.

First of all, in each village a “village-chief” or a person in the “village committee” needed to be informed about our activities. These persons were often farmers and curious about our work. For this reason, this group might be over represented.

When interviewing a household the oldest man of the household was usually the respondent. On normal working days it happened regularly that men were gone farming and that woman were present in the village. In these cases women were interviewed. In case the

communities visited on days when no farming took place, male respondents dominated. Beside the absence of men on normal days, some woman also participated in interviews when a man was present they gave answers or comments to the questions asked. When the interviewee was a woman, no involvement from man occurred. Hence, the influence of woman in providing answers is larger than shown only by the gender distribution of the respondents.

Tenant farmers are more often living outside the villages and on isolated or clustered farms in the fields. As all interviews were conducted in small to medium sized villages (less than 100 up to several thousands) tenant farmers might be slightly under represented.

#### *4.4 Methods for data collection*

For data collection a social survey was carried out using a standard questionnaire. The questionnaire used in this study was developed based on the theoretical framework and available literature on chainsaw milling in Ghana.

The questionnaire included questions on; farmer's livelihood strategies, the role of timber exploitation in farm households' livelihoods, and farm households' actual activities related to timber exploitation. Overall, the questionnaire focussed on five topics which were included in the survey:

1. social economic status;
2. livelihood activities;
3. timber sources;
4. timber tree related activities;
5. involvement in chainsaw lumbering and the perceived risks.

The survey consisted of both closed and semi-open questions. Closed questions included yes/no questions, ranking and multiple choices. Closed questions are asked to all informants. These questions provided the essential information for answering the research questions.

Semi-open questions are questions about a specific topic. The informants were asked to describing the complete context of this topic. Semi-open questions are not asked to all informants by to a point of saturation of information. Hence semi-open questions were always asked when an informant provided an answer to a closed question not heard before. Semi-open questions collected data about the context of the different answer given to the closed question. The results will also show if the answers from semi-open questions are in line with the answer given to the closed questions, checking if the questions are formulated unambiguously.

The total interview took between half an hour and one hour. Variation was caused by differences in the amount and length of answers on semi-structured questions. For the interviews a translator was used.

The questionnaire used in this study is shown in annex 1. The questions were developed during the data collection. Most of the adoptions were made after the first ten interviews.

During the later interviews small additions were made to the closed questions. The data analysis is based on the final survey. The interviews from using earlier editions of the survey could usually be used for analysis.

#### ***4.5 Data analysis***

Different kinds of analysis were made. All collected data was put in an Access document. The answers to the main closed questions were converted to Excel documents to perform descriptive statistical analysis. The analysis involved both descriptive analysis and comparative analysis between regions. In view of the small number of interviews, the comparative analysis was a basic one next including elaborate statistical tests. The number of cases included in the analysis was 81; only in case of regional comparison also the additional 21 data from Mampong were included.

In addition the semi-open questions were assessed through content analysis. This data were also used for cross-checking results from the closed questions.

## 5 Results

The results state the background information before elaborating the results related to the research questions (3.2).

### 5.1 Social-economical status

The social-economical situation of the informants is presented in the overview of table 6.

<b>Table 6. Background information of informant in the five regions</b>							
Average numbers of characteristics are provided, unless mentioned otherwise.							
<b>Forest District</b>	Household size	Working force	Age of informants	Gender (% men)	Community born (%)	Years in community	Land owner
Assin Foso	7.0	3.8	50	90	75	19	90
Ejisu	7.3	3.2	55	45	85	13	85
Goaso	8.8	5.2	55	68	5	32	90
Wiaswo	6.5	2.5	39	76	81	16	90
<b>Average</b>	<b>7.4</b>	<b>3.7</b>	<b>50</b>	<b>70</b>	<b>62</b>	<b>20</b>	<b>89</b>
Mampong	8.6	3.5	49	76	38	23	19
<b>Average (with Mampong)</b>	<b>7.6</b>	<b>3.6</b>	<b>50</b>	<b>71</b>	<b>57</b>	<b>25</b>	<b>74</b>

The averages of all regions are provided, both with and without data from Mampong. Mampong is not included in the further analysis of this study, as it is not located in the high forest zone of Ghana, hence the average numbers are provided of all regions, and all regions without Mampong. The results here elaborate on the averages of all five regions, mentioning the outliers.

The average household size is 7.6 with a variation between 8.8 and 6.5. The number of people within a household who are able to work is 3.6 with a variation between 2.5 in Wioswo and 5.2 in Goaso. The average age of the informants is 50 with an outlier of 39 in Wioswo. Small household numbers occur together with low number of people working within the household and a low average age of the informants.

Gender distribution differs greatly in the region. Woman represent on average 30% of the informants, in Ejisu this number is 55% against a mere 10% in Assin Foso. Most regions were visited on both farming days and non-farming days. On farming days more man are absent and hence more woman were representing the household in the villages during the interviews (see methods 4.3). In Ejisu fieldwork took place only during normal farming days, hence the high number of female informants. In Assin Foso a number of people were selected based on their involvement in chainsaw operations. It appears that men are more often involved in these operations, causing an over representation of male informants in this region.

The larger part of the informants, 57%, is born in the community they live in. Goaso shows an exceptional low number, only 5% of the people were born within the community. Mampong also shows a low number, namely 38%. In the other three communities around 80% of the people were born in the community they now live in. Immigrants live on average 20 years in the community. Here again Goaso is an exception; immigrants migrated on average 32 years ago.

In the all regions, most farm households are landowners; 89% of the household on average. Mampong clearly stands as 81% of the farm household tenure farmland. The land owner can decide if they cooperate with a chainsaw operator. Depending on the land owner, he does or does not share benefits from the timber extracted on the tenured land. Hence informants mention that access to timber resources depends largely on ownership of the farmland used by the household.

## *5.2 Livelihood strategies*

Livelihood mode composition (5.2.1) and livelihood goals (5.2.2) are indicators for the livelihood strategy. Both are presented where after the livelihood strategy of the interviewed households is analyzed (5.2.3).

### 5.2.1 Livelihood mode composition

Closed questions regarding the number of jobs and sources of income were asked. Even though the production of crops plays a central role in livelihood modes of the farm households, different livelihoods modes are found. In many households jobs other than farming occur, examples are sewing, teaching and selling agricultural products. Farm households cultivate in many cases more than one cash crop. Most households identify cocoa farming as a main source of income. Usually this is combined with other 'cash-crops' such as oil palm and citrus. Even when households focus on one crop for gaining financial income, than still this crop is always combined with several food crops like yam, maize, rice, cocoyam or cassava. Examples of other crops cultivated are pepper, ginger and garden eggs.

### 5.2.2 Livelihood goals

Data on livelihood goals was not collected for each household. Generalizations are made based on a limited amount of open-questions. The livelihood mode composition and social economical conditions can both be associated with specific livelihood goals. Both information sources are cross-checked with the open questions in order to conclude on the livelihood goals of the households.

The main goals of the livelihood activities show that the majority of the farm households want to maintain their different sources of livelihood income. Some people do want to focus more on one activity, but without giving up all other activities. New jobs are either not wanted or have to be additional to current activities, as long as the activities do not decrease the income from excising livelihood modes. Only few informants indicate that they want to stop with any of their current activities.

Concerning the main jobs, the analysis shows that the people prefer a diverse income source over specialization. Further, they aim at securing long term productivity and income. Short term benefits are not preferred over long term benefits as most households want to maintain or invest in their current activities. No references were made to a situation where current income sources were structurally too small for a minimum living. Household members were also not actively looking for other sources of livelihood income.

Concluding, some answers could be related to other goals. Examples are investing in one cash crop which tends to profit optimization by specialization, investing in school fees could indicate a goal in which decreasing short term shortages is more central.

### 5.2.3 Livelihood strategies

From the collected information it is concluded that all the households in this study have a diversification strategy. The absence of households with just one source of livelihood income excludes the specialization strategies. Survival strategies do not occur as households do not suffer structurally from shortages of basic needs such as food.

The overall response on the livelihood goals of respondents to focus on securing long term income from diverse sources, point also at the diversification strategy.

As all households have the same livelihood strategy, it is not relevant to test the relations between livelihood strategies and social-economical conditions.

## 5.3 *Role of timber exploitation in livelihoods*

The role of timber exploitation in livelihoods of farm households (5.3.1) is identified based on the composition of livelihood modes. The conditions resulting to the roles are elaborated in paragraph 5.3.2. In order to better understand the importance of on-farm timber exploitation for farmers' households, the sources and shortages of timber for household consumption are presented in paragraph 5.3.3.

The specific activities and perceptions regarding timber exploitation on farmlands is elaborated further in paragraph 5.4.

### 5.3.1 Role of timber extraction in livelihoods

The role of timber exploitation (hereafter referred to as 'role') is classified based on the importance of timber extraction for generating livelihood income. Each 'role' is related to the importance of timber exploitation as a job within the farm households, table 7 shows the overview of all 81 informants.

**Table 7. The role of timber exploitation in livelihoods of farm households**

<b>Importance of on-farm timber exploitation as a job</b>	<b>Now (%)</b>	<b>Future (%)</b>	<b>Related role of timber exploitation in livelihoods (after Byron and Arnold)</b>
Only job	0	0	- Central fundamental role
One of main jobs	0	0	- Major important role
Activity occurs, but not mentioned as job of household members	58	65	- Minor significant / risk limitation role
No role	42	35	- No role

The role of timber exploitation in livelihoods of farm households is not 'central' or 'major'. In 42% of the households timber exploitation has no role, in the remaining 58% of the households played a minor role.

The survey did not indicate a differentiation between minor and risk limiting role. Additionally semi-open questions show timber extraction by farmers is the only or main source of timber of household use. This information indicates a structural activity. They also indicate that most farmers use timber mostly for their own household use. Most farm households need timber less than once every ten years. There are only few farm households, six out of 81, who use trees for more than just their own timber demand. For these reasons it can be concluded that timber extraction is a minor diversification activity mostly focussed on subsistent use.

The variation between livelihood mode compositions is high in comparison to the relative small number of respondents of this study. Therefore it was decided not to carry out statistical comparison between the occurrence of timber extraction and other livelihood activities. When more data is available the relation between cocoa farming and timber production is especially interesting to test, as cocoa farms use shade trees which can be timber-trees.

### **5.3.2 Conditions for timber extraction**

The role of timber extraction in the livelihoods of farmers depends on several conditions. This paragraph looks at the following conditions; the presence of timber-trees on farmlands, the occurrence of timber exploitation with and without consent of farmers (table 8), and the risks associated with timber exploitation by farmers (table 9).

**Table 8. Timber-trees presence on farmlands, timber exploitation on farmlands, sources of timber (%)**.

	Assin Foso	Ejisu	Goaso	Wiaswo	Total Current	Total Future
Trees on farmland	60	45	90	62	<b>64</b>	<b>74</b>
Trees on farmland disappear	-	-	-	-		<b>6</b>
Trees on farmland appear	-	-	-	-		<b>17</b>
Exploitation on farms (current)	70	70	65	57	<b>66</b>	
Exploitation on farms (future)	70	45	65	71		<b>63</b>
<b>With farmers consent (current)</b>	65	15	55	48	<b>46</b>	
<b>With farmers consent (future)</b>	70	25	60	67		<b>56</b>
- by farmer	-	-	-	-	<b>2</b>	<b>1</b>
- by chainsaw operators (CO) for private use	-	-	-	-	<b>41</b>	<b>54</b>
- by CO for sales	-	-	-	-	<b>7</b>	<b>15</b>
<b>Without farmers consent (current)</b>	25	60	60	24	<b>42</b>	
<b>Without farmers consent (future)</b>	15	35	40	5		<b>24</b>
- by chainsaw operators	-	-	-	-	<b>6</b>	<b>7</b>
- by concessionaire	-	-	-	-	<b>38</b>	<b>17</b>

### Trees on farmlands

The majority of farm households have trees on their lands, enabling timber extraction. Differences between the four regions are large. In Goaso timber-trees are present on 90% of the farmlands. In Goaso most farmers are immigrants working on lands converted from forest to farms over the last decades. The other outlier is Ejisu where less than half of the farms grown timber-trees (45%). This could be related with the location close to Kumasi, the second city of Ghana which has a large timber market. The other two regions, neither close to a city nor recently converted 60% and 62% of the farms have timber-trees on them.

In the future 72% of the farmers expect to have timber-trees on their lands. Some farmers expect to lose (6%) or gain (17%) timber-trees on their farmlands.

### Timber exploitation on farmlands

On most farms timber exploitation takes place, 66% now 63% in the future. No large differences between regions occur currently. This percentage is high compared to the percentage of farms where timber-trees actually occur. This has two reasons. First, timber extraction could have resulted in the disappearance of timber-trees; hence lands without timber-trees currently were used for extraction recently. Second, the presence of timber-trees is a abstract concept asked in the beginning of the interview. Farmers might see that their

farm does not grow significant numbers of timber-trees, only some, or that they understate densities as timber-trees attract unwanted activities such as logging (both legal or illegal).

Remarkable is the decrease of timber extraction on farmlands from 70% to 45% in Ejisu; an area deforested to a larger extent due to its location nearby Kumasi. In Wiaswo an increase is expected (57% to 71%). Informants in the other regions do not expect a change.

Farm households extracting timber, or cooperating with timber extraction, will increase in numbers from 46% to 55%. In all regions a light increase in timber extracting timber is expected by the informants. Chainsaw operators are most always used for this activity, for households' consumption (41%) and sometimes for money (7%). Two farmers indicated to have cut timber themselves without the use of chainsaws, only one expects to do this in the future. In the future more people will extract timber for both private use (41% to 54%) and for sales (7% to 15%).

Of the regions, Ejisu shows a remarkable low number of 15%. This might be caused by intensive extraction by outsiders and decreasing tree density on farmlands. Assin Foso shows the highest percentage; 65. This number might be a small overestimation as 6 informants were specifically selected on their involvement in chainsaw operations instead of an at random selection.

Extraction without farmers consent happened in 42% of the cases but is expected to decrease to 24%. Concessionaires are the main group which harvests trees on farmlands; 38% now, 17% in the future. This strong decline is caused by decreasing standing volumes of the most profitable timber species. Chainsaw lumbering without farmers' consent only occurred in 6% of the cases (7% in the future).

A large variation can be found between regions. In Assin Foso and Wiaswo only 25% and 24% of the informants indicated timber extraction without their consent took place. In Ejisu and Goaso these numbers was much higher; both 65%. A decrease of timber extraction without the consent of farmers is expected in all regions.

### **Risks of farmers when extracting timber**

A lower risk of timber extraction means a better access to timber exploitation for farm households. This factor is therefore analyzed in this paragraph.

In total 33 informants were asked about their perception of the risks related to their different involvements in chainsaw lumbering. These answers are analyzed and three groups are identified; people perceiving high, low or no risks related to allowing chainsaw operations to produce timber on their farmland. The 33 informants are split up in households involved and not involved in chainsaw lumbering. Table 9 shows the overview of the answers.

**Table 9. Risk level for farmers whom cooperate with chainsaw operators**

	Number of respondents	No risk (%)	Small risk (%)	High risk (%)
Total people asked	33	14	16	5
People cooperating	12	6	5	1
People not cooperating	21	8	9	4

Of the 33 informants, 28 associate cooperation in timber exploitation with small or no risks. Of the households involved in chainsaw lumbering, only one of the twelve respondents considered timber exploitation as a very risky activity.

### 5.3.3 Timber for household use

This study looks into the supply of timber for domestic use as a factor influencing the role of timber extraction for farmers. The access to timber for private use gives insight in the importance of timber exploitation by farmers. Information was collected regarding the timber sources used for household use, including the importance of each source and the motives to use the selected sources. Households are also asked if they perceive a shortage of timber and if they expect shortages in the future.

#### **Timber sources**

Table 10 shows the sources of timber use by the interviewed farm households. Different sources of timber can exist; hence the sum of the percentages exceeds 100%.

**Table 10. Sources of timber for household use (%).**

Source of timber	Current	Future
Own land	57	65
Community	26	30
Sawmill/ market	20	30
Forest reserve	1	4

Nearly all farm households obtain timber from chainsaw operations, either from their own land (57%) or from community members (26%). Sawmills are mentioned by 20% of the informants as a source of timber. Only one informant mentioned to have obtained illegal timber which originated from a forest reserve.

The importance of sawmills is lower than it shows in table 10, as this source is usually mentioned together with other sources which are more used. Most people refer to this source as something they have used once in their lifetime. As sawmills are the only legal timber source it is possible this answer is given more often than really the case. Hence some informants not using sawmills were asked if sawmills could be used; they all answered that

sawmills are too expensive for most everybody in their community to use as a main source of timber.

Natural forests are hardly ever used; despite 38% of the informants regarding themselves to live nearby forest reserves.

For the future, people are not sure where the timber will come from as some of them observe a decreased availability of timber on farmlands. When informing after the accessibility and affordability of timber from sawmills or lumber brokers, almost every person indicates that these sources will stay much too expensive and far away to be a serious option.

### Shortages of timber

If households perceive a shortage was asked in semi-open questions. These questions were analyzed for 72 informants. Table 11 shows if households perceive a shortage now or in the future.

**Table 11. Shortages of timber supply**

	Current (%)		Future (%)		
	No	Yes	No	Yes	Unknown
Shortage of timber for household use	84	5	79	9	12

At the moment of the data collection, only 5% of the households perceived a shortage of timber. In the future this number is expected by the same households to increase to 9%, and another 12% of the households did not know if they will have access to sufficient timber. Furthermore, several farmers indicated that a sawmill is likely to be the future source of timber, replacing on-farm produced timber. As shown in the previous section, sawmill lumber does not seem to be a realistic option. Hence, even households who do not see a shortage in the future might need to spend significantly more money on acquiring timber in the future.

## 5.4 Activities and decisions related to the use of timber-trees

This paragraph will look at the activities related to timber-trees on farmlands (5.4.1), the perspective on the current activities (5.4.2), and the perspective on changing conditions for activities related to timber extraction on farmlands (5.4.3).

### 5.4.1 Timber tree related activities on farmlands

All informants are asked after the kind of activities they undertake regarding timber-trees, both now and in the future. An overview the answers are provided in table 12.

**Table 12. Timber-tree related activities on farm-lands**

<b>Timber extraction</b>	Past (%)	Future (%)
Allow Chainsaw operators to cut trees for private use the farmer	41	54
Concessionaire cuts trees without farmers consent	38	17
Allow chainsaw operators to cut in order to gain money	7	15
Chainsaw operators cuts without consent, for charcoal or other purposes	6	7
<b>Other tree related activities</b>	Past (%)	Future (%)
Allow some saplings to grow into trees	46	46
Farmer kills trees before it can be used for timber, usually by fire or debarking	6	6
Farmers cuts tree and uses timber himself	2	1
Plant trees from private nursery	0	1

Timber tree related activities are mainly conducted by farmers. Concessionaires (38%) and chainsaw operators (6%) extract timber from farmlands without cooperation with farmers (also see 5.3.2). Chainsaw lumbering with farmers consent, for household use is most common activity, 41% of the farmer undertake this activity right now. This number will increase to 54% in the future. Cooperation with chainsaw operations to gain money is much less common (7%), but is expected to increase (15%).

The main timber tree related activity which does not focus on timber extraction involves the protection of at least some seedlings, this happens in 46% of the farms. This also means that 54% of all households actively kill all regenerating trees. Some, 6%, of the farm households indicate they were destroying timber-trees to prevent harvesting. Minor activities are farmer cutting trees themselves and planting trees from a private nursery.

### 5.4.2 Reasons for farmers to conduct timber tree related activities

Linked to the activities carried out by the farm households are their motives. Motives are identified by semi-open questions to several informants and asking after the importance of different reasons to all informants.

Based on this information an overview is made showing what reasons have what importance. The percentage of informants mentioning a specific reason is shown in the table 13.

**Table 13. Reasons behind timber-tree related activities on farmlands**

Reason for minimizing tree density	Mentioned (%)	Importance rank (%)		
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Decrease light competition	<b>100</b>	90	10	-
Minimize damage to crops conducted by concessionaires	<b>20</b>	14	4	3
<b>Reasons for nurturing timber-trees until harvestable sizes</b>				
Use (timber) trees as shadow plant for cacao *	<b>61</b>	-	47	24
Use timber-trees to fulfil the households' wood demand	<b>56</b>	-	11	44
Use timber-trees to gain money	<b>16</b>	-	3	14
Other	<b>4</b>	-	3	1

\* Asked at 62 respondents instead of 81

The main reason to minimize the presence of timber-trees is to prevent competition from trees with crops. The only other primary reason mentioned is the prevention of damage inflicted by legal harvesting of concessionaires. Damage is only mentioned by 20%, but when people feel at risk from damage from timber exploitation by concessionaires, they take this as an important factor to undertake action.

Nurturing trees occurs but is ranked as less important than the two reasons to decrease tree densities. This means nurturing only takes place when it does not result in light competition considered harmful, or triggers damage inflicted by concessionaires harvesting timber.

Providing shadow for cacao plantations is an important secondary reason, also mentioned in as tertiary reasons. Using timber for household timber demand is mentioned by 56% of the respondents, usually as tertiary reason. Using timber exploitation for money is mentioned by 16% of the households, mostly as tertiary reason. It is clear that most farm households, if not all, consider the main role of timber exploitation fulfilling the households' timber demand. Of second or no importance is the role as cash crop.

### 5.4.3 Limitations of on-farm timber exploitation

This paragraph describes the limiting factors of farm households under their current but different situations.

The overview in table 14 shows the situations regarding timber exploitation the farm households can be found in. Related to the situation, is the reason of the farmers to behave in this situation the way they do. Thereafter the limiting factor is informed after. The overview shows the answers regarding the factor prevents the household to produce more timber.

**Table 14. Timber-tree related activities on farm-lands**

<b>Situation</b>	<b>Reason</b>	<b>Limiting factor</b>
All timber-trees on-farm are destroyed: no timber exploitation	Prevent damage to farm by concessionaire harvesting timber	Risk of uncompensated damage from concessionaire
	Household is not willing to take risk involved with illegal activities	Illegal status of exploitation for household use and related risk of penalties or arrest
Farmers produce only for the households' timber demand	Exploitation for the households is not perceived as illegal or risky	-
	More trees on land increase risks from damage by concessionaires	Concessionaires will cause damage when high tree densities start occurring
	Damage by concessionaire is prevented or compensated	-
	More exploitation decreases productivity of other crops	Higher use of other activities for livelihood income
Farmer produces timber for local market	More exploitation contains risks of penalties/ arrests	Illegal status of commercial timber exploitation
	- Access to benefits from timber exploitation	-
	- Access to market	-
	- Long term guaranty of ownership	-
	- Timber exploitation does not decrease income from other crops	-
	More exploitation decreases productivity of other crops	Higher use of other activities for livelihood income
	Limited exploitation due to focus on other activities	Money incentive to bridge income gap when switching from livelihood modes
		Uncertainty of benefits from timber exploitation compared to other activities, resulting in small role of timber exploitation
		Knowledge about forestry

Most farmers are not extracting timber or extracting timber for households' consumption (table 14). For these farmers the main limiting factor is the illegal status of timber exploitation.

As more trees grow on farmlands, light competition becomes a more important reason for limiting timber growth. When regulations allow timber extraction and stop damage, productions will still be limited. Interviews indicate timber production will only increase when extra money incentives are present. An effect which is not mentioned by in the interviews is the higher levels of shadow which could be tolerated when timber-trees are considered more valuable than currently.

Not all farm households indicate they want to increase timber exploitation anyway. The households that want to increase timber exploitation, usually think only about a small increase, e.g. from no exploitation to exploitation for use within the household.

Nevertheless, if a majority of the farm households increase their timber exploitation to a level they can sell some timber, the supply of timber on national level could already be influenced as there are many farmers compared to the total population.

## *5.5 Conclusion*

The research questions of this research are identifying livelihood strategies, the role of timber exploitation within livelihoods, and the current and potential role of farm households in on-farm timber exploitation. Conclusions regarding these main research questions are formulated hereafter.

### *5.5.1 Livelihood strategies*

The strategy adapted by farm households is a diversification strategy. This strategy is identified based on the found livelihood composition and livelihood goals. The compositions of livelihood modes share a combination of different activities and include the production of food for household consumption, excluding a specialization strategy where people focus on one activity. The fact that people most always want to continue and invest in current activities excludes a coping strategy where people look for new activities whom are more profitable on the short term and do not invest in long term revenues. The livelihood goals of the households interviewed all direct to the livelihood goal related to the diversification strategy, which is ensuring income on the long term income by diversifying income sources. This is concluded as people say they want to keep divers income sources and within this context work to increase or maintain income current income levels. Current income levels do not create large or urgent shortages.

The coping strategy is an additional, temporarily strategy of farm households. This strategy might co-occur with a diversification is strategy (6.2).

The livelihood strategy is used in order to better understand the use of timber-trees and the role of timber exploitation in farmers' livelihoods. How the diversification strategy explains the selected role of timber exploitation, the actual activities and motives related to timber-trees, and the measurements to increase timber productivity on farmlands, is included in the conclusions of the next topics.

### 5.5.2 Role of timber exploitation in livelihoods

When timber-trees fulfil a role in the livelihood of farm households, it is a minor role. This is the case in 58% of the households right now. In the future this percentage will increase to 65%. The role is minor as only little time and income is generated from this activity. The role is significant as it is the main source of timber for farm households, other sources of construction materials are much harder to acquire.

The used questionnaire was not suitable for understanding the use of timber as a safety net. Hence a risk-limiting role of timber exploitation could co-occur but could not be found in this study.

This role fits in the diversification strategy, where households aim at secure access to essential resources and combine different profitable activities. As timber is essential and hardly accessible from other sources, households production is likely. Households with a diversification strategy do not only aim at diverse income sources, also to decreasing risks. Risks increase when timber exploitation increases, hence people minimize production to levels only to meet their own demand. The combinations of strategy and role observed in this study are reflected in table 15.

**Table 15. Livelihood strategies and the role of timber exploitation in livelihoods**

Role of timber exploitation in livelihood	Strategy (%)			
	Coping	Survival	Diversification	Specialization
Central role	-	-	-	-
Major	-	-	-	-
Minor, significant	-	-	58	-
Risk-limiting	-	*	-	-
None	-	*	42	-

\* might occur besides the found role and strategy

It was expected that timber exploitation in households with a diversification strategy has a minor role or no role at all. The information on livelihood goals and the exploitation of timber shows that a risk-declining role of timber in a survival strategy is possible. It is not known to what extent the diversification strategy co-occurs with a coping strategy, and if timber exploitation is used as a safety-net to decrease shortages.

### 5.5.3 Motives behind the current and potential use of timber-trees

#### **The current use of timber-trees**

Informants mentioned both motives to minimize and to stimulate timber tree growth. Motives to minimize growth, avoiding light competition and avoiding damage by concessionaires harvesting timber, are ranked as more important. The motives of nurturing trees are of secondary importance. Mentioned by most households are the supply of timber for household consumption and the provision of shadow for (young) cocoa plants.

These motives and activities fit a diversification strategy very well. People regard long term security of income, hence damage is minimized. This is reflected by ranking the potential damage of timber-trees for current and future income as the main motive for activities. Second in importance are the additional income sources timber can provide.

### **The potential use of timber-trees**

Successive steps are identified to stimulate timber productivity on farmlands increasingly. The first step is preventing damage from concessionaires harvesting timber. This issue is also identified as one of the two main motives to minimize timber production on farmlands. The other motive, minimize light competition, cannot be avoided as such. The negative effect can be compensated when timber-trees have a higher value for farmers. Farmers hence indicate they would increasingly nurture more timber-trees when they are allowed to produce timber for household consumption, followed by being allowed to produce timber commercially. Thereafter extra incentives are needed, such as education and money incentives.

These measurements are typical for people with a diversification strategy. Households are interested in investing in future income sources when this fits the goals of diverse low risk activities. Hence risks need to be excluded first, and thereafter increased benefits can result in increased productivity. People are willing to invest in future income sources as they do not suffer from shortages currently and they do not want to focus on one activity as this is considered too risky.

## **6 Discussions**

This section further discusses the results presented in chapter five. First the empirical relevance is reflected upon (6.1), Thereafter the theoretical approach is discussed by looking at the suitability of livelihood strategies to understand the decisions farm households make regarding the use of timber-trees (6.2). Finally the research methodology is discussed (6.3) before providing the final conclusions and recommendations in chapter seven.

### ***6.1 Empirical relevance***

In the literature on the use of forest products four strategies are distinguished regarding specific livelihood activities (Shackleton et al, 2008). Little information referring to an overall livelihood strategy of households is available. Most of these studies relate to the use of non-timber forest products and only limited attention to the role of timber production has been given. (Shackleton et al, 2008; Byron and Arnold, 1999; Ellis, 1998).

#### **6.1.1 Livelihood Strategies**

This study found that all households have a diversification strategy. This strategy is prevailing under rural communities all over sub-Sahara Africa (Ellis, 1998). Under the general conditions both a survival and diversification strategy is not likely for reasons described hereafter. A survival strategy was not likely to be adapted by farm households under current conditions. These households have their own land which can provide a minimum income and which will be abandoned or sold when income gets too low. Furthermore, climatic conditions minimize the chance for large livelihood shocks such as droughts. A specialization strategy was also not expected as most of the rural households in Ghana have limited resources. Investing in one activity and abandoning smaller less profitable income sources is risky. Especially as access to markets are limited and households need to be self-supporting to a large extend.

The diversification strategy indicates that households are capable of investing in long term income sources, and that they are interested in diversifying their income sources. Therefore this strategy is considered the most optimal for high levels of timber production on farmlands. Wunder (1999) mentions that deforestation can be caused by both poverty and development. This can be explained based on the findings of this study. Livelihood strategies are strongly related with the welfare status perceives by households. Increased poverty leads to more shocks and people abandoning their diversification strategy to cope with shocks and use all timber resources on the short term without being able to invest in future production. On the other hand, increased welfare will cause more farmers to adopt a diversification strategy which will focus on high-value cash crops and decrease the willingness to include additional production of less profitable products. Changes in the welfare status of households to the extent that the diversification strategy is abandoned, could be an important factor in increased depletion of timber resources on farmlands.

### **Temporally exceptions**

A coping strategy could not be identified, as this strategy is not typical for the whole farm household but is directed at a limited amount of specific activities. The importance to investigate the variations between households with equal overall livelihood strategies is elaborated in paragraph 6.2.1. Suggestions for adapting the methods are made in paragraph 6.3.

#### **6.1.2 Roles of timber exploitation in livelihoods**

The finding that households have diversification strategy is further illustrated by the observed role of timber production in farm households. Timber exploitation has a minor but significant role in farm households' livelihoods in 58% of the households interviewed. Based on the livelihood strategy it is to be expected that timber exploitation is one of many minor activities. Due to the limited access to legal timber sources, the presence of timber-trees on many farmlands, the possibility to allow and profit from illegal operations on farmlands, farm households choose to cooperate with on-farm timber production in order to acquire timber for household use. This study shows much higher benefits from chainsaw operations than FORIG (2007), chainsaw timber produced on farmlands is mentioned by 83% of the households in this study, where FORIG (2007) found that only 29% of the respondents gain access to timber for construction through chainsaw operations. Conventional companies or sawmills, are found in FORIG (2007) to provide timber for 48% of the respondents. In this study only 20% of the respondents indicate sawmills as a source of timber. However, other respondents in this study stated clearly that they did not believe this as this timber was mentioned as much too expensive to buy, let alone transport back to the villages.

The large group of farmers not exploiting timber can be explained due to the absent of timber-trees on some farms, and the availability of timber when community members cut trees. This second reason might also trigger people who do have timber-trees on their land to use leftovers of others as many farmers consider the use of this wood as less risky, compared to a more active role when allowing chainsaw operators to extract timber on their own land. The increase of farmers wanting to produce timber for household consumption could be a reaction to the decrease of tree density, to ensure access to construction materials households can to a less extend count on leftovers from other farms.

The significant but minor role of timber exploitation in livelihoods indicates a long term goal, even though it was not a major farming activity. Nevertheless the amount of timber produced when the role was minor can differ. Informants indicate exploitation from less than one tree every decade, to several trees a year. These differences are very big when all farm households in Ghana are at either end. Hence it is worthwhile to understand how large a minor role is for farm households on average and what limits and stimulates these differences.

FORIG (2007) points out that besides timber production, timber-trees are know to fulfil a ecological functions for farm households. In the case of shadow plants for cocoa production this function is mentioned, though ecological functions as such were not researched.

### **Temporally exceptions**

The livelihood strategies show that a coping strategy, to which the use of safety-nets is strongly related, can exist next to the diversification strategy all informants have. The can occur regarding the risk declining role which can co-occur (temporarily) with other roles.

#### **6.1.3 Motives related to the use of timber-trees**

Crop production is the main concern of farmers. This is reflected by the two main reasons for conducting timber tree related activities. Productivity of crops decreases due to light competition and damage from harvesting by concessionaires. Hence timber exploitation is tolerated, to an extent that it does not negatively affect crop production.

Informants indicated that the main reason for nurture trees also aims at increasing crop production; cacao plants need some shadow which timber-trees can provide. This reason is ranked mostly as second, after avoiding damage and shadow. This is the only ecological function of trees referred to in this study. These ecological functions are mentioned by FORIG (2007) as the main reason for farmers to protect timber-trees. Ranked usually thereafter are the other reasons which stimulate timber exploitation, in this context the demand for timber as construction material and money sources is mentioned.

In this study damage from chainsaw operators was mentioned hardly mentioned as this activity occurred only on 6% of the lands. The statement that chainsaw operators 'do not have any considerations for crop damage' (FORIG 2007), does not underline this finding. However, the same study mentions damage to crops is considered when deciding the direction of felling in 47% of the cases, only the shape of the crown is considered more important. Furthermore this number does not exclude damage is compensated when damage is inflicted due to felling. Damage from chainsaw operations might occur and is likely to change between locations, but is unlikely to be very high. The damage from legal logging was mentioned by much more informants as a risk to crop production on farms where timber-trees were present in high amounts.

### **Increasing timber exploitation**

When farmers can increase timber exploitation due to changing conditions, this will positively affect their welfare status. Any change which increases the opportunities for farmers to diversify their income sources has a positive effect on the welfare status households with a diversification strategy (Ellis, 1998). In the case timber exploitation increased access to benefits will ensure access to construction materials but also to additional income sources. This study underlines the findings of FORIG (2007) which mention local communities welcome the supply of legal timber for domestic use, and that they furthermore welcome the idea that the community could profit from commercial timber production in their area. In this study informants indicate that these policy measurements are the first and second step towards increased timber production on farmland.

Wunder (1999) identified potential benefits from timber exploitation for livelihoods of poor local communities. The levels of improvement are; direct benefits to producers, benefits from forest-products and labour absorption. Currently farm households in Ghana already profit

from forest-products when they cooperate with chainsaw operations to acquire timber for household use. Secondly, most chainsaw operators working with consent of farmers are people from within the community. Benefits from exploitation are low due to current regulation and are hence mentioned as measurement to increased production. The downside of increased benefits from forest resources by local communities is continued deforestation (Wunder, 1999). This case in the off-reserve forests in Ghana shows that the current limitation of access to benefits from timber is the main factors for farmers to decrease timber resources on farmlands.

## *6.2 Theoretical approach*

The use of livelihood strategies to gain understanding of the role households play in the use of natural resources is elaborated (6.2.1). Furthermore the use of the four identified strategies is discussed (6.2.2).

### 6.2.1 Using livelihood strategies in analyzing natural resource usage

Livelihood strategies identify the perspective of households regarding their livelihood activities. The strategy is also a reflection of the welfare status perceived by the household. This information can be used for understanding the selection of specific activities, such as timber exploitation, under different conditions. By investigating the role of timber exploitation for farm households the exact decisions related to the use of timber-trees are clarified, enabling the identification current and potential role of farm households in exploiting timber in off-reserve forest areas.

In most studies there is a gap between the broader social-economical environment of a household and how this influences the use of natural resources, as well as the role of these products within overall livelihoods (Shackleton et al, 2008). Using the selected approach a link could be made between these two interrelated factors. In short, livelihood strategies are essential in understanding current activities, motives and responses to policy changes.

Literature on poverty reduction and forests mention the following. The identification of poverty and how households' welfare status changes under changing conditions are two essential issues in undertaking poverty reduction (Belcher 2005). The used methods facilitate understanding of both issues mentioned. Livelihood strategies are strongly related to the welfare status of households and are a simple tool for understanding the households perceptiveness on their welfare status (or poverty level). The identification of strategies can also predict and clarify household responses to changing conditions, such as changing policies or livelihood shocks.

The combination of livelihood activities, the related motives and the responses to policy changes fit the reasoning of households aiming at diversifying incomes sources to reduce risks. The identification of the strategy helps to analyze if adaptation, like increased benefits, will result in increase timber production. The adaptation of the diversification strategy indicates households are capable of investing in future income sources when benefits are accessible.

Without knowing what strategy people are in, it is harder to understand why specific activities or changing conditions are considered opportunities or threats.

Livelihood strategies are used in this study to describe the overall welfare status of households. Hence only strategies that apply for the overall activities of households are useful. A livelihood strategies not static however, nor are all households with the same strategy equal. Over time or considering specific activities, the strategy might change temporarily or permanent. This is usually triggered by change in condition, like shocks or policy changes. Changes in livelihood strategies are however not regarded in this study. The occurrence and importance of temporarily adaption of a livelihood strategy other than the overall strategies is elaborated hereafter.

### **6.2.2 The selection of different livelihood strategies**

This study identified four strategies Shackleton et al (2008), of which the coping strategy is not considered a overall strategy. A coping strategy regards only specific activities which are done to minimizing the impact of temporarily livelihood shocks. Looking at the characteristics of the other three livelihood strategies, only the diversification strategy can be combined with this strategy. In this strategy people perceive risks of suffering from shortages when livelihood shocks occur. It is likely that in some cases people are right in there estimation and suffer temporarily from shortages. When these shortages are limited, they can continue most their activities as usual. However, to cope with the shortages safety-nets need to be used. Regarding the use of these safety-nets, which only count for a limited of activities in a limited amount of time, people will adopt a coping strategy. Households in a specialization strategy are unlikely to adopt this strategy as they are safe from urgent shortages, though a combined occurrence can not be excluded. People in a survival strategy suffer from severe shortages and hence they are in a permanent coping strategy.

Concluding, a coping strategy only occurs most likely with a diversification strategy. Due to this co-occurrence this strategy can easily be missed when searching just for overall strategies. For understanding the overall social-economical situation of the household it is important to know how frequent a coping strategy occurs, this factor influences the occurrence of activities not fitting the diversification strategy. An identification of the coping strategy needs to be included in studies which aim at understanding the overall social-economical situation of households. Ellis (1998) underlines this finding by stating that diversification is a heterogeneous process and understanding of differences is an important tool for research and policy makers to understand the local context and impacts of (policy) changes.

### **6.3 *Reflection on research methodology***

This part of the discussion proposes an adaptation of the methodology which will enable the identification of temporarily changes in livelihood strategies and roles timber exploitation fulfils. The identification of the coping strategy and the related risk declining role of timber

exploitation will do exactly this. Information on the need and use of safety-nets can identify the occurrence the coping strategy and whether timber exploitation is used to reduce perceived shortages.

Several questions are needed to find if and which safety-nets are used by households. The following set-up of questions is suggested:

- What would happen when a bad harvest or something else would cause very small income and you have no money for food or something else that is essential for your household?
- Are there activities household members would only do when, e.g. after a bad harvest or other problem, the household has an urgent shortage like not enough food?
- Is timber exploitation an example of such an activity?
- Does it happen that a household member had to do something for sometime to stop the effect of a bad harvest or something else (history of future)?
- Are trees used as a safety net?

As an example of how to formulate a more complete and detailed questionnaire, annex two was developed. This annex shows an overview of survey topics, methods, and analysis.

## **7 Conclusion**

The first paragraph will of this chapter will states the final conclusions regarding the objective of this study. The second paragraph contains recommendations for future research and suggestions for policies and projects.

### ***7.1 Final conclusions***

This paragraph will conclude with the motives of farm households related tot their current and potential role exploiting timber on farmlands. But first the following questions are answered: What is the role of timber-trees in the livelihoods of farm households? What is the actual and what is the potential role of farm households in exploiting timber in Ghana?

#### **The role of timber-trees in farmers livelihoods**

The livelihood strategy adapted by all households is the diversification strategy. Access to timber resources on farmlands is limited as the only accessible method for farmers to produce timber, cooperating with chainsaw operations, is considered illegal. Only timber exploitation for household consumption is done by half of the households. Risks are considered relatively small for cooperation with timber production for household use. On-farm produced timber is mentioned by most informants as the only accessible source of timber for farm households. Besides limited access to benefits from timber exploitation, timber-trees cause damage. Damage due to light competition and damage inflicted during timber harvesting farmlands by legal operations. The combination of damage from timber-trees to other income sources, the low benefits, and the inaccessibility of other timber sources resulted that timber extraction plays no, or a minor but significant role in the livelihoods of farm households.

#### **The current role of farmers in timber exploitation in off-reserve areas**

The role of timber exploitation in farmers' livelihoods is low. This explains why the households with a diversification strategy hardly stimulate the growth of timber resources on their land. Farmers do not benefit from increased productivity; hence they have to optimize other income sources on their farmlands which led to a minimizing timber growth on one side.

On the other side, farm households only benefit from cooperating with illegal chainsaw operations. Risk avoiding behaviour is typical for households with a diversification strategy, explaining the very limited involvement of households in chainsaw operations. Only on a small scale, less than once every few years, households allow chainsaw operators to cut trees on their land in order to acquire timber for households use.

#### **The potential role of farmers in timber exploitation in off-reserve areas**

In spite of the households' interest in diversifying their income sources, current regulation schemes result in a minimal timber productivity on farmlands. Ways to increase benefits from

timber exploitation and decrease damage from concessionaires are likely to trigger farmers to nurture more timber-trees on their farmlands. Though the production of a single farm might increase to just a few timber-trees a year, the number of farmers in the Ghanaian high-forest zone would still affect an increased productivity decreasing the pressure on the forest reserves. Without benefits sharing schemes that benefit farmers more than currently, farmers will continue to focus on other agricultural products and consequently they need to minimize timber resources on their lands.

## **Concluding**

Due to the diversification strategy farmers adapted they are capable and willing to adapt timber exploitation as a current and future livelihood activity, but only when they have access to benefits from timber exploitation. Their main motive is to avoid damage and increase benefits from farm products to which they do have access. Currently farmers can not access benefits legally, hence they minimizing timber-tree densities on their farmlands and cooperating with illegal chainsaw operation to a limited extend.

## **7.2 Recommendations**

### **7.2.1 Suggestions for future research**

#### **Extended interview of farmers**

The developed survey can be used in more regions to get a more thoroughly picture of timber exploitation by farm households in different regions in Ghana. This also enables insight in the role of timber exploitation as a safety net, next to the role in providing structure income in the form of constructing material or money (see annex 2).

#### **Developments over time, concerning use and perspectives of timber-trees by farmers**

This study looked at the current perspective of farm households. An interesting next step is analyzing the actual effect of changing conditions. This can be done when asking how people's attitudes have changed over time under changes in conditions related to timber exploitation, such as changes regarding the legal status and control of chainsaw operations, changes in timber prices, etc. Another option is observing the response to current changes. In both cases the livelihood strategy at both moments needs to be analyzed separately in order to find what changes in behaviour can be triggered without changing the strategy of people.

#### **Perspectives of chainsaw operators**

Most interesting extension of this research regards enhancing the understanding of illegal timber production in Ghana. The same approach can be used for understanding the livelihood strategy and the actual activities and motives of people working as chainsaw operations. They are, next to farm households, the most influential in important actor at

chainsaw lumbering at grassroot-level. Furthermore they are badly understood as most studies did not look at their livelihood situation and activities related to chainsaw lumbering from their perspective. Conducting a comparable livelihood strategy analysis focussing on chainsaw operators and when possible appetencies, assistances, and owners, can provide this information. This will clarify the context of their activities and the factors they consider important when deciding what activities to undertake or not.

### **Use of identification of livelihood strategies in other fields**

The method of determining livelihood strategies together with specific activities and motives regarding these activities solves the much heard comment, that the livelihood framework does not provide insight in how households can influence their conditions and why they conduct the activities they carry out.

In situation suitable for analysis using the livelihood framework, the approach used in this study can be suitable, especially when aiming at understanding the selection of specific activities and predicting and understanding the responses of households regarding changes in access to livelihood assets. Increased understanding of livelihood strategies is a tool to inform researches, policy makers to understand and predict the livelihood adaptations resulting from changes in policies or other conditions (Ellis, 1998).

### **7.2.2 Suggestions for policies and projects**

Current developments in the Ghanaian timber sector will lead to a situation where farmlands only produce timber for the use by farm households. This is not good for farm households for the following reasons; households can produce more timber but farmers are not allowed to profit from this potential activity, households want to diversify their income basis, on-farm produced timber most suitable source for construction materials as other sources are expensive if accessible at all.

Projects that aim at improving the livelihood of farmers and/or improving the sustainability of timber production in Ghana include projects that stimulate timber production, by creating conditions mentioned in paragraph 5.4.3. This paragraph also describes that many farm households are interested in producing more timber. Available knowledge is present in the communities. Situation should be created where the potential of farm households are not hampered. Small pilot studies could look at the effects of allowing exploitation to different extents.

The development of new regulations and legislations regarding the forestry sector is a big chance for improving the productivity of timber by farm households. Key element is acknowledging the capacity of farm households protect and nurture timber-trees and produce timber. If benefits are not shared with the resource managers, this will result in farm households using their capacities to decrease tree growth to a level where only the timber demand for household consumption of farm households' is met. Simple because timber-trees are the only product on their lands from which they cannot access the benefits.

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## Annex 1: Questionnaire

### Part 1: Background information

id	Na	# of the day	date	id out:	0
district					
forest district					
community					
m/f		chief	<input type="checkbox"/>	community unit member	<input type="checkbox"/>
age		land owner	<input type="checkbox"/>	tenure farmer	<input type="checkbox"/>
time in community		tree owner	<input type="checkbox"/>	trees on land	<input type="checkbox"/>
# of people in household	0	next to forest reserve	<input type="checkbox"/>	distance to forest reserve	
# working		remarks part 1:			

### Part 2: Livelihood strategy

Jobs in household/ income sources:	
foodcrops: none/some/enough/sell	
where use extra money for:	
prever to focus on what (new) job, and why:	

### Part 3: Timber source

wood source	past	now	next	describe your lumber access situation and changes/ reasons on shortages:
own land - CO:	0	0	0	
land of community members - CO:	0	0	0	
forest reserve CO:	0	0	0	
sawmill/ broker:	0	0	0	
other source:				
fire wood (where, enough, future):				
forest reserve (CO, you use, who profits):				

Part 4: Use of timber-trees

current activity:	past	now	next	why do you use trees the way you do:	
concessionaire cuts trees on farm land:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
allow CO to cut commercial on land:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
allow CO for own use:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
cut myself wood from own land - non-CO:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
kill trees with value:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
kill saplings:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
other kind:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
other intensity:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<b>reasons of behaviour related to trees - order of importance:</b>					<b>what will the future of trees on your land be?</b>
need for money	need for wood	avoid damage	avoid shadow, optimize growth		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
grow more when owning trees? yes/ yes but/ no:				others reason:	
reasons for behaviour v					
what do you need to grow more trees:					

Part 5: Involvement in chainsaw operations

Co operatin activity:	past	now	next	why are you (not) working with CO:
allow trees to be cut by CO:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
chainsaw owner:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
operator:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
apprentice/ assistant:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
carrier/guard:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
other activity:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
other intensity:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
How would you feel about joining CO:				
how did you start working in CO:				
why did you start working in CO:				
How did you involvement change, and why:				
risk of CO for own use:				
risk of CO for selling:				
risk buying CO wood for own use:				
Risk of other activities:				

## ANNEX 2. Proposed questionnaire

Proposes questionnaire for researching the role of farmers in timber exploitation in off-reserve forest areas in Ghana, August 2008		
topic	Question: → analysis of question	
	Methods (kind of question)	
LIVELIHOOD STRATEGY	<p>Are safety-nets used: → all the time: <b>survival strategy</b> → sometimes: <b>coping strategy</b> → not used: continue</p> <p>What are the main jobs of the household? → only 1 job mentioned: <b>specialization strategy</b> → several jobs mentioned: <b>diversification strategy</b></p>	<p>- see question (4) related to safety-nets</p> <p>- analyze closed question in order to convert them to 'true/not true' answers</p>
ROLE OF TIMBER EXPLOITATION IN LIVELIHOODS	<p>Does farmer harvest timber trees? → yes: next question → no: <b>no role</b></p> <p>What are the main jobs of the household? → timber exploitation is main or only job of all household members: <b>central role</b> → timber exploitation is one of the jobs: <b>major role</b> → not mentioned: next question</p> <p>Is timber exploitation used as safety-net? → yes: <b>risk-declining role</b> → no: <b>minor role</b></p>	<p>- Yes/no questions providing overview of respondents with specific combination of answers leading to the identification of the role of timber exploitation in farm households' livelihood strategies</p> <p>- Closed question: list all main jobs of household members</p>
Background information: access to timber resources	<p>1. What is the source of timber for the farmer? → identify if farmlands timber exploitation is essential for household consumption</p> <p>2. Can timber trees grown on farmland?</p> <p>3. Who has access to timber resources on farmlands?</p> <p>4. What is limiting timber exploitation by farm households in the current situation?</p>	<p>- closed question + ordination List all potential sources and ask if source is: only source/ on of many source/ not used</p> <p>- Yes/no questions providing overview of respondents with specific combination of answers leading to the identification of the role of timber exploitation in farm households' livelihood strategies</p> <p>- closed question: list who is capable of harvesting timber on land of the farmer interviewed</p> <p>- closed question + ordination: list all measure suggested by farm households and ask them to order of decreasing impact (1 most)</p>

**ANNEX 2. Proposed questionnaire, continued**

<p><b>LIVELIHOOD STRATEGY</b></p>	<p>Are safety-nets used:                  → all the time: <b>survival strategy</b>                  → sometimes: <b>coping strategy</b>                  → not used: continue</p> <p>What are the main jobs of the household?                  → only 1 job mentioned: <b>specialization strategy</b>                  → several jobs mentioned: <b>diversification strategy</b></p>	<p>- see question (4) related to safety-nets</p> <p>- analyze closed question in order to convert them to 'true/not true' answers</p>
<p><b>TIMBER TREE RELATED ACTIVITIES</b></p> <p><b>Background: livelihood goals, risks of producing chainsaw lumber.</b></p>	<p>What timber tree related activities occur?                  → statement of activities in now and resent past and future</p> <p>What are the main reasons for current activities?                  → statement of reasons and their importance right now</p> <p>1: livelihood goal                  What are the livelihood goals of the livelihood activities</p> <p>2: risks                  Are farm households involved in illegal activities?</p> <p>How do farm households see the risks of timber tree related the activities they conduct?</p>	<p>- closed questions: list activities now, resent past, and future</p> <p>- closed questions + ordination: list reasons and ask which is most important</p> <p>- ordination: list for all possible involvements if farm households are involved or not, now, in the past, or in the future</p> <p>- ordination: of the possible risks, identify if farm households see the risk as absent/small/large</p>
<p><b>SAFETY-NETS</b></p>	<p><b>Topic: Safety-nets</b></p> <p>1. What would happen when a bad harvest or something else would cause very small income and you have no money for food or something else that is essential for your household?</p> <p>2. Are there activities household members would only do when after a bad harvest or other problem you do not have enough food or something else essential?</p> <p>3. Is timber exploitation an example of such an activity??</p> <p>4. Did/ Does it happen that household member has to do something for some time to stop effect of bad harvest or something else?</p> <p>5. Are trees used as a safety net?</p>	<p><b>Methods</b></p> <p>- closed question: List answers/ provided examples already heard (e.g. other job, family can help out, etc)</p> <p>- closed question: list activities</p> <p>- yes/no</p> <p>- ordination: need to do this all the time/ sometimes/ never (now and future situation)</p> <p>- ordinations: need to do this all the time/ sometimes/ never (now and future situation)</p>