Tree Tenure in Agroforestry Parklands: Implications for the Management, Utilisation and Ecology of Shea and Locust Bean Trees in Northern Ghana

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Abstract

The management and utilisation of resources in agroforestry systems are influenced by both land and tree tenure systems, especially where land and tree tenure are distinct, and rights to one do not necessarily lead to rights over the other. Most academic research has examined the impact of land tenure on management and productivity in these landscapes. This thesis investigates the impact of tree tenure alongside other socioeconomic factors through the research question: 'how do local institutional arrangements affect the management, utilisation and ecology of indigenous economic trees in agroforestry parklands?' Shea and locust bean trees, two of the most economically, culturally and ecologically important indigenous agroforestry species in Northern Ghana, are chosen for the case study. This multidisciplinary study utilises several methodologies of data collection and analysis to assess individual and household behaviour in the management of shea and locust bean trees, and the impact on the ecology of these species. The analysis of incentives (and constraints) stemming from differing tenure arrangements reveals differing attitudes among the households to the preservation and planting of these trees on their farmlands. Women, who are primary gatherers of non-timber products from these trees and hence the main beneficiaries, have differing access to these trees, depending both upon the status of their household within the community and the tenure rules in place. Econometric modelling of shea and locust bean tree densities reveals the socioeconomic and institutional determinants of these tree densities on the farmland, highlighting the importance of economic and institutional incentives and constraints in shaping the management practices, and subsequently the ecology of these indigenous economic species. The findings demonstrate that the vagaries of the resource-use dynamics should be taken into consideration by any policy targeted towards promoting sustainable management and utilisation of these valuable parkland species.

Contents

List of Tables

Chapter VII

List of Figures

Chapter VII

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Author's Declaration

I declare that this thesis represents my own work, except where due acknowledgement is made. It has not been submitted previously to this university or any other institution for a degree or other award.

Mahesh Poudyal

Chapter I - INTRODUCTION

Introduction

Traditional farming practices, such as long fallow systems, are increasingly under pressure in many parts of sub-Saharan Africa due to growing population and land scarcity, often leading to serious environmental degradation. Agroforestry systems, considered the traditional land use in much of semi-arid and semi-humid West Africa, are widely seen as a promising solution to land degradation problems, where trees (mainly economically valuable, multipurpose trees) form "an integral part of the system providing food, fuel, fodder, medicinal products, building materials and saleable commodities, as well as contributing to the maintenance of soil fertility, water conservation and environmental protection" (Boffa 1999). These multipurpose trees are also the major source (and most often the only source) of cash income to rural households, especially to women who are traditionally responsible for the collection of products from these trees (Boffa et al. 1996; Boffa 1999; Elias and Carney 2007). However, the populations of many of these tree species, such as shea (*Vitellaria paradoxa* C.F. Gaertn.) and locust bean (*Parkia biglobosa* (Jacq.) Benth.), are reported to be declining (Teklehaimanot 2004). Moreover, most of these tree species are left to grow and regenerate in wild conditions with virtually no planting by the farmers; although studies have shown that farmers protect or destroy seedlings and trees of specific species based on criteria such as growth, health, age and yield (Lovett and Haq 2000; Maranz and Wiesman 2003). It is widely acknowledged that the reasons for decline in the populations of these species cannot be explained only by local biophysical conditions, and that the prevailing land and tree tenure institutions influence the management decisions with regards to these tree species in agroforestry and other land use systems, thereby affecting their ecology (Fortmann

1985; Boffa 1999; Place and Otsuka 2000; Otsuka et al. 2003; Teklehaimanot 2004; Luoga et al. 2005).

Despite this recognition of the importance of institutional arrangements such as tenure rules and other socioeconomic factors in influencing the management and ecology of trees in agroforestry parklands, very little is understood about how *these factors affect the management and ecology of indigenous economic tree species like shea and locust bean*, especially their regeneration and growth. This thesis is an attempt to fill this gap in understanding by focussing specifically on the impacts of socioeconomic and tenure-related factors on the management and ecology of shea and locust bean trees. More specifically, the study explores the perceptions and behaviour of individuals and households towards these trees in the context of land and tree tenure arrangements (institutions), and local level socioeconomic factors (demographics, markets, resource scarcity etc.), so as to understand the dynamics in these agroforestry parklands. This study focuses on shea and locust bean trees in agroforestry parklands in the Northern Region in Ghana as a case study.

The shea tree, *Vitellaria paradoxa*, and the locust bean tree, *Parkia biglobosa*, are often referred to as associate species because they are found to grow together and with an almost identical range of distribution across Africa on the Sudan and Guinea savannah vegetation zones of sub-Saharan Africa, north of the equator (Hall et al. 1996; Hall et al. 1997; Boffa 1999). Both species form an almost continuous belt from Senegal in the west to Uganda in the east, although *Vitellaria paradoxa* found in southern Sudan, Ethiopia and Uganda is classed as subspecies *nilotica*, as opposed to subspecies *paradoxa* found in and west of the Central African Republic (ibid.).

These trees grow to 10-20 metres in height; both species mature relatively late, with first fruiting occurring only after 15-20 years (ibid.).

Fig 1: A typical agroforestry parkland in Northern Ghana dominated by shea trees. This picture was taken in Gbimsi, one of the study sites for this research, and shows a groundnut farm plot.

Research objectives and questions

The overarching aim of this research is to understand better the impacts of socioeconomic and institutional arrangements on the management, utilisation and ecology of the multipurpose tree species in agroforestry parklands in sub-Saharan Africa, taking the case of shea and locust bean trees in Northern Ghana for the study.

The main research question addressed in this study is:

"how do local institutional arrangements (political, social, economic) affect the management, ecology, and benefits distribution from indigenous economic tree species in agroforestry parklands?"

Understanding of the roles of socioeconomic and institutional processes in altering the ecological conditions of the agroforestry parklands will be crucial in devising policies that provide suitable incentives to the stakeholders for sustainable management of these parklands, which can ensure that the livelihoods of the people dependent on these resources are enhanced and their poverty reduced. In order to achieve this overall aim, this research has the following specific objectives.

1. To determine the importance of shea and locust bean trees for rural households and the distribution of benefits from them

Through a survey of a cross-section of households and communities, the full extent of the ecological, socioeconomic and cultural significance of shea and locust bean trees is explored based on the benefits (or perceived benefits) that households derive from these species. Benefits from resources, such as shea and locust bean trees, usually translate into the incentives that induce individuals and household into better managing those resources. This research investigates how the prevailing institutional arrangements, norms, culture and power structures affect the distribution of benefits among individuals and households, and whether they have the potential to provide the necessary incentives for better management of these resources in the long term.

2. To investigate human impacts on the management and ecology of shea and locust bean trees

Using qualitative and quantitative analytical techniques, the study estimates how socioeconomic and institutional factors affect the shea and locust bean trees on the farmlands. In particular, it investigates how land and tree tenure regimes, by generating certain incentives (or lack thereof), affect the management practices of these trees and subsequently their densities on the farmlands.

3. To explore gender dynamics in the management of these trees and its implications

Although men generally hold the controlling tenure rights over land and trees in agroforestry in these patrilineal societies, women are the primary gatherers of products from these trees, and hence the main beneficiaries (Schreckenberg 1996; Elias and Carney 2007). However, women are generally portrayed as being at a disadvantageous position with regards to land and tree tenure arrangements in Africa, with their access to and benefits from the resources considered 'secondary' to men (Hilhorst 2000). The study explores the gendered nature of tree tenure in agroforestry parklands, and how women negotiate these tenure arrangements vis-à-vis men and vis-à-vis other women in order to maximise benefits from these resources from their seemingly disadvantageous position. Furthermore, it considers how and whether women influence the management of these indigenous economic species in agroforestry through their status and position within their households.

This study uses the case of shea and locust bean trees in the agroforestry parklands in Northern Ghana to highlight the impact tree tenure regimes have (along with prevailing land tenure rules) in the management and utilisation of these two species. Given the economic, socio-cultural, and ecological importance of these parkland species in the region, it is hoped that the understanding of the impact of tenure regimes on individual/household behaviour regarding the management of these trees will help identify areas where any future policies related to these agroforestry parklands could be targeted so as to improve the livelihoods of the households in the region.

In contrast to a traditional book-style thesis, this study is a paper-based thesis and consists of three major research articles that have either been submitted to journals or

are in the process of submission (Chapters IV, V & VI). The thesis is given its final form with a chapter reviewing literature relevant to this study, a methodology chapter describing processes of data collection and analysis common to all major articles, and a concluding chapter summarising the major findings. A summary of each of the chapters following this introduction is presented below.

Chapter II – Tenure systems in agroforestry parklands: a review

The second chapter of the thesis discusses the current knowledge and understanding of the resource dynamics in the agroforestry systems, primarily in West Africa, based on previous studies. The objective is to find theoretical and analytical studies that this research could build on, but also to highlight the gaps in our understanding of the tenure in agroforestry systems, especially of tree tenure.

A general tendency in the study of African resource tenure has been to disproportionately focus on the land tenure issues, which, although important, does not capture all the peculiarities of resource use dynamics. This is especially true for agroforestry parklands, where tree tenure arrangements could be equally important as land tenure in influencing the management and appropriation of benefits from these landscapes. Nevertheless, the theoretical basis for many of the studies on land tenure issues – that security of tenure provides incentives to invest in land – often has a particular relevance to the study of tree tenure in agroforestry systems, where these trees are not just an integral part of the system, but are often constituted as major investments, especially when they are actively being planted and protected.

Furthermore, studies specific to shea and locust bean trees in West-African agroforestry parklands, as discussed in this chapter, reveal that both these trees, despite being among the most valuable indigenous species in these parklands, also

have a considerable negative impact on the crops. However, these trees are also reported to improve soil fertility and moisture content in the soil, thereby potentially helping in the crop yield. While these studies show the complexities in understanding the actual impact of these trees on the crops, they also highlight the complex interactions between these trees and crops, of which farmers will certainly be aware. Indeed, this research study subsequently included farmers' perceptions regarding the impact of these trees on their crop yield in the questionnaire survey in order to understand their experience as well as their perceptions regarding the impacts of these trees on their crops. Issues like these are likely to have a significant affect on how these farmers manage trees like shea and locust bean on their farmlands.

In recent years, there has been extensive research into understanding the potential impact of human land-use practices on the ecological characteristics of trees like shea in these agroforestry parklands. However, these studies, primarily carried out by researchers with a technical science background, seem to find it difficult to incorporate socioeconomic and institutional aspects of parkland dynamics, relating to human land use practices. As a consequence, these investigations usually analyse the variations in ecological characteristics of these parkland trees in various land use types, and conclude that land-use plays a significant role in determining those observed ecological characteristics of these parkland trees. These studies, despite recognising and highlighting an important aspect of parkland dynamics and finally 'bringing humans into the parkland systems', fail to go beyond their general inference about the impact on land-use on the ecology of parkland trees. These preliminary findings and postulations regarding the human impact on the ecology of parkland trees like shea have, however, created an opportunity to explore in-depth

the impact of tenure arrangements and socioeconomic characteristics of households in these parklands on the management and ecology of indigenous economic species, which this study benefits from. Therefore, this chapter not only provides a review of the literature on the aspects of agroforestry parklands and resource tenure relevant to this thesis, but it also shows how these studies have helped in refining and shaping this research itself.

Chapter III – Methodology

The third chapter describes the fieldwork processes used in this research. It provides the logic behind the selection of the study sites and describes briefly the general characteristics of these sites. The ethnic composition, general structure of local governance, and the prevailing systems of tenure in these sites are discussed, providing the background for a more in-depth data collection in the sites.

This chapter also outlines the data needs for this research, and provides a detailed description of the data collection methodology employed in the field. Furthermore, it justifies the use of one data collection technique over another (for example, rapid rural appraisal vs. participatory rural appraisal). The need for multiple, and multidisciplinary, data collection methodology is highlighted, as well as the need for multiple data analysis techniques.

Finally, this chapter describes the difficulty in collecting field data in different cultural and language settings. The use of interpreters, local facilitators and administrators/enumerators for the household questionnaire survey are described, and the ways to minimise errors and biases in the data collected are discussed. The chapter concludes by discussing the methodological challenges in conducting

multidisciplinary research, especially those that seek to combine aspects of social and natural sciences research.

Chapter IV – Chiefs and trees

The fourth chapter is the first of the three main research articles forming the core of this thesis. This article explores tree tenure in Dagomba traditional area, focussing specifically on the differences in the tenure rules for shea and locust bean trees. In this traditional area, shea trees belong to the landholder. However, locust bean trees are considered the "trees of the chief", and each community has a tree-chief, *Dohannaa*, who has full tenure rights over all the locust bean trees in the community. In contrast, despite having full tenure rights over their land, the common landholders have no tenure rights over locust bean trees, whether grown wild or planted. This study asks whether these differences in the tenure rules were causing these two species to be managed differently on the farmlands, with potential implications for the ecology of these two species in agroforestry parklands in this traditional area.

The article uses data gathered from field observations, key informant interviews, focus group discussions, and household questionnaire surveys in Cheyohi & Kpachi, two small adjoining Dagomba communities in Tolon-Kumbungu district in the Northern Region. The study identifies two major local stakeholder groups – households of chiefs and sub-chiefs, and non-chief households, and analyses their access to resources, appropriation of benefits and perceptions regarding shea and locust bean trees on the farmlands. The article highlights the major differences between these two groups in terms of their perceptions regarding shea and locust bean trees, their access to these two species, and finally the benefits they appropriate from these species.

The study presents some major and unique findings with regard to the implications of tree tenure regimes on the individual/household behaviour in managing their farmland, particularly the trees on their farmland. Specifically, it shows that restrictive tree tenure rules, such as those for locust bean trees, that benefit a few households, while negatively affecting the majority due to their perceived negative impacts on the crops, create disincentives for the majority of the households to preserve and plant these trees on their farmlands. In contrast, the study finds a healthy density of shea trees, substantial economic incentives from this species, and a positive attitude of the majority of the households towards the preservation and plantation of this species. As a consequence, the chapter concludes by highlighting the potential negative impact on the ecology of locust bean trees in the long run under the current tree tenure system for this species.

Chapter V – Coping with unfavourable tenure rules in agroforestry parklands

As Chapter IV showed, tenure rules often apply unequally to different stakeholders using the resources. Based on how these rules apply, the incentive structures might be different for different group, as well as the benefits that accrue from these resources to a particular group. This chapter analyses these issues based on the data gathered in another community, Yipala, a rural village within the Gonja traditional area in the Northern Region. More specifically, it explores how two groups of women, those belonging to the indigenous households and those from the households of the settlers, negotiate the existing tenure structures with regards to the access to and use of shea trees in order to maximise their benefits, and how each group copes with the tenure system they deem unfair.

The chapter relies primarily on the information gathered from the focus group discussions with the two groups of women from the indigenous and the settler households, with relevant additional material from the household surveys and key informant interviews. The study explores how these women go about securing their access to shea trees and sheanuts in various land types, but particularly on the older fallows, as these lands were not only one of the major sources for sheanuts but access to these lands was also the most contested.

Studies on the gendered nature of resource tenure in Africa generally agree that women are at a disadvantageous position compared to men, and that because of the lack of "ownership" of land for most women, their access to resources such as land and trees, usually controlled by their husbands or male relatives, has often been termed "secondary" (Hilhorst 2000). Women in various disadvantageous situations with regards to their access to resources have also been found to use formal and informal means to secure their access to and rights over resources, such as through purchase of land where a market exists, or manipulation of customary laws where possible (Kevane and Gray 1999). However, the tendency amongst researchers and policy-makers is still to look at "women" as a homogenous group who are disadvantaged in relation to men, and who "need to be helped".

A major contribution of this chapter is to highlight the differences within groups of women in a small rural community, not only in their level of access to shea trees, the most valuable non-agricultural resource in the area, but also in their unique way of responding to a seemingly disadvantageous position. The chapter concludes by emphasizing the need to consider these differences among women while formulating policies that seek to help improve their livelihoods.

Chapter VI – Tree tenure in agroforestry parklands: implications for management, utilisation and ecology of indigenous economic species

As discussed earlier, studies on tenure security, investment and productivity of African landscapes have largely ignored the issues of tree tenure, focussing primarily on the land tenure. However, due to the intrinsic nature of agroforestry parklands, the tree tenure institutions are just as likely to influence the human management of these landscapes, especially the indigenous economic trees such as shea and locust bean, and the utilisation of resources therein. Based on this premise, this chapter explores the impact of tree tenure institutions, along with other socioeconomic and land tenure factors, on the management and ecology of indigenous tree species, and the appropriation and distribution of benefits from those trees.

Chapter VI is also the third and the final article forming the core of this thesis. Indeed, this chapter focuses on the overarching objective of this thesis, taking further the analyses presented in Chapters IV and V. Based on the field data collected from the study sites in three main traditional areas within the Northern Region in Ghana, it explores the differences in tenure systems regarding shea and locust bean trees across these traditional areas. It further investigates whether (and how) the tenure arrangements and other local socioeconomic factors influence the management and utilisation of these two indigenous economic species in the agroforestry parklands. Using a simple econometric model, this chapter analyses and quantifies the main socioeconomic and institutional determinants of shea and locust bean tree densities in the study sites. Finally, the potential impacts on the ecology of these species in these traditional areas, based on the analysis of the tree densities, are discussed.

Studies have analysed the importance of local resource management institutions, such as tenure systems, in determining access to and rights over resources such as land and forests, and how individuals and households negotiate these institutions to gain access to and benefit from these natural resources (Berry 1989; Afikorah-Danquah 1997; Freudenberger et al. 1997). Furthermore, it has also been proposed that land and tree tenures not only affect how resources are accessed and benefitted from, but they also affect individual and household behaviour in preserving, planting and protecting trees, ultimately affecting their ecology (Bruce and Fortmann 1988). Understanding the effects of these tenure arrangements becomes crucial for agroforestry, where agricultural productivity and land use practice is inextricably tied up with the management of the tree species present in these landscapes. Moreover, separability of land and tree tenure arrangements, often present in African agroforestry systems (Fortmann 1985), means that studies focussing only on land tenures in these landscapes becomes inadequate and incomplete. Unfortunately, our understanding of the effects of tree tenure arrangements on the management of these landscapes, and especially on the management and ecology of the indigenous economic species, often the subject of differing tenure rules, is still very sparse.

Therefore, the major contribution of this chapter is in highlighting the importance of tree tenure in the management and ecology of indigenous economic species in agroforestry parklands through the analysis of the primary data from the field. Furthermore, this chapter shows that these tenure systems not only determine the access to and appropriation and distribution of benefits from these resources, but also create incentives (or disincentives) for individuals and households in managing these trees on their landholdings.

Chapter VII – Conclusions

The final chapter assesses the research questions posed in the introduction to this thesis in light of the findings from the research conducted, and in the wider context of the studies on African resource tenure. It summarises the research findings along thematic lines that emerge from this study, and that correspond to its specific objectives as outlined earlier in this chapter. The chapter then discusses how these themes relate to each other, setting them in the context of the overall resource dynamics in agroforestry systems. Finally, the chapter discusses how the findings from this research could contribute to formulating policies that seek to create better incentives for a sustainable management and use of these parkland resources. The chapter concludes by summarising the contribution of this thesis to academic knowledge, but also by highlighting the limitations of this research and suggesting potential areas for future research.

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Chapter II - LITERATURE REVIEW

Tenure in Agroforestry: Assessing the Behaviour of Individuals and Households Managing the Parklands

The importance of social processes and institutions, and their (potential) impact on ecology and environmental conditions has increasingly been recognised (and investigated) in recent years. These studies have often argued for more integrated analysis of the "social ecological systems" so as to "bring humans into the ecosystem", and with them all the associated institutional, socioeconomic and political characteristics (Berkes and Folke 1998; Berkes 2004). Indeed, studies have shown that the management and utilisation of resources by individuals, households and communities are characterised by their socioeconomic, cultural, political and institutional characteristics and constraints, which ultimately control their access to and rights over these resources (Berry 1989; Beck and Nesmith 2001; Adhikari et al. 2004; Coomes et al. 2004; de Merode et al. 2004; Masozera and Alavalapati 2004). Moreover, these factors not only affect how resources are appropriated, but also how they are managed, subsequently affecting their ecological characteristics – as Kepe and Scoones (1999), investigating the impacts of social institutions on grassland ecology in South Africa, conclude, grassland landscapes are "created through social processes".

In West African agroforestry parklands, human land use practices have long been recognised to have shaped these landscapes, where trees of a few selected economic species are scattered throughout the cultivated farms or on fallows (Pullan 1974; Lovett and Haq 2000; Maranz and Wiesman 2003). Furthermore, studies have highlighted the complexities in the agroforestry systems – physical complexities such as tree-crop interactions (Kater et al. 1992; Kessler 1992; Bayala et al. 2004), as well as institutional complexities stemming from various systems of customary land

and tree tenure practices (Fortmann 1985; Berry 1988; Augusseau et al. 2006). This chapter explores the studies on African resource tenure, focussing particularly on the importance of land and tree tenure regimes in the agroforestry systems. Furthermore, the chapter assesses the studies on shea and locust bean trees in West African parklands, and their attempts to link with and understand the impact of land use systems on the ecology of these trees – highlighting the gaps in our understanding of the impact of socioeconomic and institutional factors on the management, utilisation and the ecology of these species.

Land Tenure

Land tenure regimes and their impact on the wider socioeconomic and environmental systems have been an area of intense research and debate for decades, especially in the context of African countries who have embarked upon some of the most ambitious land tenure policies in the continent (Bruce and Migot-Adholla 1994; Murray 1996; Maxwell and Wiebe 1999; Gebremedhin and Swinton 2003; Tsikata 2003; Cotula et al. 2004; Pule and Thabane 2004; Benin et al. 2005; Lesorogol 2005; Deininger et al. 2008). It has been widely acknowledged that institutional arrangements like the tenure systems and other forms of social contracts do influence the decisions of individuals and households managing resources such as land and trees, and crucially their incentives to invest in these resources (Fortmann 1985; Berry 1988; Bruce and Fortmann 1988; Berry 1989; Sjaastad and Bromley 1997). Accordingly, one of the most studied aspects of differing land tenure regimes is the issue of tenure security and (agricultural) productivity from the land, primarily based on the assumption that a landholder's incentive to invest in land increases with the security of tenure (for example, Atwood 1990; Migot-Adholla et al. 1991; Place and Hazell 1993; Besley 1995; Sjaastad and Bromley 1997; Brasselle et al. 2002; Place

and Otsuka 2002; Smith 2004; among many others). In the Western view of land tenure, a secure tenure is generally seen as individual private landholding, as Demsetz (1967) argued in his paper on property rights almost half a century ago. However, in most of the African countries, despite the states promoting the Western model of tenure as the statutory tenure regime, land rights, especially in the rural areas, are still managed under customary tenure regimes.[1] Furthermore, even though the studies mentioned above analyse the impacts of tenure security on productivity generally, the main focus of these studies seems to be in assessing whether the statutory tenure, promoted by the governments (with help of international financial institutions in many cases), provides more secure tenure and hence a higher productivity than the customary tenure regimes. From the varying, and often inconclusive, results of these studies, it is clear that productivity under the customary tenure is no less than that under the statutory tenure regime, as David Atwood (1990, pp. 668-9) put it:

> The conventional and largely erroneous view of land registration's impact on agricultural efficiency and productivity in Africa stems from a failure to take adequate account of the extra-legal, informal, local institutional environment through which most rural Africans continue to acquire and maintain their claims to land. Establishing a land registry or land titling system often does not lead to a wholesale change from a traditional, informal set of property rights and rules to a modern, legal one…. It is not at all certain that the net effect on either productivity or equity is positive.

Atwood's conclusion about the impact of land registration on agricultural production still seems to hold water after two decades. In fact, a survey of the studies on this issue since the late 1980s reveals numerous similar conclusions: that modern,

1. In the simplest of terms, "customary tenure" can be defined as a system of tenure that is usually undocumented and is based on local-level practices (Whitehead and Tsikata 2003); and enforced in understanding between the individuals, households and lineages.

western-style statutory land tenure regime based on land registration and titling is not the panacea for solving the problems of low agricultural productivity in Africa (Migot-Adholla et al. 1991). Many studies have in fact failed to find any impact of tenure on agricultural productivity (for example, Gavian and Ehui 1999; Place and Otsuka 2002; among many others). Indeed, this seems to be the conclusion of another empirical study in Ghana by Besley (1995, p. 936) when he writes:

> Developing land rights is often offered as a feasible intervention, especially in Africa…. However, the analysis of this paper warns against viewing it as a panacea for problems of low growth and investment before the process determining the evolution of rights is properly understood.

Furthermore, even the basic assumption that the customary tenure regimes are essentially communal, with very few individual rights to land is also often contested. Ault and Rutman's (1979, p. 181) study of individual rights to property in Africa highlights this point further:

> …communal land tenure systems in tribal Africa were generally sets of individual rights that had yet to be defined or exercised. As long as transaction costs were positive, the African had little incentive to exercise his rights as long as the supply of resources exceeded demand. Once the demand for resources exceeded supply at zero price, individual rights to property were exercised.

Indeed, it has been argued that the "customary" tenure system as is now understood (as being essentially "communal") is in fact a colonial construct and heavily influenced by the colonial system of governance in these parts (Chanock 1991; Mamdani 1996; Lentz 2000; Kunbuor 2002). However, as Woodman (2001) points out, the rule of law in these societies may have been influenced by colonial institutions, but it should be recognised that a *dynamic* customary system existed even before colonialism and has been changing and evolving over time. Ault and Rutman (1979) concur with this notion of dynamic tenure responding to external

influences when they argue that individuals in tribal Africa respond to economic incentives as any other individual in developed economies of the west, and under the changing economic conditions, the customary law also changes to accommodate these incentives. They further point out that the native court decisions have led to the land tenure systems [that strengthened individual's rights to land], which reflected the changing economic conditions, mainly due to growing population and commercialisation in agriculture. In other words, customary systems can provide secure tenure rights to individuals in the same way statutory tenure (in the form of land registration and titling) is thought to do so, and as studies have shown, sometimes that security is even stronger (Atwood 1990; Barrows and Roth 1990; Migot-Adholla et al. 1991; Place and Hazell 1993; Bruce and Migot-Adholla 1994; Sjaastad and Bromley 1997; Brasselle et al. 2002).

The concept of tenure security providing incentives for investment in land becomes especially relevant when such investments form an integral part of the land use systems – as with the trees in agroforestry. Studies have shown, on the one hand, that planting of trees is influenced by the security of tenure on the land (Place and Otsuka 2002); while, on the other hand, trees are often planted to claim and to increase tenure security over the land (Fortmann 1985; Berry 1988; Sjaastad and Bromley 1997). Moreover, trees, as investments in agroforestry systems, do not just provide the benefits, but also come with costs as they often have a negative impact on the crops underneath (Kessler 1992). To make matters more complex, land tenure rules do not always apply to trees in Africa, and in most of the cases, especially where large economically valuable fruit trees are concerned, the rights to trees are often governed by separate tree tenure rules (Fortmann 1985; Fortmann and Bruce 1988;

Akinnifesi et al. 2006). This complexity is apparent in the following passage from Boffa (1999, pp. 126-7):

> Whereas annual crops generally belong to the cultivator whether he has permanent rights to the land or not, trees, and particularly perennial tree crops, may belong to one person while heritable rights to the land on which they grow may be held by another person, and yet another person or group may be entitled to gather products from the trees.

Although this distinction in tenure systems between land and trees has long been recognised, studies have largely focussed on land tenure issues, and ignored tree tenure, with a few exceptions. In the following section, the studies on the systems of tree tenures in Africa are discussed. Furthermore, the influence of land and tree tenures on one another is explored, especially in the context of incentives to invest in agroforestry trees such as shea and locust bean.

Tree Tenure

Although rights to trees are generally connected to the rights to the land on which they grow, it is quite common, especially in the African context, to have the rights to trees governed by a tree tenure regime, which is often distinct from land tenure (Fortmann 1985; Fortmann and Bruce 1988). Furthermore, it is not only that the land tenure regime affects the trees on the land; the reverse is often true in many instances, such as when trees are used to claim and secure rights to land (Fortmann 1985; Berry 1988). Of the few studies specifically dedicated to the understanding of tree tenure, Fortmann's (1985) study on the tree tenure in agroforestry, and Fortmann and Bruce's (1988) edited volume on tree tenure issues stand out as probably the most comprehensive works.[2] Fortmann (1985) identifies four main classes of rights

2. This section is based heavily on Fortmann (1985) and Fortmann and Bruce (1988).

making up the "bundle of rights" under tree tenure: (i) the right to own or inherit; (ii) the right to plant; (iii) the right to use; and (iv) the right of disposal. All these classes of rights, in some way, relate to or are influenced by the prevailing system of land rights. Moreover, characteristics and use of the trees as well as the features of the land tenure system in practice affect how and what rights are distributed and to whom, with regards to trees. Whether the tree in question is planted or has grown wild determines whether it is a private or a common property resource in a number of countries. The former is generally considered the property of the planter or the land owner, and the latter is considered as the community property (Fortmann 1985). Another factor that affects how and to whom tree rights are distributed is the nature of the use, which is directly related to the tree type. Trees that provide subsistence products, such as fruits and other non-timber products, are generally considered "common resource" open to all member of the community, especially when they are on common land (Fortmann 1985; Akinnifesi et al. 2006). Whereas access to and use of commercial trees are usually restricted to the landowner on whose land the tree is growing. Some cultures exhibit species-specific access and use rights to trees, as Howard and Nabanoga (2007) explore in case of the Buganda people in Uganda, where traditionally important species such as fig tree (*Ficus natalensis*) were protected with many rigorous (and complex) customary laws that gave tenure rights to specific individuals and excluded others; while fruits from exotic multipurpose tree species such as the jackfruit (*Artocarpus heterophyllus*) were accessible by individuals other than the owners of these trees for personal consumption.

Despite being considered distinct, land and tree tenures usually affect one another in a variety of ways. The strength of the impact of land tenure regimes on tree tenure and how trees are managed is usually higher, compared to the strength of the impact

of tree tenure on land. Tree rights are usually stronger in places where the land tenure is communal, favouring the tree planters (Fortmann 1985). Although it is generally accepted that the tree planters are the tree owners, the strength of their rights over trees could be curtailed by the strength of their rights over land, especially in places with strong private rights to land. Furthermore, if trees on the land are for subsistence use, such as perennial fruit trees, the landowner (or the tree owner for that matter) might not be able to restrict the access to and the use of trees by other members of the community (Fortmann 1985; Boffa 1999; Howard and Nabanoga 2007). In addition, ownership of certain indigenous fruit trees often belongs to certain individuals in the community, such as the ownership of locust bean trees by the chief or the original landowners, regardless of their current tenure rights over the land (Schreckenberg 1996; Boffa 1999). Such cases could create disincentives for preservation and planting of these trees, as Bruce and Fortmann (1988) argue.

In contrast to the landowners, tenants and borrowers of the land have mostly restricted rights to trees. For example, tenants could harvest non-timber products from economic trees for personal use but not for sale, they could not cut trees growing on the land, plant trees without owners consent, and even where they could plant trees, they generally have to share benefits with the owner (Fortmann 1985). Based on a study on tree biodiversity on farmlands and farmers' strategies in Burkina Faso, Augusseau et al. (2006) report that migrant farmers often get rights to farm on a land without any rights over the trees therein, although traditionally products from trees such as shea and locust bean used to be shared between the landowners and the tenant farmers. However, the study also reports migrant farmers starting to plant cashew on rented land, which could increase their tenure security on

the land in addition to providing cash income. Borrowers generally face even more stringent restrictions than the tenants where tree plantation is concerned – they are not normally allowed to plant trees on the owner's land at all (Fortmann 1985), however, the use rights of the borrowers could be less restrictive as they are likely to help protect trees on the lands they borrow (Boffa 1999). Furthermore, Boffa (1999) cites examples where the borrowers are given a share or all of the wild fruit crops, such as shea nuts. Like borrowers, the pledges or mortgagees have restricted rights to the land. Although the restrictions are very context specific, they are generally not allowed to plant trees without the owner's consent (Fortmann 1985).

In terms of gender, rights to trees generally seem to reflect the rights to land. In most African societies, where women are not permitted to own land, their rights to land, and the resources therein, such as the trees, are restricted – typically to use rights – on the husband's land or those of the relatives (Rocheleau and Edmunds 1997; Gray and Kevane 1999; Hilhorst 2000). However, women as the primary gatherers of tree products, especially non-timber products, can exercise substantial rights over the tree resources on their husband's land and those of other male relatives as Rocheleau and Edmunds (1997) demonstrate. Furthermore, through their study of rights to plant species in Uganda, Howard and Nabanoga (2007) demonstrate that rights to a particular species are often gender-specific, and under the customary systems, women often have as strong a right to plant resources as men. Moreover, through the cash income women earn from these tree resources, they can not only contribute substantially to their household's livelihoods but also exert a great deal of influence on how their husbands manage the land and the trees.

It is clear that both land and tree tenure regimes have significant implications for agroforestry, due to the very nature of this land use practice. However, despite a considerable number of studies of land tenure, investment incentives and agricultural productivity, very few contributions have focussed on the impact of tree tenure on similar incentives, such as to plant and protect trees on agroforestry parklands. Those that have tried to assess the determinants of tree planting on agroforestry systems, have usually focussed on economic determinants such as output prices (for example, Godoy 1992; Shively 1999), however, Godoy (1992) does recognise tenure as the "next most important determinant" after prices. The costs to the farmers in establishing trees in agroforestry is also seen as a major determinant to protecting and planting trees in agroforestry (Dewees 1995). Moreover, studies on tree planting in Malawi suggest that customary tenure systems related to marriage (uxorilocal) and inheritance (matrilineal) are creating disincentives to plant trees, especially by men (Hansen et al. 2005; German et al. 2009).

All these studies recognise the importance of tenure in the management of trees on the farmlands, especially by changing the behaviour of the individuals and households managing these lands and the trees therein. The understanding of the impact of tenure and other socioeconomic factors on the management behaviour as well as the subsequent impact on the ecology of parkland species becomes crucial, especially for economically valuable multipurpose species such as shea and locust bean. For they provide a significant contribution to the livelihoods of the poor rural households in the agroforestry parklands in Northern Ghana and throughout the West Africa, in addition to contributing to the national economy through their exports (Chalfin 2004; Teklehaimanot 2004; Elias and Carney 2007). In the following section, the studies focussing on these two species are reviewed to identify their

economic and ecological importance, as well as to identify the gaps in our understanding of the management and ecology of these two species, especially in the context of land and tree tenure institutions.

Shea and locust bean trees

Perhaps not surprisingly, studies on shea and locust bean trees in West Africa have been almost entirely on the technical aspects of these trees and on the parklands in which they stand. Studies of the socio-economic aspects of agroforestry parklands and the trees therein, by nature of these disciplines, tend to be broad in nature, hence encompassing the general issue rather than focussing on particular tree species such as shea or locust bean. In this section, a review of the studies on these two parkland species is presented, concentrating particularly on those published in English. It has to be acknowledged that there are numerous publications on shea and locust bean trees and on the agroforestry parklands in West Africa in French, however, scanning through the abstracts of these studies,[3] they too seem to focus mostly on scientific/ technical issues, with a few exceptions (Agbahungba and Depommier 1989; Zomboudré et al. 2005; Nouvellet et al. 2006; Diarassouba et al. 2008).

The tree-crops interactions involving shea and locust bean feature prominently in the studies related to these two species in agroforestry. Kater et al. (1992) looked at the effects of these two major tree species on the crops grown in the agroforestry parklands in Southern Mali. They studied the interaction between shea and locust bean trees and cotton, sorghum and millet crops. Of these six interactions, only shea-cotton was found to have no "tree-induced reduction" in the production of the crop.

3. The researcher's access to these francophone articles was limited to the abstracts due to the lack of knowledge of the French language.

Similarly, studying the effects of shea and locust bean trees on sorghum production in Burkina Faso, Kessler (1992) reported an average reduction in sorghum yield by 50% and 70% respectively under shea and locust bean trees. Although the study found a higher soil nutrient content under these trees, the reduction in overall yield is largely attributed to the reduced sunlight under the canopy of these trees. However, the study also argues that the benefits from these trees outweigh the losses in crop yields, thus giving farmers the incentives to maintain these trees on their farmland. A similar study by Boffa et al. (2000) also found reduced crop yield under the crown of shea trees in the parklands compared to the yield from the crops away from the crown. However, as with previous studies they also found a richer soil in terms of nutrient content closer to the trees. Moreover, the paper concluded that when the benefits from the sheanuts were taken into account, the landholders would be better off maintaining the trees on their farmland. From a slightly different study regarding the effect of shea and locust bean trees on the crops, Bayala et al. (2003) reported that through the application of mulch produced from shea tree pruning, millet production could be increased, however, the study found that locust bean mulch had a negative impact on millet yield. Other studies have also reported increased nutrient contents on the farmlands with these two tree species present, mostly directly below the crown (Tomlinson et al. 1995; Traore et al. 2004). However, the studies also suggest that species like shea and locust bean could be of great importance in maintaining soil fertility in the long run, especially as the farmers are beginning to farm continuously the same plot of land for a longer period than they used to because of population pressure and scarcity of farmland to follow the traditional farming practice of fallow-farm rotation.

The impact of trees such as shea and locust bean on crops is indeed an important issue, as most of the households managing these agroforestry parklands are subsistence-farming households. Accordingly, these households are likely to manage trees on their farmlands, as well as alter their farming practices, to maximise the benefits they receive from these agroforestry parklands. Moreover, as several studies have argued, the benefits from having trees on the farmlands compensated for any negative impact on crop yields, thereby making it beneficial to have trees on the farmlands (Kessler 1992; Boffa et al. 2000). In terms of the actual contribution of these trees to the total NTFP income of the households, Schreckenberg (1996) reports over 60% of the total NTFP income to the households in the Bassila region in Benin coming from shea and locust bean, whereas in Burkina Faso the contribution of these trees is reported to be even higher at over 85% combined (Teklehaimanot 2004). Indeed, studies have shown that shea and locust bean trees are among the most important sources of cash income of rural households across the region (Schreckenberg 1996; Chalfin 2004; Teklehaimanot 2004; Elias and Carney 2007). This not only means that farmers are likely to leave multipurpose and economically valuable trees like shea and locust bean on their farmlands, but also that they are likely to manage these trees more extensively so as to maximise their overall benefits from agroforestry. Although very few studies have looked into the socioeconomic determinants of household behaviour regarding the management of these trees in agroforestry, there are studies examining the variations in the ecological characteristics of shea and locust bean trees on various land use types to infer the impact of land use practices on these trees.

Studying the shea tree inventory on different land use types in Northern Region in Ghana, Lovett and Haq (2000) report a significant impact from farming practices on

the composition as well as population of valuable trees like shea on the farmlands. They find larger trees on intensely managed farmlands compared to fallows and bush. Moreover, the study reports of intensive management practices for trees like shea on farmlands including selective removal/retention of mature as well as young trees based on characteristics such as fruit productivity. A similar variation in the distribution of shea trees was found in Mali with fields and younger fallows containing shea trees with larger girth compared to older fallows and bush (Kelly et al. 2004). In addition, the study reports variation in spatial distribution pattern of shea trees between these land use types, with more regularised patterns found in fields and fallows. Furthermore, through the study of size class distribution of shea trees on farmlands and on protected woodland in Benin, Djossa et al. (2008) come to a similar conclusion in that they report larger trees on farmlands compared to the woodland. However, the study finds a higher density of shea seedlings and saplings in woodlands compared to farmed lands, inferring a negative impact of farming activities on shea regeneration. In contrast, a positive impact of farming practices on shea trees is reported in Mali as they appeared to provide better flowering conditions for these trees than fallow and forests (Kelly et al. 2007). All these studies show that management and ecology of economically valuable tree species like shea in agroforestry are influenced by local farming practices as well as the local needs of the farming households. Maranz and Wiesman (2003) report a similar finding but at a landscape level through their study of fruit traits as well as present and historic distribution of shea trees. They conclude that continued selection of desired traits in valuable species such as shea might have influenced their genetic variation, whereas their composition and distribution in agroforestry parklands is shaped by management of these parklands by humans to meet their resource needs. Local

people's preferences for shea fruits and nuts of particular characteristics is reported in a study by Maranz et al. (2004), which shows geographic as well as a gender dimensions to these selections. People from the northern and drier range of shea were found to value shea more for fruits and base their selection of trees based on fruits with more pulp, whereas people in wetter areas were found to value shea more for its nuts and hence for the fat in the form of shea butter. Similarly, the study reports men preferring sweeter fruits and those with more pulp, while women's selection was also based on high fat content, as they are the ones involved in the collection and trade of sheanuts and butter. These preferences for fruits and nuts are likely to influence the management of shea trees on their farmlands, including selective removal/retention, and subsequently the ecology of these trees as reported by other studies.

Summary

It is clear from the studies reviewed here that it is not just the biophysical factors that influence the ecology of tree species like shea and locust bean, especially on the anthropogenic landscapes such as agroforestry parklands where these trees are managed with the food crops. The studies of shea and locust bean trees on these parklands, although indicating the influence of land use practices on the management and ecology of these trees, have largely ignored the impacts of tenure systems, both land and tree tenures, on these parkland species. More specifically, the impact of land use practices on the ecology of these tree species is implied based on the observed ecological characteristics of these species, such as size-class and spatial distribution, on various land use types. A fuller understanding of the human impact on these trees, however, can only be gained by assessing how socioeconomic and institutional factors alter the land use practices and management of these trees on the

land in the first place, with consequences for the ecology of these species. Furthermore, studies need to take into account other factors such as land scarcity and an increasing pressure on land for intensive agriculture to feed a rising population as well as the market pressures on the land for commercial farming and urban development. Moreover, in many areas the impact of these pressures on land is already being felt in the form of long farming periods, reduced or no fallowing of land, in contrast to the traditional practice of regular farm-fallow cycle in these parts of the world (Lovett and Haq 2000; Augusseau et al. 2006). These intensive and long farming periods with reduced fallow have been blamed for the reduction in regeneration of tree species like shea and locust bean (Schreckenberg 1999; Lovett and Haq 2000), which could have major implications for their long-term population in these parklands. It is thus crucial that we have a better understanding of not just the ecological variations in shea and locust bean trees in various land use types, but also of the factors that are likely to influence the land use and management practices of these valuable trees on agroforestry parklands. Only then are we likely to be able to make informed policy decisions to facilitate sustainable management and utilisation of these valuable tree species in these agroforestry parklands, thereby leading to a better livelihood for the households who rely on these parklands for their sustenance.

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Chapter III - RESEARCH METHODOLOGY

Research setting

Northern Ghana, comprising the three political regions, Upper East, Upper West and Northern Regions, covers about 41% of the total land area of Ghana (Songsore 1996). These regions, lying in the Guinea-savannah agro-ecological zones, are also amongst the poorest in the country (Canagarajah and Portner 2003; Ghana Statistical Service 2008). Moreover, unlike other regions, Northern Ghana has persistently shown very low economic growth, and the poverty in these regions was found to be increasing during the 1990s (Canagarajah and Portner 2003). Mainly rain-fed, smallholder farming is the primary source of livelihood in these regions, with the majority of the population living in rural areas (Songsore 1996; Ghana Statistical Service 2008). Overall, in the provision of basic services like water, electricity, health services, as well as other facilities such as roads, transport, banking etc., Northern Ghana sits rooted at the bottom in comparison to other regions in Ghana (Ghana Statistical Service 2008). The reasons for this underdevelopment, often in stark contrast to the growing economies of the southern regions, are considered to have their origins not only in ecological characteristics of the region with unreliable rainfall and frequent droughts, low-soil fertility and short growing seasons, but also in political neglect during the colonial and post-colonial periods (Whitehead 2006).

Households and communities in these semi-humid and semi-arid savannah regions with high climatic and ecological variability, who primarily rely on rain-fed agriculture for their livelihoods, are often the most vulnerable. For these households and communities, diversification in the sources of income could be crucial if they are to avoid falling into poverty traps. At a regional level, diversification of exports and private sector growth are seen as essential for economic growth and poverty reduction (Canagarajah and Portner 2003). Multipurpose and economically valuable

trees like shea and locust bean have the potential to provide opportunities for income diversification at the local level as well as export diversification at the regional and national level. The potential of shea as a major source of income for Northern Ghana has been recognised since the colonial period (Chalfin 2004, pp. 89-131); however, this potential has not been realised at the scale perceived during the colonial and post-independence period in this region. Realisation of this potential could be constrained not only by the climatic/biophysical conditions but also by the local socio-economic conditions and the institutional arrangements, as well as the regional and national laws and regulations. In this respect, Northern Ghana provided a suitable region to study the role of socio-economic and institutional factors in altering the management and ecology of the shea and locust bean trees, subsequently influencing the livelihoods of the rural households who rely on these trees as a major source of cash income.

Selection of study sites and sampling

Among the three regions in Northern Ghana, I decided to focus my study only in the Northern Region for a number of reasons. First, for a research project of this size, it was not possible to cover all the three regions. By focussing on the largest region among the three that covered the breadth of the country, I hoped to capture at least the variability in this region in terms of land and tree tenure, and the management and utilisation of shea and locust bean trees on the farmlands. Secondly, there have already been a number of studies on shea, and generally on socioeconomic and political aspects of natural resources management, conflicts and poverty in the Upper East Region (see for example, Chalfin 2000; Chalfin 2001; Whitehead 2002; Lund 2003; Chalfin 2004; Whitehead 2006). In contrast, I have come across very few studies like these for the Northern Region, and none that has looked into the issues of

tree tenure in agroforestry parklands. Lastly, because of the necessity to cover a large area, mainly due to the comparative nature of this research looking into customary tenure systems of the major ethnic groups, logistically, it was much easier to cover multiple study sites within the Northern Region.

The region has three major traditional areas: Dagomba, Gonja and Mamprussi. Each area is governed by the paramount chief of the respective ethnic group, and the traditional governance structure follows down to the village level with various hierarchies of chiefs and paramount-chiefs in between. In each village, there is a local chief and a group of elders (who are often called sub-chiefs and are the chief's advisors). In order to cover the traditional tree tenure rules in all three ethnic groups, a purposive sampling was carried out to select the study sites – one in each traditional area. This purposive selection of the study sites followed from a number of exploratory visits to various parts of the Northern Region during June – August 2007. During these field visits, I had informal discussions with the community leaders (mostly chiefs and elders), farmers, and shea butter processors (exclusively women). The topic of these discussions included land use systems and practices, use of trees such as shea and locust beans and their importance at the household and community level, and general dynamics in the agroforestry systems (i.e., perceived interaction between different crops and trees, use and management of the trees, selection of tree species etc.). These interactions allowed me to refine my research questions substantially, and were also helpful in forming initial versions of questionnaires and semi-structured interview guides.

One of the most important aspects of these initial visits was that they provided opportunities to understand the key issues better, meet various stakeholders – from

government officials at the District Administration Offices to farmers in the rural communities - and to develop the framework for conducting more formal data collection later in the fieldwork. During this time, I also had the opportunity to talk to local experts, especially with the academics from the University for Development Studies (UDS) at Nyankpala, and prominent personalities in the shea industry in the Northern Region. This gave me a broader perspective, from local livelihoods to the industry-scale view, on the shea industry.

In terms of sampling, I planned to survey about 80-85 households from each study site. The decision on this sample size was based on the need to have large enough sample to conduct proper statistical analysis within and between these sites, at the same time staying within the logistic and budget constraints. Even with potential stratification in each site, this sample size was large enough to compare variations within groups of households, based on criteria such as ethnicity, settlement status or position within the community (for example, chiefs and non-chiefs), within a study site. These sampling considerations were also taken into account while selecting study sites in three traditional areas, and deciding on the sampling proportions.

After these initial field visits, observations and exploratory surveys, Cheyohi & Kpachi were selected in Dagomba, Yipala in Gonja, and Gbimsi in Mamprussi. A description of each of study site follows this section.

Cheyohi & Kpachi

Cheyohi (9º 26', 0º 59') and Kpachi (9º 25', 0º 58') are two small communities within Tolon-Kumbungu district in Northern Region of Ghana. They lie at about 21 km from the regional capital Tamale, and adjoining a fast-growing town of Nyankpala (Figure 1). Both the communities are homogenous in ethnic composition

with all households belonging to the Dagomba ethnic group, allowing the study to capture the Dagomba tenure systems for land and trees, and their systems of land use and the management of shea and locust bean trees on the farmland. Furthermore, being at a commuting distance from Tamale with regular local transport from Nyankpala, households in these communities had relatively easy access to the markets, and were aware of the commercial potential of both shea and locust bean trees, which was important in capturing the external influences in the management and utilisation of these tree resources. Moreover, being next to Nyankpala, with an increasing land scarcity, research in these communities allowed an examination of tree tenures in a context of resource scarcity and external pressures.

The community of Cheyohi had 102 households, while Kpachi had 29 households[1] – with a total population of 1393 and 409 respectively. Each had a chief, locust bean tree-chief (*Dohannaa*), and other sub-chiefs and elders. A 70% random sampling was carried out in each community (to include the replacement households if required) with a view to survey 60% of the households in total, which provided a total sample of 80 households, within the planned range. Of these 80 households, 62 were in Cheyohi and 18 in Kpachi. Primary data were collected in these two communities during October-November 2007.

1. The primary unit of survey for this research, a household, is defined as a person or a group of persons living together who eat from the same kitchen and share the house-keeping arrangements (United Nations 1997).

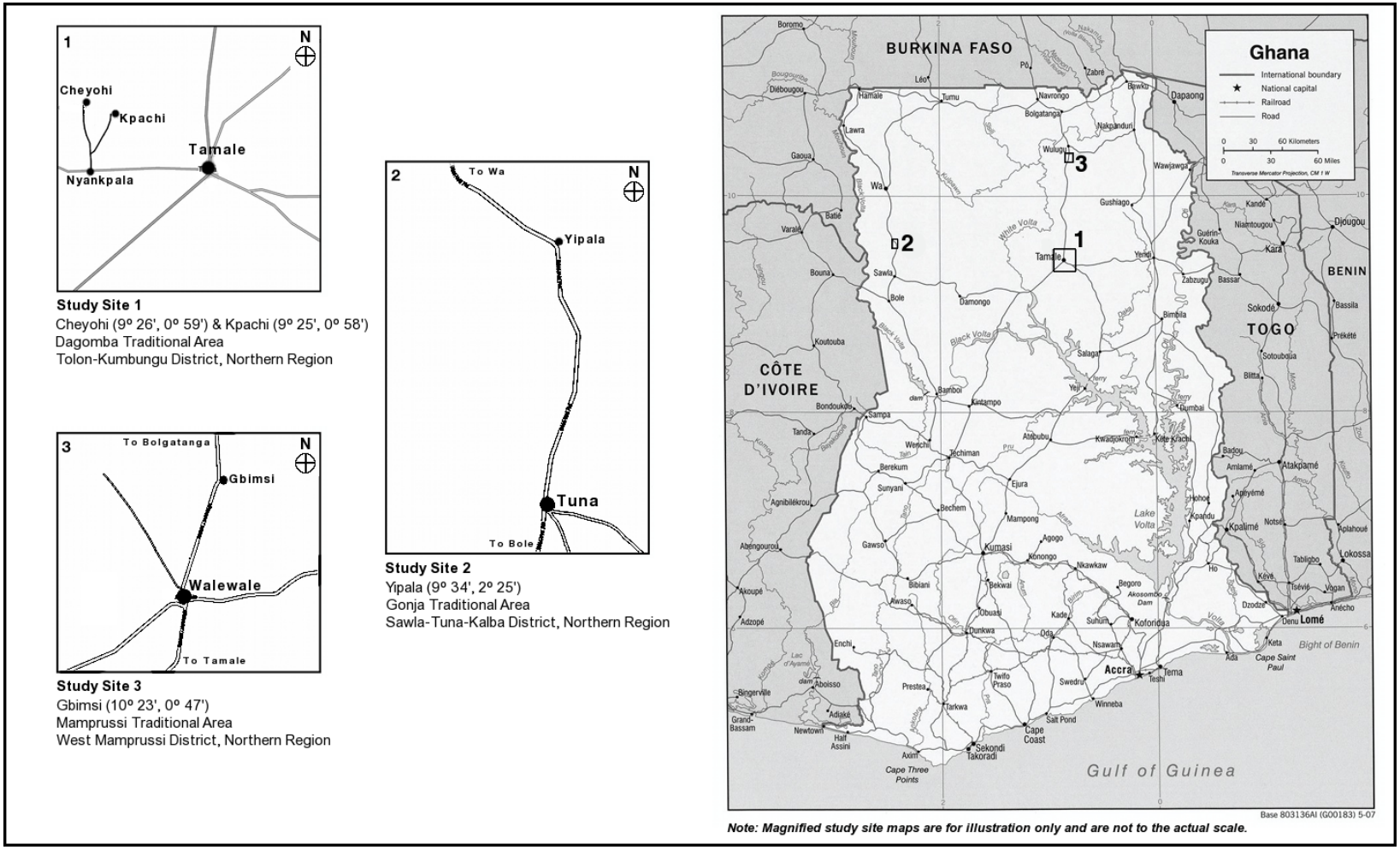

Fig 1: Map of Ghana showing locations of the three study sites. The magnified insets of the study sites are to illustrate their relative location from the nearest market towns and regional centres only, and are not to the actual scale.

Yipala

Yipala (9º 34', 2º 25') is a community of mixed ethnic groups within the Gonja traditional area in Sawla-Tuna-Kalba district in Northern Region, Ghana (Figure 1). The community has a Gonja chief, *Yipalawura*, but is otherwise diverse with Gonja, Wala, Dagarti and Lobi ethnic groups residing in the community. In addition, a few Fulani households have settled on the outskirts of Yipala.

Yipala lies on the Bole-Wa road with relatively easy access, through regular local taxi and bus services, to a small market town of Tuna, and a bigger town-centre Wa, which is the regional capital of the Upper West Region. However, compared to Cheyohi & Kpachi and Gbimsi, this community was the most rural with very little infrastructure development. The community is spread on either side of the main road, with almost all of the Gonja and Wala households residing on the eastern side of the road where the houses are built close to each other. On the other hand, Lobi-Dagarti households are on the western side of the road with their dwellings spread across a large area with households far apart. Unlike Gonja and Wala households, Lobi-Dagarti households have their farmland around their dwellings, with additional farmlands farther from the dwellings.

Primary data was collected in Yipala during November-December 2007. The community had a total of 161 households (excluding Fulani households that are not considered a part of the community proper), with a total population at the time of survey of 1813. A stratified random sampling was used to select the households for the survey so as to include households of all major ethnic groups proportionally in the final sample. The sampling was done at 60% (including replacement households), with a view to survey at least 50% of the total households to obtain a

total sample of 85 households within the planned range. The major stratification of the household surveyed was: 39 Wala (45.9%), 14 Gonja (16.5%), 1 Vagla (1.2%), 3 Dolime (3.5%), 15 Lobi (17.6%), 13 Dagarti (15.3%).

Gbimsi

Gbimsi (10º 22', 0º 47') is one of the largest settlements in the West Mamprussi district in Northern Region of Ghana. At the time of the survey during August-September 2008, Gbimsi had a total of 565 households and a population of 6002. Due to its considerably large size, the community was divided into 9 sections, called "*fong*", by the local community leaders themselves – each section with a male and a female leader who represented the concerns of the section to the community-level meetings and discussions. The community was composed largely of Mamprussi households; the rest of the households belonging to ethnic groups such as Frafra, Mossi, Kasina and Talensi. Seven of the nine sections were entirely composed of Mamprussi households, while the remaining two were mixed communities composed mainly of non-Mamprussi households.

In order to represent all nine sections within the community proportionately (and to capture non-Mamprussi households) in the final sample, a stratified random sampling method was employed to select the households for survey, with *fongs* representing the strata. Sampling was done at 15% to obtain a total of 85 households for the survey, of which 82 households were surveyed successfully. The sample surveyed contained 70 (85.4%) Mamprussi and 12 (14.6%) other (6 Frafra, 2 Mossi, 3 Kasina, 1 Talensi) households.

Data collection

The primary data required for this study can be categorised into two main types: socioeconomic (including institutional) data and ecological data (density of trees). The data collection methodologies were adapted accordingly to meet the data requirements for the study. I start with the collection methodology for socioeconomic and institutional data.

Socioeconomic data

This study combined rapid rural appraisal (RRA) techniques with a more traditional household survey method using a structured questionnaire to collect primary data on socioeconomic and institutional aspects of agroforestry. The use of RRA as opposed to more detailed participatory rural appraisal (PRA) methods was deliberate for a number of reasons – the most important being the nature of the study as academic research focussed as opposed to project focussed. In addition, PRA entails involving the local population (the subjects of research) much more and throughout the process of the research and during the analysis and sharing of the results, which was not possible for a research-focussed study. Generally RRA has been considered better suited to studies that aim to gather primary field data in a systematic way without taking too much of the precious time from the rural households/respondents (Chambers 1992, 1997).[2] Moreover, RRA was combined with more traditional data collection methods such as a structured household questionnaire survey and other technical field data collection, such as a tree census, which provided the opportunity to increase contacts with the respondents differently and cross-check and verify the information when needed.

2. For a more detailed comparison between RRA and PRA see Chambers (1997).

Following the well-established RRA techniques, initial visits to the study sites were made to gain familiarity with the study area, local stakeholders and key issues. The first visit involved following the local custom of greeting the local chief, often with a small gift, termed 'kola' locally. This was also the official entry to the community. Once the chief was made aware of the purpose of the visit and requested permission to carry out the fieldwork in his community, he gathered his council of elders and discussed the issue, and gave permission in consultation with his elders. This was very important, especially for an outsider going to a rural community for fieldwork, as without the consent and cooperation of the chief and elders, it would have been very difficult to get the cooperation of other households and respondents. Once the chief gave permission to carry out work in his community, it did not take long for the information to spread throughout the community, as the chiefs summoned their drummers to go around the community informing people of the visitors. This helped enormously in the surveys later on as everybody in the community was already aware of our presence, and often the purpose of our presence too. I also used these initial visits to the communities to identify the key informants for interviews, and identify the major stakeholders in the community for focus group discussions later during the fieldwork.

The first entry into the community also involved a walk through the community (a transect walk), with a handheld GPS unit helping to map a general outline of the community – the position of the dwellings and major settlements, and that of the farms, usually away from the settlements. Moreover, I was able to see and greet most of the community members during these transect walks, which was the starting point of repeated interaction over the course of the fieldwork in the community. Except for Cheyohi & Kpachi, which were at a commuting distance from Tamale, I stayed in

the community during the period of the survey, which allowed me the maximum contacts with the community members during the course of the survey.

Key informant interviews

In each study site, the initial visits not only provided the opportunity to understand the key issues related to land and trees, but also to identify the key local stakeholders. Chief and elders (often called sub-chiefs) were the traditional leaders of the each of these communities. Then there were individuals who were active in local level politics, especially in representing the community as unit-committee members or as assemblyman/woman in the local district assembly. These were often referred to as "opinion leaders". There were other individuals active in community activities, such as leaders of the youths, teachers and educators, women's group members, and so on. A number of key informants were identified in each study site from among these individuals who had a broad knowledge of issues related to land and tree tenure, local governance, and intra-community relationships, and who were willing to share that information in a personal interview. All key informants were interviewed following a semi-structured interview guide focussing on the areas of interest, which was flexible enough to include open-ended and follow-up questions as required (Appendix 1). The interviews were audio recorded, and those that were not in English were later transcribed with the help of the interpreters. These semi-structured key informant interviews concentrated on gathering community-level information, as well as the opinions of these individuals. Overall, in each study site, key informants were composed of at least one individual each from traditional leaders, opinion leaders, women's group, and farmers.

Focus group discussions

The identification of the local stakeholders was the key in selecting the number of focus groups in each study site. The main purpose of the focus group was to discuss and elucidate stakeholder specific information regarding the management and utilisation of shea and locust bean trees in these areas. Therefore, focus groups consisted of farmers who managed the land and trees on a day-to-day basis, women who gathered sheanuts and locust bean pods and marketed them, and women who processed and traded shea butter. Each focus group was homogeneous in terms of the participants, which was deliberate, as I did not want one or two members dominating the proceedings, and some members not expressing their views about the matter discussed. Finally, focus group participants were selected from the households that were not picked on the random sample for the household survey, as it was important to have as much unique representation in the data collection process as possible. In each study site, a minimum of three focus group discussions were carried out – one consisting of the farmers (male), one consisting of the sheanut collecting women, and one consisting of the shea butter processors (women). As with the key informant interviews, focus groups discussions followed a semi-structured discussion guide to incorporate major issues related to the particular stakeholder (Appendix 2). For example, FGDs with farmers focussed more on local agricultural production systems, management practices regarding trees on farms, their general views on trees on farmlands, perceptions about the mechanised farming methods etc.

Household questionnaire survey

The structured household questionnaire survey sought to gather detailed information on demographic and socioeconomic characteristics of the households, respondents' views on land and tree tenures, and perceptions of the effects of trees on the crops

(Appendix 3). The initial versions of the survey questionnaires were pre-tested, and revised based on the feedback from pre-testing to prepare the final version (Glewwe 2005a, 2005b). From each household, the household head (or the member responsible for providing for the household), and the head woman were interviewed. The household-level information related to income, expenditure and agricultural-production were collected for the 12-month period leading up to the survey using a recall method. "Off-farm income" included incomes from trading, employment, wage labour, and collection and sale of non-timber forest products (NTFPs). The information was recalled by the main respondents, with the help of relevant members of the household when necessary. For example, a household member working for seasonal wage labour would recall the total number of days worked and daily wage giving an approximation of her/his total income. The household head and the head woman from the household were interviewed separately. This not only allowed to record their views independent of each other, but it also gave flexibility in carrying out a rather detailed survey that took from one and a half to two hours in total (household head + head woman).

The survey questionnaires were prepared in English, and were administered in the local language by the enumerators with concurrent translations, and the final recording of the responses was done in English. For most of the structured questions, especially those asking about the agricultural inputs/outputs, incomes, and other numeric responses, or those asking the respondents to select from multiple choices, this concurrent translation posed no difficulty. Moreover as the enumerators became well versed on the questionnaire over time, they had all the standard translations in a local language for these kinds of questions in advance, speeding up the process. However, for the few open-ended questions, and those seeking perceptions of the

respondents about a particular issue, on-the-spot translation had a slight disadvantage in comparison to recording the responses in the local language. This was because the enumerators had to translate not just long statements and/or questions but also listen to the responses while recording those back in English. However, given the scale of the study it was not possible to prepare standardised questionnaire and responses in 4 or 5 different languages and translate them later. To minimise the errors that were likely to originate from these problems, and to obtain standard data from all sites, I spent a day or two before the start of the surveys briefing the enumerators, responding to their queries regarding the questionnaires, asking them to rehearse and do mock-up surveys. These sessions were vital in successful administration of the surveys later. I have detailed the process of selection of the interpreters, field assistants and enumerators, and their preparation for the data collection in a separate section below.

Fieldwork dates and data compatibility

Of the three sites selected for the study, I was able to conduct field data collection in only two sites in the year 2007 due to logistic constraints. The data was collected at the beginning of the dry season - late October to early December in 2007 - in Cheyohi & Kpachi and in Yipala. Field data collection in the third site, Gbimsi, was conducted during August-September 2008. The potential problems likely to arise in the comparative analysis of data between the sites where data was collected in 2007 and 2008 was considered thoroughly. As the survey questionnaire sought to gather information for 12 months leading up to the survey, there were some overlaps between all the study sites. This meant the condition for yields and prices, especially of the NTFPs such as sheanuts were similar. Moreover, during both the years covered by the survey, the yield of sheanuts throughout the Northern Region was

reported to have been lower than usual leading to the higher prices of the nuts. Most of the information on yield, sales and prices of sheanuts and locust bean gathered from the household in Gbimsi concerned those collected from the 2007 harvest. This was because at the time of the survey in this community, the harvest for 2008 (year of survey) had just ended and they had yet to start selling the fresh batch of nuts and locust bean. This meant, most of the data on prices and yield of these NTFPs coincided with those collected from Cheyohi & Kpachi and Yipala in 2007, where the fieldwork was conducted almost at the peak season for the sale of these products, with prices at their highest. A comparison of the prices between these two years as well as general yield in the study sites and the Northern Region at large was not found to be significantly different. Hence, in this study, the data gathered from all three sites are analysed as they are, without any corrective measures for the years of survey.

Census of shea and locust bean trees

In order to analyse how socioeconomic and institutional factors affect the ecology of shea and locust bean trees, I decided to use densities of these two species on the farmlands as an indicator variable to measure the impact on ecology. As I planned to do an exhaustive census of both these trees for each household surveyed, the census was only carried out on the farmlands that they were cultivating at the time of the surveys. A similar census on the fallows was not possible due to time and logistical constraints; however, general observations and rough estimations were carried out for some of the fallows to give an idea of the differences in tree densities between farmlands and fallows. Furthermore, the census was restricted to the farmlands that were within the three communities surveyed, as some households, especially those from Cheyohi & Kpachi, had additional farmlands in outside communities. An

exhaustive count of mature (fruiting and old non-fruiting) and young (taller than 1 metre, yet-to-fruit) trees of both species was carried out for all the households surveyed. In Cheyohi & Kpachi, I carried out the census with the assistance of a student from the Faculty of Agriculture at the University for Development Studies, Nyankpala campus, and a member from the household surveyed who was aware of the plot boundaries on all sides. In the other two study sites, I carried out the census on the first few farmland plots with the help of a member of the household surveyed who was aware of the plot boundaries while training an assistant with knowledge of the trees and farmland systems in the area. The rest of the tree census was carried out by these assistants with the help of a member of the household with knowledge of the plot boundaries. As the tree census was ongoing, I made frequent visits to the farms to check on the progress of the census, and to ensure the reliability and quality of the data collected.

Fig 2: Conducting shea and locust bean tree census in a farmland in Cheyohi, Northern Ghana.

Interpreters, enumerators, and local facilitators

Although the official language in Ghana is English, in rural areas very few people understand and speak English, especially those who have no formal education. In addition, the nature of this study in covering the three main traditional areas in Northern Ghana meant that there were at least three different languages across the study sites, and often more than one language spoken within a site, especially in diverse communities like Yipala. Thus, the role of interpreters, field assistants and local facilitators was crucial for the success of this study. At the beginning of my first field visit in June 2007, through local help, I was able to recruit an interpreter, Mr Yussif Sella, who could speak most of the languages spoken in Northern Ghana, in addition to being fluent in the main southern languages and in English. Mr Sella had a secondary-level education, and being a native of Bole in Northern Region who had travelled well within the region and beyond, he was very knowledgeable about the region and the local customs, especially about the formalities that needed to be understood with regards to the traditional chieftaincy even at the village level. Furthermore, over the course of my exploratory field visits to various communities in the Northern Region during June-August 2007, I found Mr Sella very knowledgeable about the farming system, trees on the farmlands, local livelihood practices, and he had excellent communication skills, which made my own contacts with the rural households extremely easy. Mr Sella worked with me, as an interpreter and as a field assistant, throughout my first field season in 2007. More specifically, he interpreted for me in all the interviews with farmers, women, chiefs and elders in the pilot study site of Kanfieyili near Tamale, and in the study site Yipala. In both these sites, he facilitated and interpreted the focus group discussions for me.

Furthermore, in Yipala, he helped me in carrying out the census of shea and locust bean trees on the farmlands.

For Cheyohi & Kpachi (2007) and Gbimsi (2008), I was able to find two undergraduate students in their final year at the University for Development Studies (UDS) who were willing to work as interpreters for me, and assist me in the tree census in these communities. Mr Adam Iddrisu, a native of Tamale and a final year undergraduate in Forestry and Agriculture at UDS-Nyankpala was an ideal assistant for Cheyohi & Kpachi. Mr Iddrisu himself came from a Dagomba family and understood the culture and language of these Dagomba communities well. Moreover, living in Nyankpala at a walking distance from the community, he was able to maximise his and my time with the community during the period of fieldwork. Mr Iddrisu interpreted for me during all the interviews and focus group discussions in Cheyohi & Kpachi, in addition to assisting me in carrying out the census of shea and locust bean trees on the farmlands in these communities. Mr Tahiru Mohammad Salifu, a native of Naliregu in Mamprussi traditional area, and a final year undergraduate at UDS-Wa, interpreted for me in Gbimsi. He also assisted in the tree census in the community. Again, being a native of the area, and a Mampruli speaker, Mr Salifu was well suited to his role, and performed an excellent task. Working with three different interpreters/assistants in three study sites was both challenging and rewarding. They were all excellent learners and hard workers, but also brought their unique perspective in terms of working with the community, and facilitating my communication to my interviewees. Before the start of the interviews, I briefed them on the issues to be discussed and gave them a copy of the interview guide to familiarise them with the general structure of the interview in advance. However, being semi-structured interviews with mostly open-ended questions, they had to be

prepared to translate my questions concurrently. All the interpreters were also made aware of their role in advance to translate everything that was being said and not to edit the replies. Moreover, in order to be able to record everything that was being said during the key informant interviews verbatim, they were recorded using portable audio recorder after getting consent from the interviewee. This also allowed crosschecking the interview notes with the translations from the recordings that were done afterwards. The key informant interviews that were not in English were transcribed later by the respective interpreters, and the transcriptions were cross-checked by my translator/field-assistant Yussif Sella.

A second group of assistants for my fieldwork were the enumerators who administered structured household survey questionnaires. Because of the wide range and complexity of the questions in the survey questionnaires, I again decided to recruit suitable undergraduate students in their final year from the UDS who had better understanding of the issues, both theoretical and practical. Moreover, I wanted to recruit individuals who were willing to learn, but would also follow the instructions as given so as to have standardised surveys in all the study sites. With the help of colleagues at the UDS, I recruited one enumerator for each study site. All these enumerators had previous experience of conducting PRA, RRA and other data collection exercises such as household questionnaire surveys. In order to make them aware of the research I was carrying out, and of the questionnaires they were going to administer, I conducted a one-day induction/training session, focussing on the specific issues related to my household survey questionnaires and research questions. This also gave them the opportunity to study the questionnaire, and raise and clarify any misunderstandings. During the administration of the household questionnaire surveys, I shadowed the enumerators during the first few surveys, and then left them

to carry out the surveys, with regular monitoring in order to verify, and make sure the administration of the questionnaires was up to the expected standard. Moreover, regular monitoring and contact with the enumerators gave them the opportunities to ask me questions raised by the households being surveyed, and clarify any new issues raised. Each survey questionnaire took one and a half to two hours to complete in its entirety. However, as the household head and the head woman were interviewed separately and independently of each other, the length of time spent with each was not too long to create survey fatigue.

The choice of interpreter from outside the study sites was a deliberate one. Although it took a little longer for these interpreters to get acquainted with the community and gain their trust so as to elucidate true information, they also brought an 'objective eye' to the issues being discussed, and brought neutrality to the interviews which was important in reducing the bias. Furthermore, my research questions, especially related to tenure systems and conflicts, were often very sensitive, and the interviewees were often not willing to discuss their opinions with another villager openly. Moreover, in many of these communities, selecting one member of the community as an interpreter often created a situation of conflict, especially if more than one person was able to act as an interpreter. The one selected felt he was being given preferential treatment, while those not selected felt they were being discriminated against.

In terms of the gender of the enumerators, interpreters and the assistants, the decision while selecting/recruiting was based on research as well as practical concerns. Although, it is generally believed that women interviewees are likely to confide better to a woman interviewer, for key informant interviews, it was I, a male, who

was asking the questions, and the role of an interpreter was just that. This meant, making the women interviewees comfortable was the primary objective, and in all the study sites, through prior contact through the community walks, general meeting with the community members, and specifically with the women's groups, I was able to convey to the women in the community the purpose of my visit, of the research and the importance of the information they would be asked to provide either through the key informant interviews, focus group discussions or the household surveys. This meant that in all the communities, I found women willing to talk to me through a male interpreter and willing to respond to my queries as best they could. Moreover, as all of these interpreters were from outside the community surveyed, the women as well as the men interviewees had that freedom to talk about some of the sensitive issues without worrying about antagonising other community members with their views. Another important reason in selecting men interpreters was that they were also required to function as general field assistants to help in tree census. Since it was not possible to find a women interpreter/assistant who was also willing to go out in the fields to count shea and locust bean trees, I had to resort to selecting men interpreters/assistants.

However, for administering the household surveys, I was able to recruit women as enumerators for Cheyohi & Kpachi and Gbimsi, while for Yipala I had a male enumerator. Having a woman enumerator had its benefits. First, there was a large (and separate) section in the household survey questionnaire for the head woman of the household, asking her of not just general information about her economic activities and such but also of her opinion about some of the sensitive issue such as tenure, conflicts and management of trees in the farmland. Although, through gradual immersion in the community and by gaining the trust, the male enumerator

in Yipala was able to conduct a successful survey, it did take him a little longer initially. While the women enumerators in other two sites were able to talk to the household heads and especially the head women without much difficulty from the start. On the whole however, both male and female enumerators carried out the household surveys equally successfully.

However, there were one or two key informants and facilitators in each of the communities surveyed who were able to assist in collecting community-level information, such as the list of the households, total population of the community, and so on. These individuals assisted me in setting up meetings with the chiefs, elders and other members of the community, and in organising focus group discussions. These individuals were also very helpful in disseminating information to the community as and when needed.

Data analysis

The collected data was entered and analysed in SPSS 16.0 (SPSS Inc. 2008). The primary objective of this study was to explore the differences in tenure systems with regards to shea and locust bean trees in three main traditional areas in the Northern Region in Ghana, and to investigate whether (and how) the tenure arrangements and other socioeconomic factors in these study areas influence the management and use of these two tree species on the agroforestry parklands, especially on the currently farmed plots. Hence, the study focuses on the comparative analyses of the study sites in terms of demographic and socioeconomic characteristics, tenure systems (land and tree tenures, focussing primarily on tree tenure), and the density of shea and locust bean trees on the farmlands. The study also investigates the potential relationships

between the variables of interest, within and across the sites using correlation and crosstabulation.

For the qualitative data, such as the respondents' perceptions regarding the tenure systems, impact of trees on crops and so on, qualitative data analysis techniques such as ordering, ranking, crosstabulations are used to understand the variations within and across the study sites. Furthermore, the study attempts to build coherent 'narratives' (Abbott 1992; Abell 2003, 2004, [1986?]), based on the actors' (individuals or households) observed actions and responses, to understand their behavioural pattern in the management of indigenous economic trees on the farmlands, given the set of incentives and constraints generated by socioeconomic factors as well as tenure arrangements. However, the multidisciplinary nature of this study meant that it does not use a single methodology, such as 'narrative analysis', as the main analytical framework. Instead, the thesis tries to integrate multiple methods of analysis, both qualitative and quantitative, and from multiple disciplines, to analyse and interpret the field data. Furthermore, the paper-based structure of this thesis has meant that each article employs a set of analytical methodology relevant for the problematic analysed in that article, which are described in those chapters. This chapter only presents some of the 'general' techniques used for the analysis of the collected data that cuts across all major analytical chapters.

For quantitative data, descriptive statistical methods, and comparative analysis techniques such as Independent samples t-test, ANOVA were used to analyse the variables of interest. Finally, correlations were performed among the variables of interest to explore potential relationships between these variables, with a view to performing regression afterwards. A series of regression analyses was carried out

with the density of shea and locust bean trees as independent variables to understand and quantify the impact of socioeconomic and other tenure-related factors on tree densities on the farmlands. The ultimate aim of this exercise was to understand the potential impacts of these factors on the ecology of shea and locust bean trees, particularly in the long term, taking densities of these species as an indicator variable of their ecological health.

Methodological challenges in the study of agroforestry parkland dynamics

Studies on resource systems like agroforestry parklands demand multidisciplinary approaches. The reason being that these systems are primarily considered to be anthropogenic (Pullan 1974; Maranz and Wiesman 2003), which invariably means aspects of socioeconomic and institutional factors that influence human behaviour will ultimately shape these systems. As a result, a fuller understanding of the resource-use dynamics will only be attained through a holistic, multidisciplinary approach that seeks to understand both ecological and socioeconomic characteristics of these landscapes. Although in theory, it could easily be attained by combining natural science and social science approaches, in practice, and especially in field-based research, this poses enormous challenges, particularly in data analysis. However, the overwhelming, and growing, need for this kind of integrated research in integrated systems like agroforestry means that innovative methods have been devised and used increasingly in recent years. This research is but one such case where ecological and socioeconomic aspects agroforestry parklands have been analysed as one integrated problem.

As discussed in previous chapters (1 & 2), very few studies have attempted to analyse resource-use dynamics in West-African agroforestry parklands by analysing socioeconomic and institutional factors relating to indigenous economic trees together with their ecological characteristics, such as density. In this respect, this study presents a novel case study on how we can start to analyse agroforestry parkland dynamics using socioeconomic and ecological data and methods.

The description and discussion earlier in this chapter regarding the data collection methodologies sufficiently highlight the difficulties involved in research of this kind. Notwithstanding the differences between natural and social scientific data collection methods, the difficulties also arose from aspects such as language and culture, which have been dealt with in depth earlier. However, the major challenge of this study was in analysing socioeconomic data together with ecological data. This study takes a middle ground in that it tries to simplify the models estimated as much as is possible without losing the core analytical framework that the model is built upon (Chapter VI). This could be a potential weakness of this research. However, I would argue that given the core objective of this research, as well as the in-built constraints (economic, logistical) for a research of this size, this middle ground represented the most appropriate approach. In the absence of these constraints, of course, it would have been possible to improve and expand the data gathered – both social and natural science data – and extend and improve the basic analytical framework as presented and discussed in Chapter VI, and the analysis of the model depicting the agroforestry parkland dynamics.

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Chapter IV - CHIEFS AND TREES

Chiefs and trees: tenures and incentives in the management and use of two multipurpose tree species in agroforestry parklands in Northern Ghana

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Abstract

Amid growing concerns about the perceived population decline of shea (*Vitellaria paradoxa*) and locust bean (*Parkia biglobosa*) trees in the agroforestry parklands, this article explores the impacts of differing tree tenure regimes on their management and use. Using a case study of Dagomba communities in Northern Region, Ghana, the study shows that the differing institutional arrangements governing the ownership, access and use of these two species have led to different sets of incentive structures that have contrasting effects on the management of these species. Shea, in general, seemed to fare much better than locust bean under the current customary regulations. The research finds that in the absence of proper incentives, old and dying locust bean trees might not be replaced by young ones, thereby further jeopardising its population, and along with it a variety of benefits it accrues to these rural communities.

Keywords: tree tenure, property rights, shea, locust bean

1. Introduction

Studies on land tenure regimes in sub-Saharan Africa (and elsewhere) have focused primarily on the issues of tenure security, investments and productivity for various forms of land use practices, including agroforestry. These studies generally posit that security of tenure encourages investments in the land because legally secure tenure gives the owners more incentives to invest in "their" land, and that entitlement documents allow owners to obtain loans or guaranteed investments easily by using land as collateral (Ault and Rutman 1979; Feder and Noronha 1987; Sjaastad and Bromley 1997; Platteau 2000). However, most studies of tenure security and investments, and their subsequent impact on productivity, have not produced clear results (Atwood 1990; Barrows and Roth 1990; Place and Hazell 1993; Besley 1995; de Zeeuw 1997; Sjaastad and Bromley 1997; Brasselle et al. 2002). Furthermore, some scholars have questioned the direction of causal relationship between tenure security and investments, stating that investments in the land, such as tree planting or development of physical infrastructures, are just as likely to lead to greater tenure security, as tenure security is to lead to greater investments in the land (Besley 1995; Sjaastad and Bromley 1997). As Sjaastad and Bromley (1997) conclude: "tenure security is a result, as well as a cause of land use decisions". Moreover, reviewing earlier studies on tenure security and productivity, it becomes clear that most studies seem to be concerned, ultimately, with whether statutory (and mostly free market oriented) tenure regimes provide better tenure security compared to the customary tenure regimes. Again, the results are not straightforward, and in several cases, customary tenure has been shown to provide as much security as statutory tenure – and sometimes even more (Atwood 1990; Barrows and Roth 1990; Migot-Adholla et

al. 1991; Place and Hazell 1993; Bruce and Migot-Adholla 1994; Sjaastad and Bromley 1997; Brasselle et al. 2002).

The incentives/disincentives, such as from the security/insecurity of tenure,[1] that promote/hinder investments in the land become particularly relevant when such investments are an integral part of the land use systems – such as trees in agroforestry. Moreover, agroforestry systems are not only affected by land tenure but also by tree tenure regimes in place, both of which often have complex institutional arrangements based on the prevailing customary and statutory tenure systems.[2] It is often the case that having a certain bundle of rights does not necessarily guarantee access to resources - it is how individuals and households exercise their rights vis-à-vis other individuals and households in the society, often bounded by institutions such as marriage, lineage, and chieftaincy (Berry 1988, 1989, 1997). Furthermore, land and tree tenure could be distinct such that the ownership, access and use rights to perennial trees like shea and locust bean could belong to different (and multiple) individuals or groups than those who hold the rights to land (Fortmann 1985, Boffa 1999). Although various systems of land and tree tenures have been studied across West African agroforestry parklands, very little is understood about how these tenure

1. A term usually associated with "rights", tenure systems in the context of this study mean the rules/ institutional arrangements whereby an individual or a household or a group of individuals/households is given some form of rights (among the bundle of rights usually associated with the resource (Schlager and Ostrom 1992)) to access, use, control, or appropriate benefits in some form or other from that resource.

2. "Customary tenure" should be understood in this paper as a system of tenure, often undocumented, based on the local-level practices (Whitehead and Tsikata 2003) and understanding between the individuals, households and lineages. A complex and controversial issue, customary tenure in Africa has been variously defined, understood and debated (see for example, Chanock 1991, Mamdani 1996, Lentz 2000, Woodman 2001, Kunbuor 2002, among many others).

systems and other socio-economic factors affect the management of valuable tree species like shea and locust bean in these parklands. This article examines one such case in the Dagomba land[3] in Northern Ghana, where shea and locust bean trees are managed under different tenure structures. More specifically, it examines the incentives in the present institutional arrangements with regards to these trees, and explores how these incentives influence household behaviour in managing these trees.

This article is structured as follows. Section 2 sets the context for this study and outlines the main research questions. Section 3 describes the methodology of data collection and analysis. Results are presented in section 4, followed by a discussion of the findings in section 5 and a summary of the major conclusions in the final section.

2. Tree tenure in agroforestry parklands: incentives and constraints

Agroforestry parklands, often referred to as 'farmed parklands' are the main feature of the semi-humid and semi-arid landscape in West Africa where mature trees of a selected few species occur scattered across the cultivated fields or fallow (Pullan 1974). In Northern Ghana, shea and locust bean are two common tree species found in farmed parklands, whose ecology, as Pullan asserts, has been shaped by human activities. Whilst intensification of agriculture has decreased the overall number of trees, it has also led to a selective protection of certain tree species, with only two or three species, typically including shea and locust bean, kept in the parklands (Blench 1999; Lovett and Haq 2000; Maranz and Wiesman 2003). Shea and locust bean trees

3. Dagomba is one of the major ethnic groups in Northern Ghana, and the area governed by them is termed Dagomba land (or interchangeably, Dagbon or Dagomba traditional area).

are generally retained for their economic benefits, however, they may also be kept on the farmlands as a result of traditional tenure restrictions that prevent cutting of these trees, such as by migrant farmers (Augusseau et al. 2006).

Shea, *Vitellaria paradoxa*, and locust bean, *Parkia biglobosa*, are often referred to as associate tree species because they are found to grow together and with almost identical distribution range across Africa on the Sudan and Guinea savannah vegetation zones of sub-Saharan Africa, north of the equator (Hall et al. 1996, 1997; Boffa 1999). Both species form an almost continuous belt from Senegal in the west to Uganda in the east (ibid.). These trees grow 10-20 metres in height; and both species mature relatively late, with first fruiting occurring only after 15-20 years (ibid.).

People living in semi-humid and semi-arid zones of sub-Saharan Africa have traditionally used shea butter as their main cooking fat, and for purposes ranging from medicinal to traditional ceremonial use (Chalfin 2004, pp.7-9; Lovett and Haq 2000). Moreover, shea also provides a major source of cash income to many rural households through the sale of its fruits, nuts, and locally processed butter. In recent years, the demand for shea butter on international markets has made shea an international commodity (Chalfin 2004, pp.157-184). In contrast, the locust bean is still extensively traded and used locally to prepare a condiment called *dawadawa*, which is used in soups and stews. In Northern Ghana, although not as populous as shea trees, the locust bean is still considered important economically and for its traditional uses, and *dawadawa* is still the favoured condiment for many rural households. Moreover, studies in other West African countries show that locust bean trees provide one of the highest sources of non-farm income for rural households

(Hall et al. 1997, pp.48-50; Teklehaimanot 2004). It is thus clear that these two species have the potential to provide significant economic incentives to the households to preserve them in their farmlands.

In addition to the economic benefits, shea and locust bean trees could provide additional benefits, such as defence against erosion, moisture retention and higher nutrient content in the soil (Boffa et al. 2000). However, studies have also shown that both trees could have negative impacts on the crops (Kessler 1992; Kater et al. 1992). Thus farmers have to make a trade-off between benefits and costs of having trees on their farmlands when making management decisions regarding these trees. As Bruce and Fortmann (1988) posit, preservation, protection and planting of trees will not occur if these activities are costly, and unless people get the right kind of incentives. Furthermore, it is often the case that the prevailing systems of tenure make these activities costly (ibid.). Thus, the selection of a particular tree species to keep on the farmed parklands, and the decision to plant or remove others, could be driven not just by economic concerns but also by institutional and other socio-political factors.

Under the customary tree tenure regime in the Dagomba traditional area, shea trees belong to the landholder using the land. In contrast, locust bean trees come under the domain of the chiefs – and usually, there is a "tree chief", *Dohannaa*, in each community who has full tenure rights over all the locust bean trees in the community. The common landholders, while having full tenure rights over their land, have no tenure rights over the locust bean trees on their land. So, the issue here is that even when farmers/landowners have secure tenure over their land, the locust bean trees, whether grown wild or planted by themselves, would not belong to them.

This is likely to affect the way farmers manage locust bean trees on their farmland. Furthermore, due to different tenure regimes between shea and locust bean trees for most farmers, the management of these two species on their lands are likely to differ*, with a subsequent impact on their current population and the viability of their future population.* This proposition is analysed based on three specific research questions.

(i) *What are the major distinctions between shea and locust bean trees in terms of their tenure?* By identifying the major distinctions between the tenure rights over shea and locust bean trees, we can identify whether the tenure regime is likely to provide particular incentives, and to which stakeholders in the community.

(ii) *What are the contributions of shea and locust bean trees to the households?* It is essential to ascertain and compare the contributions of these species to household income and to other non-monetary benefits to assess the level of incentives available to the households to manage these trees on their farmlands. It is expected that farmers would be more favourable to protecting the species that provides relatively higher benefits to their households.

(iii) *What are the perceptions of various stakeholders towards shea and locust bean trees?* Understanding the perceptions of various stakeholders towards shea and locust bean trees should provide an insight into how they are managing these trees on their farmland, and how they might manage them in future.

3. Study sites, data collection and analysis

Two adjoining communities – Cheyohi (9º 26', 0º 59') and Kpachi (9º 25', 0º 58') – in the Dagomba traditional area in Northern Ghana, next to a fast-growing town of Nyankpala, were selected for this study (Map 1). The communities were at a

commuting distance from the regional capital Tamale, which meant they had relatively easy access to the markets, and were aware of the commercial potential of both shea and locust bean trees. Furthermore, being next to Nyankpala, with an increasing land scarcity, research in these communities allowed an examination of tree tenures in context of resource scarcity and external pressures.

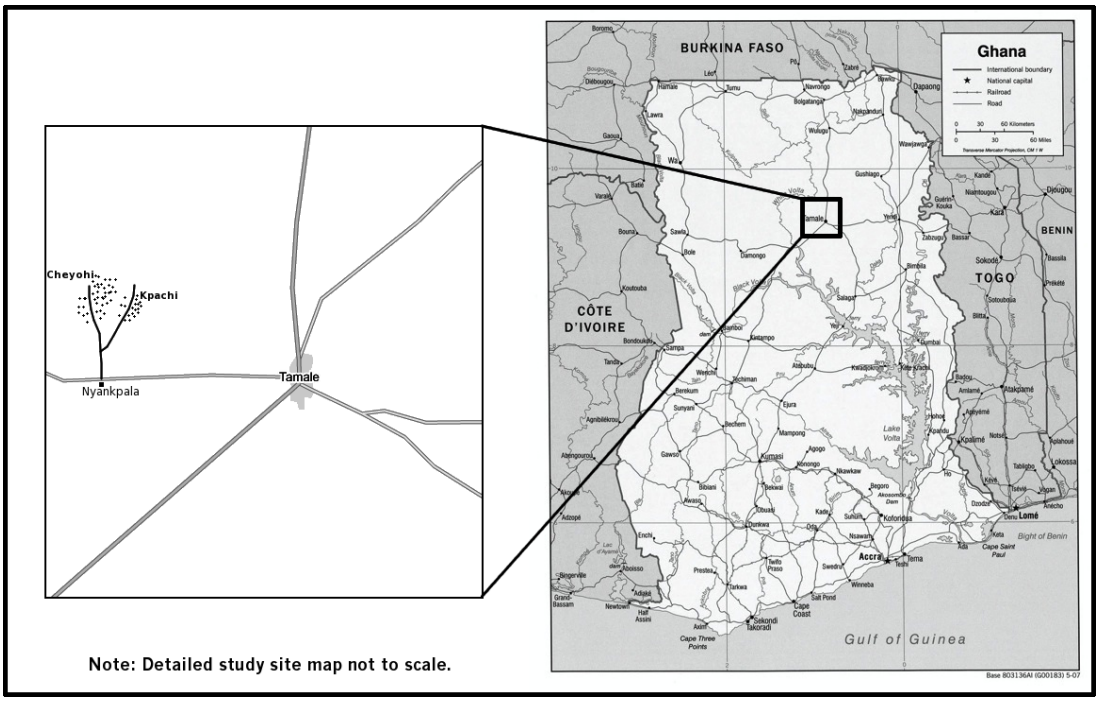

Fig 1: Map of Ghana showing Northern Region Capital, Tamale and the location of study site. The location of the communities Cheyohi and Kpachi relative to the town centres of Nyankpala and Tamale is for illustration only and is not to scale.

Cheyohi had 102 households, while Kpachi had 29 households[4] – with a total population of 1393 and 409 respectively. Each had a chief, tree-chief, and other sub-chiefs and elders. Both the communities were homogenous in ethnic composition with all households belonging to the Dagomba ethnic group. A 70% random sampling was carried out in each community (including replacements) with a view to

4. The primary unit of survey for this research, a household, is defined as a person or a group of persons living together who eat from the same kitchen and share the house-keeping arrangements (United Nations 1997).

survey 60% of the households in total, which resulted in a total sample of 80 households: 62 in Cheyohi and 18 in Kpachi.

Primary data was collected, during October-November 2007, through (i) key informant interviews and focus group discussions (FGDs), (ii) household questionnaire survey, and (iii) census of shea and locust bean trees. Initial visits to the study sites were made to gain familiarity with the study area, local stakeholders and key issues. Key informant interviews and FGDs concentrated on gathering community-level and stakeholder-specific information. The structured household questionnaire survey sought to gather detailed information on socioeconomic characteristics of the households, respondents' views on land and tree tenures, and perceptions of the effects of trees on the crops. The initial versions of the survey questionnaires were pre-tested, and revised based on the feedback from pre-testing to prepare the final version (Glewwe 2005a, 2005b). From each household, the household head (or the member responsible for providing for the household), and the head woman were interviewed. The household-level information related to income, expenditure and agricultural-production were collected for the 12-month period leading up to the survey using a recall method. "Off-farm income" included incomes from trading, employment, wage labour, and collection and sale of non-timber forest products (NTFPs).[5] The information was recalled by the main respondents, with the help of the relevant member of the household when necessary (for example, a household member working for seasonal wage labour would recall the total number of days worked and daily wage giving an approximation of her/his total income).

5. NTFPs, following FAO's definition, are defined as products of "biological origin other than wood, derived from forests, other wooded land and trees outside forests" (FAO Forestry 1999).

Finally, a census of shea and locust bean trees was carried out on the farmlands of all the households surveyed. The census was restricted to the farmlands that were within these communities, as some households had additional farmlands in other communities. An exhaustive count of mature (fruiting and old non-fruiting) and young (taller than 1 metre, yet-to-fruit) trees of both species was carried out for all the households surveyed. The author carried out the census with assistance of a student from the Faculty of Agriculture at the University for Development Studies, Nyankpala campus, and a member from the household surveyed who was aware of the plot boundaries on all sides.

The collected data was entered and analysed in SPSS 16.0 (SPSS Inc. 2008). This study focuses on two main stakeholder groups – common farming households, and the households of chiefs/sub-chiefs, and explores differences in their access to resources, their interests, and their management and utilisation of shea and locust bean trees (Grimble et al. 1995). The article relies on the qualitative data analysis methods (cross tabulation, ordering and ranking), which were used to analyse local institutional arrangements with regards to land and trees, respondents' perceptions of the impact of trees on crops, and their attitudes towards trees on their farmlands. Furthermore, descriptive statistical analysis, and correlation were used to explore quantitative data and the relationship between two or more variables of interest (Swinton and Labarta 2003).

4. Results

Landholding, and access and use rights over shea and locust bean trees

All surveyed households had access to at least one plot of non-irrigated land used to grow staple crops, such as maize, yam, millet and beans; and all but one household

claimed ownership over the land it was farming (Table 1). It is important to note that “ownership” in this study means the ownership as the respondent saw it, and not necessarily with legal documents. Indeed, despite not having formal entitlement papers, all the respondents who said they had gained access to land through inheritance, said they had the rights to use their land as collateral for loans, or even to sell it. The system of land tenure was that of a typical Dagomba community, with the chief claiming overall "ownership" of the land, however as Abudulai (1986) explains, it was more of a "trusteeship" than ownership in a proprietary sense - as the local chief had no absolute rights to dispose of the land that was being held and used by a common household. This meant the respondents who claimed "ownership" over their land indeed had stronger proprietary rights than the local chief.[6]

The total area of farmed plots held by the households varied from 0.61 ha to about 6.88 ha, with an average of 2.47 ha. In terms of distribution, 5% of the respondent households held less than one hectare of farmed plots, 75% held 1–3 ha, and the remaining 20% held more than three hectares of farmed plots. The households of chiefs and sub-chiefs held 2.71 ha of farmed plots on average compared to 2.39 ha held by the non-chief households, with no significant difference between the two groups (t=0.986, p=0.327, df=78). Of the households surveyed, only 17 (21%) had left fallow plots – the area ranging from 0.40 ha to about 8.09 ha with an average of 1.49 ha.

6. The scope of this study limits a detailed analysis of the system of land tenure, and local governance structure in relation to land in Dagomba traditional area, however specific characteristics of land tenure that are relevant to the discussion, especially in relation to tree tenure are explored in the text as required. For an excellent overview of the land tenure among the Dagomba in Northern Ghana see Abudulai (1986).

All respondents said they "owned" shea trees on their lands and that their household had full access and harvest rights, including rights to exclude others (Table 2). Only one household allowed other households in the community the secondary harvest rights to shea nuts on fallow lands. Secondary harvest rights amounted to the permission to collect shea fruits and nuts on the land after members of the landholding household (i.e., with primary rights) had completed the first round of collection. Only 19 respondents - all from the households of chiefs and sub-chiefs - said they had ownership of locust bean trees on their lands including full access and harvest rights. It is important to note at this point that although *Dohannaa* was the overall chief for the locust bean trees within the community, the chief and sub-chiefs had full tenure rights over locust bean trees on their land. Altogether 19 of the 80 households surveyed had greater tenure rights over locust bean trees by virtue of their status as the households of the chief, tree-chief or a sub-chief. The remaining respondents reported that the locust bean trees on their land belonged to the tree-chief, including full access and harvest rights (Table 2).

Table 1: Land holding and tenure information for households surveyed

		Irrigated land	**Non-irrigated land**	
		Plot I	**Plot I**	**Plot II**
Households with plots		59 (73.8%)	80 (100%)	76 (95%)
Average landholding (ha)		0.93	1.01	0.49
Ownership	Yes (w/ papers)	1 (1.7%)	1 (1.2%)	1 (1.3%)
	Yes (w/o papers)	57 (96.6%)	78 (97.5%)	74 (97.4%)
Rights to sell or use as collateral	Both	58 (98.3%)	79 (98.8%)	75 (98.7%)
	No rights	1 (1.7%)	1 (1.2%)	1 (1.3%)
Use obtained through	Inherited	58 (98.3%)	79 (98.8%)	75 (98.7%)
	Rented	1 (1.7%)	1 (1.2%)	1 (1.3%)
Years under continuous farming	1-10 years	11 (18.7%)	10 (12.5%)	23 (30.3%)
	More than 10 years	47 (81.3%)	70 (87.5%)	53 (69.7%)

Although all respondents said they could plant both tree species on their land, only 19, all from the households of chiefs and sub-chiefs, had unrestricted rights to plant locust bean trees; while 60 said they could plant locust bean trees on their land but could not claim ownership over those trees. One respondent could only plant locust bean trees if his household did not claim ownership over the land where they were planted. In contrast, everyone reported having unrestricted rights to plant shea trees on their land. Yet, despite possessing the rights to plant trees, only one household had planted either of the two trees.

Table 2: Tenure information for shea and locust bean trees

Level of Rights	Trees	Holders of the rights				
		Household head	**HH members (inc head)**	**Chief**	**Land owner**	**Other villagers**
Ownership	Shea	80 (100%)				
	Locust bean	19 (23.8%)		61 (76.2%)		
Access and harvest rights – 1st priority	Shea		80 (100%)			
	Locust bean		19 (23.8%)	61 (76.2%)		
Access and harvest rights - other	Shea		78 (97.5%)			1 (1.2%)
	Locust bean		19 (23.8%)		60 (75%)	1 (1.2%)

All the respondents said they would plant shea trees on their farmlands if "improved varieties were available", whereas only those from the households of chiefs and sub-chiefs would plant locust bean trees under the same incentive. However, everyone said they would plant both the trees if they had "unrestricted access/use rights" or "full ownership" over the trees planted. Whilst 86% of respondents indicated that the availability of improved varieties would be the most important factor in their decision to plant shea trees, the same would be true for only 24% of the respondents in case of locust bean trees. For three out of four respondents, having full ownership

over the planted trees would be the most important factor in their decision to plant locust bean trees.

Common tree management practices on farmlands included pruning or cutting of the branches, removal of unwanted trees and seedlings, and transplanting of the seedlings or saplings. All the respondents said they had unrestricted rights to cut branches from shea trees. However, only 25% had equivalent rights for locust bean trees on their land, while 60.5% could only cut dry branches and 14.5% could cut those only with chief's permission. Whilst all the respondents said they had the right to cut shea trees on their land, only those from the households of chiefs and sub-chiefs had the rights to cut locust bean trees.

Contribution of shea and locust bean to the households

The total off-farm income of the households surveyed ranged from zero to GH¢4539, with an average of GH¢607.30 (~US$ 613.30).[7] Shea contributed GH¢10.40 to GH¢230 to the household income, which translated to about 1.2–100% of the total off-farm income for those households.[8] The bottom 10% of the households received less than 4%, whereas the top 10% of the households received more than 31% of their total off-farm income from shea (Table 3). Female respondents reported total annual cash income between GH¢20 to GH¢550, a substantial portion coming from the sale of shea nuts and/or butter. In contrast, only three households/women were involved in selling locust bean, which contributed less

7. The end of the year 2007 exchange rate between US$ and GH¢ used in this paper was 1 GH¢ = 1.0099 US$. Thus the amount in GH¢ can be taken as being equivalent to the amount in US$.

8. Only 76 households (out of 80 surveyed) were involved in the collection, processing and trade of shea nuts. The remaining four households did not have an adult female member, and were not involved in shea nuts collection and trade.

than 2% of the total off-farm household income and less than 3.5% of the women's total cash income (Table 3). It is important to note that the cash income from shea and locust bean reported in this study is the income only from the sale of these products, and does not include the value of these products used for household consumption. This means the actual value of these NTFPs for the households are likely to be higher than that reported in this study based on what the cash income shows. This also explains why only three out of 19 households with access to locust bean reported earning income from this tree - the rest using the seeds only for household consumption.

Table 3: Contribution of shea and locust bean to the household income. The contributions reported do not include the value of these products used for household consumption.

Percentiles (% of valid respondents)	Income from shea (N=76)		Income from locust bean (N=3)	
	As % of total off-farm income of the household	As % of total income of women in the household	As % of total off-farm income of the household	As % of total income of women in the household
10	3.41	13.70	0.20	1.09
25	5.66	21.35		
50	11.51	28.60	1.00	1.64
75	21.85	42.20	2.07	3.53
90	30.56	66.50		
Average	**17.06**	**35.10**	**1.09**	**2.09**

In addition to cash income, fruits from both these trees were part of the diet for most households during the fruiting season. Shea trees provided fodder for 70% of the households surveyed, while 24% used both shea and locust bean trees. Shea trees were also the main source of firewood for about two-thirds of the households, the rest appropriating from both trees. Bark and roots of both trees were used as medicine by most households, while just over a third of the households sourced building materials from shea trees.

Trees on farmland: current densities and respondents' perceptions

The number of mature shea trees per hectare of farmland ranged from one to about 99, with an average of about 27 trees per hectare. The number of mature locust bean trees ranged from zero to about 14 trees per hectare with an average of about three trees per hectare. The density of young shea trees ranged from zero to about 12 trees per hectare, while young locust bean ranged from zero to about four trees per hectare – with an average of two trees per hectare for shea and less than one per hectare for locust bean. Pearson correlation showed a weak but significant negative correlation between the mature shea tree densities and plot sizes (r-value=-0.349, p<0.001, N=80). Although mature locust bean tree densities, and young shea and locust bean tree densities were also negatively correlated with plot sizes, these correlations were very weak and statistically insignificant.

The respondents were also asked about their views on current population of these trees within their farmlands compared to five years ago,[9] in order to discover how they perceived changes in these parklands: 97% and 86% of the respondents respectively thought the number of fruiting shea and locust bean trees had increased compared to five years ago. However, only half of the respondents thought the number of non-fruiting young shea trees and seedlings had increased, with 40% saying they had decreased. A gloomier picture emerged for young locust bean trees and seedlings, with 4%, 31%, 58%, and 7% of the respondents saying that the

9. The selection of a five-year period to gauge their perceived changes was a compromise, based on the feedback from pre-testing of the questionnaires, between the respondents' ability to recall (shorter period), and the potential changes in tree densities in these farmlands over time (longer period) due to population pressure, land scarcity, and pressure for tree resources, such as fuelwood.

number had increased, decreased, remained about the same, and "don't know/can't tell" respectively.

In general, both male and female respondents had similar responses regarding threats to shea trees on their farmland - fire and cutting branches being the top two threats for both. Male respondents felt felling trees for firewood was the third major threat, whereas female respondents felt it was the deliberate killing of trees by the farmers to clear land for intensive farming (Table 4). In contrast, a significant majority of respondents, both male and female, said they "don't care" or "don't know" about the threats to locust bean trees (Table 4). The remaining responses were dispersed among the threats such as fire, cutting branches or tree felling.

Table 4: Perceived threats to shea and locust bean trees on the land

	Threats to Shea Trees			**Threats to Locust Bean Trees**		
	1st	**2nd**	**3rd**	**1st ‡**	**2nd ‡**	**3rd ‡**
Male respondents (N = 80)	Fire	Cutting branches	Felling trees (for firewood etc.)	Don't care + Don't Know	-	-
	73%	69%	66%	65%	-	-
Female respondents (N = 76)	Fire	Cutting branches	Deliberate killing (for farming)	Don't care + Don't know	-	-
	82%	70%	75%	71%	-	-

‡ The minority of the respondents who *did not* say "don't care" or "don't know" in response to the question about threats to locust bean trees had similar responses about their perceived threats to these trees as they had for shea trees.

Every farmer responding to the question about the effects of trees on crops said shea trees negatively affected maize yield, while 58% perceived a negative effect of locust bean trees on maize yield, with 40% saying locust bean trees had no effect on maize. The yam yield was also thought to be negatively affected by shea trees by 38 of the 48 farmers responding to the question. In contrast, only 5 farmers thought locust bean trees negatively affected yam yield, with 40 responding that locust bean

had no effect. Thirty farmers (out of 32 responses) believed shea trees had a negative effect on groundnut yield, while 17 farmers (out of 30 responses) believed the same of locust bean trees. Overall, more farmers believed shea had negative effects on the crops than locust bean trees. None of the respondents believed that these trees had positive effects on any of the crops.

5. Discussion

Shea contributed significantly to the total off-farm household income, primarily through women's cash income. The fact that every woman surveyed earned some income from shea during the 12 months prior to the survey shows its importance to the women and subsequently to their households in these rural communities. In addition, shea trees provided a variety of products for household consumption highlighting the benefits from shea to the households and especially to women, as other studies have shown in Northern Ghana (Chalfin 2004) and across West Africa (Teklehaimanot 2004; Elias and Carney 2007). Furthermore, recognition by men (who held rights over land and trees therein) about the importance of shea to their households meant that they had the incentives to protect and better manage these trees on their farmlands, often making trade-off with their crops. For example, farmers planted crops like pepper and millet on farms with higher densities of shea trees, and maize on those with very few trees. Moreover, despite reporting lower yields for almost all crops under these trees, an issue commonly reported for these agroforestry parklands in the region (Kater et al. 1992; Kessler 1992; Boffa et al. 2000), most farmers were very protective of the shea trees on their farmlands, indicating the strength of the incentives these trees provided. In contrast, the income from locust bean was almost non-existent, which is not surprising as most households had restricted rights to access and use these trees even on their own

farmlands. However, this study found that of the 19 households (of chiefs and sub-chiefs) with rights over the locust bean, most of them utilised this product for household consumption with only three households involved in the sale of locust bean to earn cash income. The overall cash income contribution of locust bean to these three households was still negligible compared to income from shea. Although both trees provided a multitude of products to the households, shea provided larger benefits to a wider proportion of the households, thereby providing higher incentives to a wider population compared to locust bean.

Despite the distinction in tenure systems, the strength of rights over the land and trees usually complemented each other. This, however, was not the case for locust bean trees, which belonged to the tree-chiefs regardless of the tenure rights over the lands on which they stood, a system synonymous to many other groups in the region (Boffa 1999; Schreckenberg 1999). The fact that common households had no rights over locust bean trees on their farmlands, while having to tolerate potential negative impacts of these trees on their crops, generated a huge disincentive. Furthermore, if the chief decided to harvest all the locust beans and not leave any for the landholders, which was reported to be the case by a number of the common households in Cheyohi & Kpachi, the latter had no right to complain. It was this lack of ownership and the subsequent lack of incentives that prompted most respondents to declare that they would not plant locust bean trees even if improved varieties were available. The frustrations of these respondents at having to tolerate locust bean trees on their farmland also shows in the frequencies of “don’t care” and “don’t know” responses when asked about major threats to these trees, which is in stark contrast to their eloquent explanation of the threats to shea trees. These disincentives inherent in the tenure system for locust bean trees are likely to discourage farmers from taking

care of this species. Indeed the low number of locust bean trees left on the farmlands, especially young ones, illustrates this neglect.

Although all respondents said they would plant both tree species on their farmland if they had unrestricted access/use rights or full tenure rights over the planted trees, by ranking “access to improved varieties” as the most important factor in deciding whether to plant shea trees, they showed that they felt secure about their existing tenure rights over shea trees. In contrast, it was only the households with rights to locust bean trees who said access to improved varieties would be the most important factor in their decision to plant locust bean trees. For non-chief households, possessing full tenure rights over the trees planted was the most important factor. Thus, under the present tenure system for locust bean trees, it is unlikely that these farmers would voluntarily plant or protect these trees - supporting the argument that rules of tenure indeed impact on the "preservation, protection and planting of trees" (Bruce and Fortmann 1988).

These tenure issues should also be considered in the context of land availability in these communities. These communities were increasingly facing a shortage of fertile farmland, and had to use chemical fertilisers to maintain soil fertility. Most households had continually cultivated the same plots of land for more than 10 years, which is unusual in a region where farm-fallow rotation is the traditional way of farming (Schreckenberg 1999; Augusseau et al. 2006). Furthermore, some respondents had additional farmlands in other communities, while very few had left the land fallow highlighting the degree of land scarcity. The scarcity of land leading to more intensive farming and lack of fallow are both reported to lead to a reduced regeneration of these trees (Schreckenberg 1999; Lovett and Haq 2000). In the face

of this land scarcity, it was clear that most of the respondents wanted greater rights over the trees on their land so that they could make decisions, when necessary, on whether to leave or to cut certain trees based on the level of benefits they accrued (or the costs they incurred). However, it is also clear from the density of shea trees on these farmlands, especially from the fact that the tree densities were higher on smaller landholdings as shown by the significant negative correlation between shea tree densities and plot sizes, that having full tenure rights did not necessarily lead to the clearing of shea trees for intensive farming.

The densities of mature shea and locust bean trees reported for Ghana, and West Africa historically have shown a relatively high value for shea compared to locust bean trees (Hall et al. 1996, 1997). In the communities studied, although the density of mature shea trees was little different from those reported for the West African parklands (Hall et al. 1996), the worrying aspect was the density of young shea trees: 38% of the households had no young shea trees and only 7% of the households had more than five young shea trees on their farmland. These findings indicate a serious deficiency in the level of regeneration of shea trees. However, the plight of shea trees looks much better when compared with locust bean trees: 14% of the households had no mature locust bean trees, and only half had more than two trees per hectare of their farmland, a density comparable to those reported for Northern Ghana (Hall et al. 1997). Furthermore, 87% of the households had no young locust bean trees on their farmlands, and only 5% had more than two young locust bean trees per hectare. With an average of 0.20 young locust bean trees per hectare of farmland in these communities, the seriousness of the problem in regeneration of this tree species cannot be exaggerated.

6. Conclusions

Given the pressure on land from food production demands, it is very unlikely that the densities of shea and locust bean trees will improve in future, a trend common to the region (Schreckenberg 1999, Lovett and Haq 2000, Augusseau et al. 2006). However, as argued in this paper, the pressure on land is not the sole factor affecting the densities of these trees in these communities. The absence of strong incentives to care for the locust bean trees seems to be compounding the problem, especially in its regeneration, as it is much easier to get rid of young trees or seedlings than a big tree. Many farmers did acknowledge that they cared little about locust bean trees on their farmland, because the trees did not belong to them. In contrast, shea trees provided a significant contribution to the household income, in addition to the products such as fuelwood for local energy needs, thus providing enough incentives to protect these trees. Indeed, the current densities for shea trees in the area studied seem reasonable in the context of greater West African shea densities on the farmlands (Hall et al. 1996). Although the level of regeneration seems lower compared to the mature tree densities, the responses that farmers would be willing to plant shea trees if they had access to improved varieties of seedlings indicates that they do care about having shea trees in their farms. Furthermore, the realisation in most households, and among most men (farmers) that these trees provide valuable cash income to their women, which in turn is helping them run their household better, should be a stronger incentive to protect these trees.

Finally, there could also be an element of complacency (or lack of realisation) in caring for young shea trees given healthy mature shea densities on the farmland, which could be avoided through extension support, training in agroforestry, and helping farmers understand the need for a healthy population of young trees to

replace old and dying ones. As for locust bean trees, the findings here make it clear that mere training and extension supports might not be enough. An increased market for locust bean seeds and *dawadawa* – similar to that for shea nuts and butter - could certainly provide strong incentives for preservation of these trees. However, and more importantly, there needs to be a major shift in tenure (and subsequently the incentive structure) with regards to locust bean trees in order to encourage farmers to plant, protect, care for and manage locust bean trees in the way they seem to have done for shea trees. Failure to do so could rob these parklands of not just one of the most important indigenous trees, but also of the potential for off-farm income generation in these communities.

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Chapter V - GENDER DIMENSIONS IN SHEANUT COLLECTION

Cooperation and conflicts among sheanut pickers in a Gonja village in Northern Ghana

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Abstract

Studies on the gendered nature of resource tenure have highlighted the disadvantageous position most women find themselves in compared to their male counterparts, especially with regards to their access to and ownership over resources such as land and trees. Few have, however, analysed how women in these seemingly disadvantageous situations respond to these inequalities. Through a case study in a rural community in Northern Ghana, this study explores the gendered nature of tenure in agroforestry, and analyses how women in these communities deal with their unequal tenure rights vis-à-vis men and vis-à-vis other women. The study focuses on two groups of women collecting and processing sheanuts, analysing their access to and benefits from the shea trees. The study finds that women as a group, even in these small rural communities, are often diverse, with levels of resource inequalities among themselves; and hence, cannot be studied as a homogenous unit. Moreover, women in these communities were found to devise and put in place strategies that not only secured their access to resources like shea trees, but also maximised the benefits from the resources they had access to. Furthermore, each group of women exhibited their own strength and unique way of dealing with tenure inequalities, which should be harnessed positively for any successful policy that is targeted towards helping these women improve their livelihoods.

Keywords: gender, tree tenure, shea, agroforestry

1. Introduction

The gendered nature of resource tenure has been a prominent area of research, with a general consensus that women in Africa are in a disadvantageous position when it comes to tenure rights determining their access to and rights over resources, especially land (Hilhorst 2000; Whitehead and Tsikata 2003). Moreover, women's tenure rights over land and other natural resources are often termed 'secondary' in that they obtain those rights – usually limited to access and use rights and not extending to the control of these resources – through their relations with men, as wives, mothers, daughters, sisters and so on (Lastarria-Cornhiel 1997; Hilhorst 2000; Toulmin and Quan 2000). The majority of these studies on gender and access to resources in Africa focus on land tenure issues, which, although very important, do not cover all the vagaries of African resource tenures. One of these variations is the separation of land and tree tenures, still prevalent in many parts of Africa (Fortmann 1985; Fortmann and Bruce 1988; Howard and Nabanoga 2007). As with access to land, access to trees for women often relies on their relations with members of the household, who usually possess overall control of these resources. However, studies have also shown that women generally have access (usufruct) to trees and tree products, especially non-timber forest products (NTFPs), although the security of their tenure rights may not always be guaranteed (Rocheleau and Edmunds 1997). Although, these studies highlight the inequality in tenure rights based on gender, few have analysed how these women, seemingly in a disadvantageous position, respond to these inequalities.

This article explores the gendered nature of tenure in agroforestry parkland in a rural community in Northern Ghana, with the objective to understand *how women in these communities deal with their unequal tenure rights* – vis-à-vis men and vis-à-vis other

women. The study focuses on two groups of women: from indigenous and settler households. The dynamics in the access to and use of shea trees in field, fallow and bush are analysed in order to understand how women from these two groups try to secure their tenure rights over and to maximise benefits from these trees in various land types, and whether they are successful in doing so. Furthermore, the coping strategies of these women in the face of unequal tenure rights are explored, highlighting the conflicts and cooperation based on settlement history and on gender and tenure rules, with particular emphasis on the inter-relatedness of these various issues. The understanding of these issues should enhance our knowledge of the overall resource dynamics in agroforestry systems in these parts of Ghana, leading us to more appropriate policy recommendations.

One of the distinct features of customary tenure in Northern Ghana (and indeed many other parts in Africa) is the idea of "settler" or "settler group". These are the class of individuals or households who are considered not to be the original inhabitants of the community.[1] Settlers often have different tenure rights (usually weaker rights) than the autochthons when it comes to the access to and use of land and trees. For example, settlers are allowed to cultivate the land they are allocated but should refrain from using the trees, or they are barred from planting or disposing

1. The idea of "origin" and "original" inhabitants can be quite confusing at times. To obtain a basic understanding it is helpful to take the case of a community. In a community, a "settler" group is that which was not present at the inception of that community (for example, the first clearing of the forest to make the settlement). And by the "group", we refer not just to the group at present but all their ancestors too. This is the reason why these groups are often classed as "settlers" even after several generations in the community, as their forefathers were not present during the founding of that community. However, we also need to take into consideration the members/descendants of the "conquering tribes", who, for all intent and purposes, typically have the same rights as the original inhabitants.

of trees (Fortmann 1985; Augusseau et al. 2006). Thus the logic follows that women from settler households would be double-disadvantaged - first for being in a "settler" group, then for being "women". As with the general trend in the rights of women over NTFPs, shea trees are also considered to fall under the women's realm. Recent growth in the commercial value of shea has made it an international commodity (Chalfin 1996, 2004) with significant economic benefits at local level too. Increased economic potential from the shea trees have made them valuable to the women collectors and to the households, and hence the opportunity cost of the rights over these trees and enforcing those rights have risen accordingly. Previously, casual incursions into others' farm or fallows to collect sheanut might have been ignored,[2] but now they are much more rigorously protected, and equally vigorously contested.

The study reveals that the women from indigenous households try to consolidate their already stronger tenure rights and power through cooperation within their own group, based on mutual understanding and reciprocity (and without any formal 'institution') leading to greater benefits from the resources and higher livelihood security for their households. In contrast, women from the settler households, with few power and much weaker tenure rights, try to maximise their benefits from the resource that they have access to by adding value to their products and through cooperation within their own group, often with the formation of cooperative and more formal institutional arrangements. This points to not only the inventiveness of both groups of women in consolidating their tenure rights and/or making the most of

2. In fact, "traditional" rules in many of the rural societies allowed anyone to collect NTFPs from trees like shea, which obviously stemmed from the distinction between land and tree tenures (Fortmann 1985; Fortmann and Bruce 1988).

the rights they have, but also resilience, especially in the case of settler women to try and secure a better livelihood for themselves and their families.

The article is organised as follows. The next section provides a brief background to the study, setting it within the theoretical and analytical frameworks of the concepts that will be explored later in the paper. Section 3 describes the study site, and the methodologies used for data collection and analyses. Results from the study are presented and discussed in sections 4, 5 and 6, followed by some major conclusions in the final section.

2. Dynamics of resource use in agroforestry parklands in Northern Ghana

In the semi-humid and semi-arid savannahs in Northern Ghana, agroforestry parklands, often referred to as 'farmed parklands', are the main feature of the landscape where mature trees of a selected few species occur scattered across the cultivated fields or on fallows (Pullan 1974; Lovett and Haq 2000). Of those few selected species of trees left on the parklands in Northern Ghana, shea (*Vitellaria paradoxa*) and locust bean (*Parkia biglobosa*) are the most prominent (ibid.). These trees form a vital part of the agroforestry systems providing not only material benefits to the households in the form of food, fodder, fuelwood, building materials, medicine and other marketable products, but also helping in soil fertility, moisture retention and in reduction of erosion (Boffa 1999; Traore et al. 2004). Recent studies have suggested that these trees could be vital in the retention of carbon in these parklands, a service that could be exploited for the benefit of the local population through mechanisms such as REDD – Reducing Emissions from Deforestation and Forest Degradation (Pandey 2002; Montagnini and Nair 2004; Takimoto et al. 2008).

These multipurpose trees are also the major source (and most often the only source) of cash income to rural households, especially to women who are traditionally responsible for the collection of products from these trees (Chalfin 2004; Teklehaimanot 2004; Elias and Carney 2007).

The appropriation of economic and other benefits from these trees in the parklands, however, depends in large part on the institutional arrangements in place - such as access and use rights through various tenure regimes. At the local level, natural resource governance in Northern Ghana is primarily in the hands of local chiefs, sub-chiefs, elders and traditional landowners, who decide on the access to and use of the resources based on their customary laws and practices (Blench 1999; Kasanga and Kotey 2001). However, earlier studies (Abudulai 1986; Lavigne Delville 2007) and my own field observations have shown that these systems of resource governance are very flexible, dynamic and changing. In terms of the gendered nature of the access to resources, as studies of gender and land/resource tenure elsewhere in Africa have shown, women's tenure security on resources in Northern Ghana, especially on the lands are usually very weak, and are tied to their relationship with men (Quisumbing et al. 2001). However, as a study by Rocheleau and Edmunds (1997) suggests, there are cases where these relational tenure rights on certain types of resources, for example non-timber forest products that most women gather as part of their livelihood activities, could also be quite strong. Nevertheless, not having the direct (and controlling) tenure rights is always likely to limit their access to, as well as the way they manage and appropriate benefits from these resources.

The situation becomes even more complex and worrisome for women whose menfolk themselves have lesser tenure rights than their other male counterparts in

the community, because of their origins and residency. The main issue here is the distinction in rights between indigenous men/households and the settler men/ households. In a traditionally governed community in Northern Ghana, the settler men often do not have the same level of tenure rights (over land and resources) as those originating in the community (Abudulai 1986; Tonah 2002; Wardell and Lund 2006). This is especially true for the resources other than the land the settler men are allocated, for example trees, water and so on. In many cases the access and use rights for these settler households are limited to the land that they are allowed to farm, and do not even extend to the trees on those lands (de Zeeuw 1997; Augusseau et al. 2006). In these cases, women who usually have to rely on their menfolks' tenure rights to gain access to these resources will be the worst hit. In the area studied, although the case was not as limiting, as is later explored, there were severe tenure restrictions, especially for the women from the settler households, which is likely to limit their potential to provide livelihood support for their households.

3. Study site, data collection and analysis

Fieldwork for this study was conducted during November-December 2007 in Yipala, a community in the north-western part of the Northern Region in Ghana. The community lies within Sawla-Tuna-Kalba district in the Gonja traditional area. The chieftaincy of Yipala is considered among the senior chieftaincies under the Bola paramount chieftainship. The community is diverse in terms of ethnicity, with households from Gonja, Wala, Dagarti and Lobi ethnic groups residing within the community, and a few Fulani households living on the outskirts of the village.[3] The community, however, could be classified into two main groups based on the

3. This study however left out Fulani households as they are usually mobile group focussing on cattle rearing rather than agroforestry, and were not included in community-level decision-making.

respondents' own sense of place within it – with Lobi-Dagarti being the "settler" group and the rest being the "autochthons". The research focuses on these two groups within the community, especially on the women from these groups involved in collection, processing and trade of shea nuts from farm, fallow and bush.

The main sources of data/information for this study were the field observations by the author, focus group discussions conducted with two groups of women in Yipala, and interviews with the key informants in the community. Two main focus group discussions were held - one with the group of women from "indigenous" ethnic groups (Gonja, Wala), and one with the group of women from "settler" ethnic groups (Lobi-Dagarti). The key informants included the community chief (*Yipalawura*), a local teacher, and an opinion leader. A detailed household survey was conducted on a randomly selected sample of 85 households in Yipala, to obtain information on the management and use of land and trees, agriculture and other household-level demographic and socioeconomic characteristics. However, this article focuses mainly on the data collected from the focus groups, key informants, and field observations, with some additional input from the survey results where relevant.

The focus of the analysis is two groups of women with interests and stakes in shea trees, which provide most of their cash income. A stakeholder approach (Grimble et al. 1995; Grimble and Wellard 1997) is taken to understand the distinctions and conflicts between these two local stakeholder groups, while the study also looks into the theories of cooperation and collective action (Olson 1965; Baland and Platteau 1996; Baland and Platteau 1999) in natural resource management to try to understand the cooperation and conflicts among women within and between groups to further their interests. The analyses include deductive/inferential techniques based

on the information collected from aforementioned sources. In addition, quantitative data from the survey were entered and analysed in SPSS 16.0 (SPSS Inc. 2008) using common statistical techniques.

4. System of tenure in Yipala

As a community within the Gonja traditional area, Yipala has a Gonja chief and the community-level governance is based on the Gonja customary laws. This section outlines the system of customary tenure in Yipala for land and trees as understood and practised by the community members, especially women who are the primary users of the non-timber products from economic trees such as shea. Furthermore, access to and use of shea trees by two main groups of women – those who class themselves as "indigenous" to the community, and those who are classed as "settlers" by the first group – are explored. The focus is on the institutional aspects of tenure, and how these two groups of women negotiate those institutional arrangements while contributing towards the livelihoods of their households.

The general understanding of the rules regarding the collection of sheanuts was that all women in the community could collect them from their husband's farm and fallows, and from the bush and other community lands without restrictions; but they had no right to pick from other households' farm or fallows. However, this understanding of the rules contrasted sharply with the "official" Gonja customary laws when it came to the access to fallows that were older than two years.[4] The

4. The word "official" is used here with caution. The official Gonja customary laws referred to here denotes the ones listed in two unpublished documents, both coming from the Gonja traditional authority - (i) "Gonja Traditional Authority's Reply to the Justice and Peace Commission of the Catholic Church of Ghana's Paper on Inter-tribal Conflicts in Ghana"; and (ii) "Understanding the Documentation of the Law Making Bodies of the Gonja Traditional Area". See references.

Gonja traditional laws dictated that any land left fallow continuously for a period of more than two years reverted to the status of community land, where all had equal rights to access the resources therein (Anonymous 1991, no date; and personal communication with *Yipalawura* Alfred Mahama Yahaya, the chief of Yipala, on 10 November 2007). Furthermore, the customary laws also make it clear that all settler households in the community who had settled there with the consent of the chief and the landowner will have the same rights as the indigenous households with regards to access to land and trees - as the laws state: "Once a stranger is given permission to settle and granted land to make a farm he is treated for all purposes like a citizen farmer, and is subject to all customary duties" (ibid.). In practice, however, virtually all fallows left by the indigenous households were considered exclusive to those households (and hence the women from such households), even when they were left continuously fallow for more than two years. In contrast, settler households were not able to lay similar claims for exclusivity over the fallows they left for more than two years, an issue further explored below.

Access to shea trees on fallow lands: whose rights?

The first issue to consider is the general access to shea trees on the fallow lands. Access to and rights over the shea trees and sheanuts on the fallow lands up to two years old were exclusive to the women from the household that had left the land fallow – a practice common across the region (Boffa et al. 1996; Schreckenberg 1996; Boffa 1999). This rule was enshrined in the Gonja customary law as well and all the households, indigenous as well as the settlers, respected this exclusivity. However, the case of access to and rights over fallow lands older than two years, and the resources therein, especially shea trees and sheanut was not so straightforward or universally respected. Despite the Gonja customary laws stating otherwise, women

from the indigenous households were found to preserve exclusive access to the shea trees and sheanuts on the fallow lands that their household had left for more than two years. Indeed, this also contrasts with the traditional practice in West Africa and elsewhere in the continent of considering tree products from old fallow lands (along with bush and forests) as common resources, especially fruits and nuts from the indigenous trees (Fortmann 1985; Fortmann and Bruce 1988; Schreckenberg 1999; Tonah 2008).

These women's claim of exclusive access to and rights over shea trees and sheanut in these older fallows could only be successful if other women in the community agreed to, and respected, their claims. For these women had no exclusive rights over the sheanut on these old fallows based on the rules of their traditional authority – and as Sjaastad and Bromley (2000) suggest, unless you can get the authority to protect your interest, a property right cannot be established. Indeed, in Yipala, women from the indigenous households not only respected each other's exclusive rights over shea trees in these older fallows but also actively helped each other in enforcing their exclusivity, especially to prevent the women from settler households collecting sheanut from those fallows. This is an interesting case of collective action, for the cooperation among women within these indigenous households was to establish and secure *de facto* private property rights on old fallows as opposed to managing them as the "commons", the latter being the primary focus of studies on collective action in natural resources management (Ostrom 1990; Baland and Platteau 1996). Nevertheless, many of the "conditions for successful collective action" as proposed by these studies of the commons seemed to be present in the case of indigenous women's group in Yipala. For example, the realisation that they would have to be in repeated contact with other women in the community seems to have provided an

additional impetus to respect each other's exclusivity and avoid conflict, as this response from one of the focus group participants illustrates. When asked if they could pick sheanuts from fallows that were older than three years, one Wala woman said:

> Within the Wala, you dare not go to the fallow of another Wala person or else you will fight. But if it is a Dagarti person, you can go into the fallow even after three years or less. (29 November 2007)

These women also made clear that anyone violating the tenure arrangements regarding the access to and rights over sheanut in old fallows was likely to face social sanctions. Statements like "I would be embarrassed if I did [collect sheanut from one of the other women's fallow]"; and "I won't be able to look at her eye-to-eye afterwards" show that the women within this group were careful not to offend each other, and lived in harmony when it came to collecting sheanut from older fallows.

This co-operation among the women from the "indigenous" group could also be analysed as an "assurance game" (Taylor 1987). In the face of repeated future contacts, it was more beneficial for them to co-operate than to defect. Defection here means accepting the basic rules set out on the Gonja customary laws regarding the access to and use of fallow lands such that any land left fallow for more than two years becomes a "common property" and anyone in the community can access and use its resources. Although this situation gives them access to a larger area of fallow lands, they would have had to compete for the picking of sheanut in all the fallow lands older than two years from not only the women from their own group but from the women from settler group as well. So, in essence the co-operation among the indigenous women not only gave them exclusive access to their older fallows, it also

made possible the exclusion of women from the settler group from accessing and using resources (i.e., sheanut) from these older fallow lands. In addition, they had access to any older fallows left by the settler households, giving them additional payoffs.

Interestingly, these women reported that they were allowed to pick sheanuts from each other's fallows after five years, however, because of the existing cooperation and to avoid conflict they said they refrained from going into each other's old fallows to pick sheanuts. Obviously they had created their own rules regarding the access to and rights over sheanuts in older fallows that the indigenous households had left. Moreover, they actively helped each other in enforcing their rights, for example, by looking after each other's fallows when they were around, and informing each other of any incursions by the other women (usually the settlers or outsiders). This understanding and mutual cooperation consolidated their rights over sheanut from the trees on their husband's fallows that were older than two years in two ways. First, by gaining recognition of other women in the group (their peers) about their exclusivity over the nuts from the shea trees on those fallows, they made their claim stronger and more secure. Secondly, each woman in the group looked out for incursions not just on "their" fallows, but also on their peers' fallows and informed them of such incursions whenever they saw one. This helped enormously in the enforcement of their exclusive claims over nuts from the shea trees on those fallows. In the event of any incursions, they first tried to fend off those involved, often with the help of their husband. When the matter got worse, it often ended at the court of the chief, whose decision all agreed to be final, whatever the outcome. However, the previous chief of Yipala was reported usually to rule in favour of the women from indigenous households, which further strengthened the exclusivity of

access to and use rights over shea trees on older fallows, and gave them power to exclude any other women from collecting sheanuts from those fallows.

A second issue concerns the rights to land and other resources in the community as a "settler". It is important to note that most of the settler households in the community were second or third generation inhabitants in the community, and their forefathers were the settlers in the real sense. However, the settler identity not only passes through the generations in West Africa, but many disputes over land and trees seem to pitch settlers/migrants against the autochthons (Gray 2002; Tonah 2002; Berry 2009). The Gonja customary laws stated that the outsiders who were given permission to settle within the community will be "treated like a citizen farmer" (Anonymous 1991, no date). The irony of this law in Yipala was that the settlers were made to follow certain Gonja customary laws regarding the access to and use of land while the indigenous households did not. For example, the settler households' rights over the land only extended until they were farming that piece of land and until the land they had left fallow was two years old or less. Fallows left by the settler households for more than two years were considered community land and the resources therein accessible to all. The women from the indigenous households were forceful about these issues, as they were collecting sheanuts from these fallows in addition to their exclusive claims over sheanuts in the older fallows left by their own households.

Women from the indigenous group insisted that they had and should have greater tenure rights to trees than settler women who, they claimed, were only given access to land for farming, and not the trees on them. As one woman put it: “when chief gives them land, it's only the land he is giving, and not the trees.” Indeed, it is

traditional in many parts of Africa, especially where there is a distinction between land and tree tenure, for gifted or borrowed land to come with restrictions regarding the use of existing trees and planting of new trees (Fortmann 1985; Boffa et al. 1996; Schreckenberg 1999). However, in Yipala, the land given to the settler households was allocated free of charge as is the case elsewhere in Northern Ghana where land scarcity is still non-existent (Kasanga and Kotey 2001), and as the Gonja traditional laws dictated, these settlers were to have the same rights as the indigenous households once they received permission to settle in the community and were allocated the land including full tenure rights over the trees on those lands. Nevertheless, the women from the indigenous households did seem to enjoy stronger tenure rights and greater access to sheanuts and hence the benefits, mainly through their own efforts, compared to the women from settler households.

(The real) system of customary tenure in Yipala

The system of customary tenure in Yipala, although based on the Gonja customary laws, diverted from the "officially" stated laws on a number of points. The laws as practised in the community, the *de facto* tenure laws, were the real laws in the sense that they had a tangible impact on the livelihood of the households. The major distinctions between the stated Gonja customary laws and those practised in Yipala are summarised in Table 1.

Table 1: System of customary tenure in Yipala: Gonja customary laws and those practised in the community.

Contested issues	Gonja traditional laws‡	As practised in Yipala
Access to/rights over fallow lands	Whoever leaves his farm fallow for a period of two years ceases to own that particular piece of land. Any land thus left fallow is regarded as being abandoned and revert to the whole community: any other citizen can cultivate that land which had been abandoned, without seeking permission of anybody.	The fallows left by the indigenous households, however old, still belong to that household, and no other household can convert them into the farm without explicit permission of the original household that farmed the land. The customary rule, however, applies to the fallows left by the settler households.
Access to/rights over shea and locust bean trees	All sheanut and dawadawa trees on a person's subsistence farm are picked or plucked by the owner of the farm. He will continue to pluck them for a period of two years when the farm is left to lie fallow, but after this period, if no other person cultivates the land, the dawadawa and sheanut trees revert to the whole community.	In case of the indigenous households, the sheanut and dawadawa (locust bean) trees in a fallow still belong to the household that left the land fallow no matter how old the fallow. In case of the settler households, the original rule applies.
Collection of NTFPs by women	All the women in a village collect firewood, water, sheanuts and other sylvan produce in common with the wives of the chief and no one is treated differently.	Women from the settler households are not allowed to lay exclusive claim to sheanuts on the fallow that are older than two years even if they were left by their households. However, women from the indigenous households lay exclusive claims to sheanut on the fallow left by the households.

‡ These are quoted as they are on the unpublished documents obtained from the Gonja traditional council secretariat in Bole. See footnote 5.

It is important to point out that a new chief had been appointed for Yipala earlier in the year that the fieldwork was carried out. The new chief had yet to resolve conflicts regarding the access to and use of shea trees on the fallow lands, especially those regarding the picking of sheanuts from the fallows older than two years. When interviewed, the new chief repeatedly mentioned that the people in the community

"do not know" about the Gonja customary law regarding the access to and use of land and trees, especially the rule that states all fallows older than two years are considered as community land. He stated that he would enforce the customary laws as he understood them and as documented (see Anonymous 1991; no date). However, this idea of land belonging to the community has often been attributed as a colonial construct by various authors studying the African "customary" tenure systems (Mamdani 1996; Lentz 2000; Kunbuor 2002).

Indeed, during the household surveys and field observations it was clear that despite having no written document confirming the ownership of land, most households had strong tenure rights over the land they were using, and managed it in the same way a "private property" in the western construct would have been managed. It was no surprise then that all 71 indigenous households in the survey said they "owned" their land (despite not having any ownership documents), of which 70 said they could use it as security to obtain loans. Moreover, 66 of the households surveyed had inherited the land they said they owned. As for access to trees and tree products, the strength of tenure rights over land certainly played a part. However, the increasing value of products like sheanut in recent years seemed to have had a growing influence over the claims to these trees, especially on lands with less secure tenure traditionally, such as old fallow and bush. Fruits and nuts from these indigenous trees on old fallow and bush were traditionally considered a "common resource", and would have been accessible to everyone in the community (Schreckenberg 1996; Boffa 1999). This suggests that it might be difficult to get these households to accept that their lands could revert to the status of community land if they leave them fallow for more

than two years, especially when such lands contain economically valuable resource as shea trees.

5. Collection and trade of sheanut

The above discussion of the tenure structure for land and trees in Yipala and the subsequent local rules and practices regarding access to and rights over shea trees, raises two major issues related to the collection of sheanuts by the women in Yipala, which are discussed in this section: (i) the process of collection of sheanuts by the women and determinants of this process; and (ii) the quantity of sheanuts collected by two main groups of women (those from indigenous and settler households). I start with the first issue.

All the women in the community had three main land types to collect the sheanuts from - bush (forests or very old fallows), fallow, and farm. It is important to note that the rights of women to collect sheanuts from any of these land-types depended upon the rights that their household (and usually the male) had over the land, and the trees. It is clear that the tenure rights of any household over these land types moves from being the weakest in case of the bush (i.e., in the common land where it cannot exclude other households in the community from accessing/using it) to the strongest in the case of the farm (i.e., private property, *de facto* as lands are without any official papers, where the households can completely exclude other households from accessing /using it). In the middle are fallow lands, where, as discussed above, the issue of tenure rights becomes quite complicated and contested. As established earlier, women from the indigenous households had their own (informal) rules regarding the access to older fallow lands for the collection of sheanut, making their fallows exclusive for their households even in the long run, as opposed to the stated

Gonja customary laws of older fallows being community land accessible by all. This complex tenure system, consequently, seems to have set the process of collection, which is represented graphically in Figure 1.

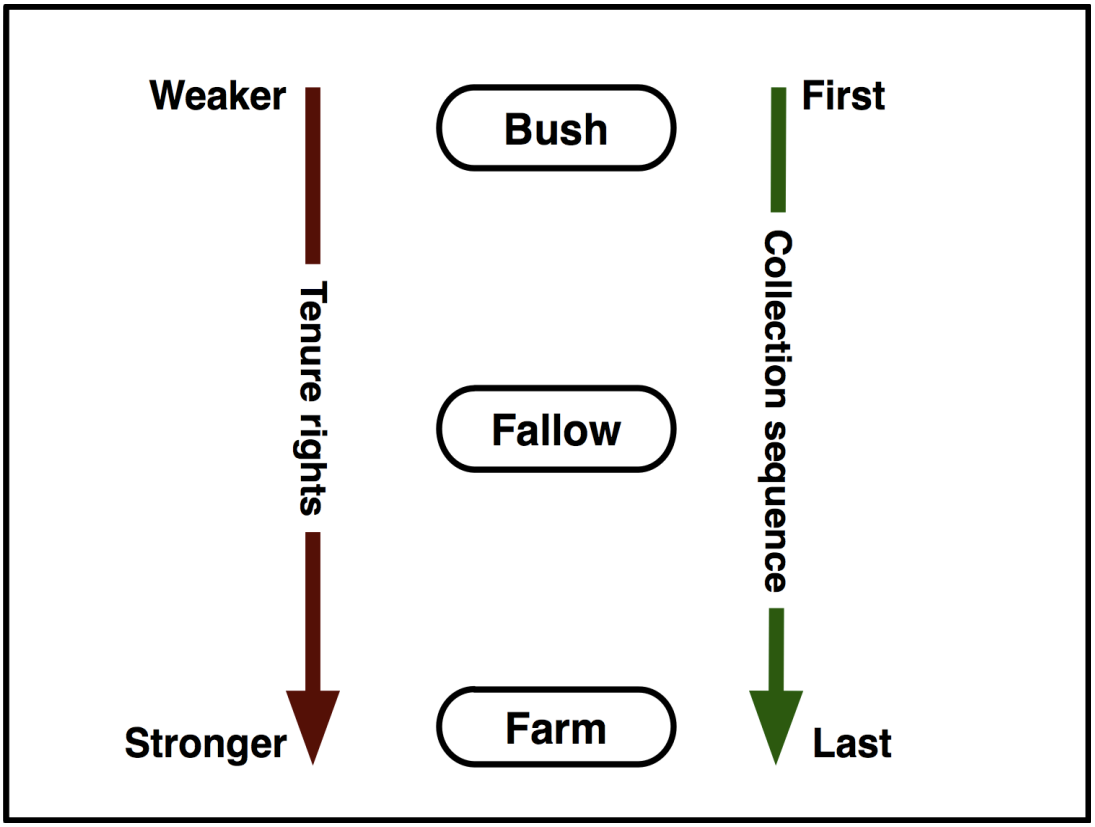

Fig 1: Level of tenure rights of a household over various land types, and the sequence of collection of sheanuts by the women in the household from these land types.

For each land type, the arrow on the left shows the level of tenure rights, increasing from bush to the farm, while the arrow on the right shows the sequence of collection. Field observations showed that women collected sheanuts first from the bush, where they had the weakest rights in terms of exclusivity, and where there was considerable competition from other women in the community for its collection. It is interesting to note that Schreckenberg (1996) found a similar pattern of shea fruits/nuts collection by the women in Bassila Region in Benin, where shea tree tenure seems to resemble the system in Yipala. This system of sheanut collection often worked spatially as well if we take various land types as being in concentric circles - with dwellings at

the centre, farm/fallow in the enclosing circle and bushes in the outermost circle. So they would start from the bush, then move onto the fallow, where they had devised their own rule to exclude others, but where some disputes still occurred, and then on to the farm where they could practice absolute exclusivity in terms of collection of sheanuts. To summarise, as the women were confident of their exclusive rights to collect sheanuts from their fallows and farm, they left it till last by collecting first from the common land, where they had the least rights and had to compete with other women in the community for sheanuts.

However, the case of women from the settler households was quite different. Not only did they face exclusion from the old fallows left by the indigenous households, they were not able to exclude other women (especially those from the indigenous households) from picking sheanuts from the fallows left by their own households that were more than two years old. It came as no surprise then that the settler households surveyed had only fallow lands that were less than five years, or in many cases they did not have any land left fallow. Of the 14 settler households in the survey, 10 households had fallows that were 1-5 years old, three households had no fallow lands, and only one household had left the land fallow for more than five years. For these settler households, leaving land fallow for longer meant weakening their tenure rights to those lands and shea trees therein, hence, the shorter fallow period. In contrast, 32 percent of the indigenous households had fallow lands more than five years old.

On a different (but important) note, this practice of leaving shorter fallows could have major implications for shea regeneration, as most of the natural regeneration of these trees takes place in the fallow and bush compared to farmland where regular

farming and intensive collection of sheanuts means natural regeneration is minimal (Kessler 1992; Hall et al. 1996; Schreckenberg 1999; Kelly et al. 2004). Furthermore, continuous farming or fallows that are too short are likely to be detrimental to the soil quality and farm productivity in the long run, as the farmers here rarely add external nutrients, such as chemical fertilisers, to the soil. The practice of fallow-farming cycle provides time for the soil to recuperate and restore fertility during the fallow period (Tian et al. 2005). Furthermore, longer fallows not only increase organic matter in the soil and hence their fertility (Salako and Tian 2001), they also preserve soil from erosion as they get dense vegetation cover as they get older (Bielders et al. 2002).

The inequality in the access to fallow lands to collect sheanuts shows in the analysis of the quantity of sheanuts collected by women from the "indigenous" and the "settler" groups. Of the women surveyed from 85 households, those from 70 households had collected sheanuts during the past 12 months of which 58 were from indigenous households and 12 from settler households. The results show that the women from indigenous households collected significantly more sheanuts on average than those from the settler households (Table 2).

Table 2: Collection of sheanuts by the women from indigenous and settler households in Yipala

Group	Average sheanut collection during the past 12 months (in bags)		
	*From Husband's farm/ fallow**	*From other sources (common fallow/ bush)***	*Total*
Indigenous	4 (N=58)	1.5 (N=11)	4.3 (N=58)
Settlers	1.5 (N=12)		1.5 (N=12)
Test for the difference in means (Equal variances not assumed)		Mean difference = 2.8	
	$t = 4.878$	p-value < 0.0005	$df = 67.7$

* Husband's fallows include all those up to two years old, and in case of the indigenous households, those claimed by them as their exclusive fallows.

** Common fallows or bush include fallows three years or older (left by the settler households primarily in Yipala) which, according to traditional Gonja rules becomes common fallow, and very old fallows that are effectively classed as bush and are considered common land. It is important to note that although fallows left by the indigenous households that are three years or older should also become common fallow according to the Gonja traditional rules, as discussed in this chapter, the indigenous households in Yipala has effectively kept these fallows for their exclusive access for sheanuts.

In terms of the average income from the sale of sheanuts during the past 12 months, women from the indigenous group were earning on average GH¢83 from the sale of about 3.4 bags of sheanut (N=52), while those from the settler groups were earning on average GH¢25 from the sale of 1.2 bags of sheanut (N=12) – a significant difference (p-value <0.0005, df = 52.2).[5] Obviously this follows from the picking. However, it doesn't tell the whole story. Although randomly sampled households captured very few women who were processing shea butter for sale during the past 12 months, almost all of the women in the focus group from the settler group were involved in processing butter from sheanuts. They also had a formal butter processors' group, and were able to use labour exchange in processing the sheanuts

5. 1GH¢ was roughly equivalent to 1US$ at the time of the survey.

thereby making the process easier and more efficient. By processing and selling butter instead of selling nuts, they added some value to the small quantity of sheanuts they were able to collect. For example, the household survey revealed that the lowest price a woman got for one bag of sheanuts during the previous 12 months was GH¢10, while the lowest price that the butter produced from one bag of sheanut received was GH¢20. Even after factoring in the costs associated with processing and sale of butter as reported by the women, the net value added was quite significant for the study area.[6] Moreover, the opportunity costs of labour used by these women were very low, as there were few other employment opportunities for them, so the women who had a very small quantity of sheanut felt better off processing butter and selling that instead.

6. Based on the information obtained from the butter-processing women, their processing and marketing costs for one bag of sheanuts were: Roasting and grinding (using grinding mill) – GH¢2.5; Return trip to the main market – GH¢1.2; Total labour days required – 3. This shows that without factoring in the value of their labour, they were adding GH¢6.3 by processing one bag of sheanut. After accounting for the value of their daily labour obtained from the survey - at GH¢0.8/day paid to the women hired to weed the fields, the common agricultural labour they were hired to perform – the net value added to the sheanuts in processing and sale of butter comes out to be GH¢3.9. This is still a significant amount for three days' work for these women based on the ongoing agricultural wage labour rate in the village.

Fig 2: Processing sheanuts into butter is a hard work, especially if one has to manually grind the roasted sheanuts to prepare it for kneading. This picture shows a young girl from a Lobi household in Yipala grinding roasted sheanuts manually. She was processing shea butter for household consumption.

It is important to discuss another factor that might have contributed to the significant difference in the income from the sale of sheanuts between women from indigenous and settler households – the price of sheanut, which fluctuated quite significantly during the year, starting from lowest right after the harvest and increasing until the start of the next harvest. During the course of the fieldwork, the price of the sheanut went as high as GH¢40 per bag – a 400% increase from the lowest reported price at GH¢10 per bag. Some of the women in Yipala reported selling their sheanuts at GH¢40 per bag. However, they had to have sufficient capital and income from other sources to hold on to the sheanuts they collected during the early season when the prices are low. Many women from the indigenous households were indeed holding on to the sheanuts they collected to sell at a higher price, and some of them even bought the sheanut early on at a lower price to store and sell later at profit. For most

of the women from settler households who did not have the financial means either to hold on to the sheanuts until late in the season or to invest in sheanuts early on to sell later at a profit, this was not an option. Furthermore, as the price of sheanuts grew, processing butter became an increasingly non-profitable venture, for the price of butter at the local market was not growing proportionally. This could explain why there were very few women processing shea butter as reflected in the household survey. The field evidence also showed that later in the season, even the settler women were selling sheanuts rather than processing and selling shea butter. However, as the average income from the sale of sheanuts by the women from settler households shows, they were significantly less well off compared to their counterparts from the indigenous households in terms of the benefits they received from shea.

6. Household and community-level support for women

Thus far, I have presented and discussed cooperation and support among women in the indigenous and settler groups. This support mainly focussed on consolidating and enforcing additional tenure rights over shea trees and sheanuts on older fallows in the case of indigenous women; while in the case of settler women, the support concentrated on processing of butter through labour-sharing and exchange. The focus group discussions with these two groups of women also revealed additional support that both groups were receiving from their menfolk, as well as others in the community. All the women from the indigenous households received support from their husband in protecting their tenure claims over shea trees on the older fallows. The active involvement of the men from the indigenous households in protecting

their wives' claims was exemplified in this incident recalled by a woman, Baboyina, from the settler group:

> Last year we collected our nuts [from some other place] and were walking through someone's farm. The man claimed that the sheanut were collected from his farm and therefore seized our basins and the sheanut as well. Later the chief settled the dispute and our basins were given to us but not the nuts. (30 November 2007, Yipala)

In the case of women from settler households, we found little evidence that their menfolk were as actively involved in supporting them to claim stronger tenure rights over shea trees on older fallow lands. However, one man within the settler community had established a mechanised grinding mill to grind roasted sheanut, which greatly reduced the amount of manual labour required to process butter. The women who processed shea butter revealed that without the grinding mill, it would take them one whole week to process one bag of sheanuts, as most of the hard is labour spent on manually crushing and grinding them. With the grinding done by the mill, they could process a bag in three days, or if they shared labour with other women, in one day with three women's labour. Moreover, the owner of the mill provided an interesting case of support to the women from the settler households in that he let them grind their sheanut on credit, which they could pay back after the sale of butter. For women who were always struggling for the capital investment in processing sheanut up-front, this was a great relief. However, the owner of the grinding mill did not extend his support to the women from the indigenous households. In fact, according to the women from the indigenous households, he not only refused to provide the grinding facility on credit, but also charged them more than those from the settler households for using the mill. This was one of the reasons given by the women from indigenous household for not being able to process butter.

According to the owner of the mill, he provided on-credit grinding facility to the women from settler household for two main reasons – to help them in their shea butter processing venture as they were his "own people"; and it was less risky as the collection of the due later was easy because they all lived close by and needed to use the mill repeatedly. By contrast, the dwellings of the women from indigenous households were at the other end of the village, so it was more difficult to collect the dues, and over time they were more likely to default. However, it should also be noted that the women from the indigenous households appeared less keen in processing shea butter than those from the settler households. The former group of women mentioned having a functioning grinding mill in their own community previously, which was now not working. Furthermore, owing to the high price they were fetching for their sheanuts, it seemed they were happy to sell sheanuts rather than put effort into processing butter without much added value, as Ajara Davi, one of the leading sheanut seller women from the indigenous group explained:

> We have [a] ready market for nuts - [in] Wa we have a market. Also we can join our colleagues in Tamale to have a bigger market. (29 November 2007, Yipala)

Finally, in all the tenure claims relating to land and trees, it is important to have the consent, if not active support, from the chief. It was clear during the discussion with the group of women from the indigenous households that they had received favourable rulings from the previous chief whenever they had taken a case of conflict regarding sheanut picking involving themselves and the settler women. However, both groups of women were uncertain as to how the new chief would decide on cases of conflicts involving the indigenous and settler women, especially when it concerned picking of sheanut from the older fallows. As noted, this chief made clear in his interview that he wanted to have the Gonja customary laws

followed within his jurisdiction, noting specifically that fallows older than two years must be considered as community land and everybody should have access to those fallows – including the members from the settler households. He made it clear that he would decide the cases based on the Gonja customary laws, and not the variants in practice in Yipala.

7. Conclusions

This study highlights a number of issues related to the gendered nature of tree tenure in agroforestry parklands in Yipala, many of them likely to be found in other communities in Northern Ghana. The study particularly focuses on two main aspects with regards to gender and tenure - (i) what is the true nature of land and tree tenure in these communities (written/documented vs. practised)?; and (ii) how do women negotiate their position vis-à-vis their customary rights (in comparison to men), and vis-à-vis other women in the community?

It is clear that the rules regarding access to and use of land and trees in practice in Yipala are quite different from those stated in the Gonja traditional laws, especially in the case of fallows that are older than two years. It is interesting that this difference in access rules is not uniform. The women from the indigenous households not only preserved and consolidated their exclusive claims to collect sheanut in the fallows older than two years left by their households, they were also able to collect sheanut in the fallows older than two years left by the settler households invoking the same rule that they were ignoring - i.e., the rule which stated that all fallows older than two years reverted to community lands where all members of the community have access. Their position in the community as autochthons, the support they received from their husband, as well as the power they

were able to garner through mutual cooperation with other women in the group, all played a key role in being able to exercise these additional tenure rights. Moreover these women believed they should have the greater tenure rights over shea trees for belonging to the indigenous households, and they worked towards, and were successful in securing those rights. On the other hand, women from the settler group were forced to follow the Gonja traditional laws as practised in the community, without much benefit – lack of support from their menfolk in claiming their tenure rights and their low number probably furthering their weaker position.

Negotiating one's position in the community in the face of adversity requires not just support structures in place, but also innovative actions on the part of the individuals negotiating such positions. The success of women from the indigenous households in securing exclusive access to sheanut in the fallows older than two years is a case in point. However, this seems not to be unique to the study site, as a review study by Gray and Kevane (1999) on women's access to land in various sub-Saharan countries suggests. They report cases where women were found to use a variety of means to secure their land tenure in response to declining access, such as through their relationships with male kin, organising themselves into groups, purchasing through local unofficial markets, or even manipulating customary institutions. In a similar context, Kevane and Gray (1999) argue that women's tenure rights to land are often derived from multiple social and community relations and are complex, and cannot be simply understood as being secondary to their male kin, especially their husband. In the case of the women from indigenous households in Yipala, they had support from their menfolk in claiming their tenure rights over shea trees on the fallows older than two years, but support from within the households certainly would not have been enough to lay exclusive claim to those fallows. The recognition and

acceptance of their claims (which they obtained by collectively creating and enforcing a new set of (*de facto*) tenure rules) from women from other indigenous households was the key.

While mutual benefits for the women from indigenous households created an environment for cooperation in order to preserve exclusive access to the shea trees on old fallows that would otherwise have been common lands, this also created a situation of conflict with the women from the settler households. The women from the settler households were disadvantaged twofold. First, they were excluded from picking sheanuts from the fallows older than two years, even though the stated Gonja customary laws allowed them to do so. Secondly, they were unable to create a similar situation of exclusivity over the fallow lands they left, mainly because of their lack of power in the community, as women, and more importantly as "settler" women. The rules created by the indigenous women applied primarily for their own benefit, and to the detriment of the settler women - as reflected in the appropriation of benefits from shea trees in the fallow lands by the two groups of women. Lack of access to most of the fallows left the women from settler households with few options in terms of sourcing their sheanuts. They either had to travel long distances to collect from the bush and compete with other women to pick the sheanuts, or they had to make do with the picking in their husband's fields and fallow lands. Most of these disadvantaged women from the settler households were found to process shea butter, thereby adding significant value to the sheanuts they were able to collect. They sold shea butter instead of sheanuts as long as the value added was significant compared to the price the sheanuts fetched in the market. Moreover, they had

established a formal shea butter processors' group in order to help each other in processing butter, mainly through labour sharing and exchange.

This contrasting access to and benefits from the tree resource between these two groups of women shows the need to go beyond a general "women" (in contrast to "men") as a group in our understanding of the gendered nature of tree tenure. For all women cannot be treated as being the same, and in any society divisions such as landowner vs. tenant, autochthon vs. settler are manifested in these differences in access to and benefits from resources, cutting across gender (Meinzen-Dick et al. 1997). This also highlights an important aspect from among the gender-related issues that policy makers need to take into consideration while formulating policies targeting women. More specifically, it is crucial to understand not only the differences between men and women in terms of access to resources, but also those between women from different groups. Furthermore, each group of women exhibited their own strength and unique way of dealing with tenure inequalities (or in the case of women from indigenous households, claiming what they perceived as their just rights), which should be harnessed positively for any successful policy that is targeted towards helping these women improve their livelihoods.

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Chapter VI - MANAGEMENT, UTILISATION AND ECOLOGY OF SHEA AND LOCUST BEAN TREES IN NORTHERN GHANA

Management and use of shea and locust bean trees in Dagomba, Gonja & Mamprusi traditional areas: a comparative study of the customary rules and present practices

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Abstract

Studies on African resource tenure have focussed primarily on land tenure security, investment incentives and productivity. However, due to the intrinsic nature of agroforestry parklands, the tree tenure institutions are just as likely to influence the human management of these landscapes, and the utilisation of resources such as indigenous economic trees within. This study explores the impact of tree tenure institutions, along with other socioeconomic and land tenure factors, on the management and ecology of shea and locust bean trees in Northern Ghana, and the appropriation and distribution of benefits from those trees. A comparative analysis of the management and utilisation of these species in three main traditional areas shows that household behaviour regarding the management of these species is affected not just by economic incentives, but also by the incentives and constraints stemming from the prevailing tree tenure rules. Furthermore, an econometric analysis of the densities of shea and locust bean trees on the farmlands highlights the importance of tenure systems and socioeconomic factors in shaping the management practices, and subsequently the ecology of these indigenous economic species. The study concludes that the success of any policies targeted towards promoting sustainable management and use of these indigenous economic species in agroforestry parklands requires a proper understanding of the peculiarities in the resource-use dynamics in these parklands.

Keywords: tree tenure, land tenure, shea, locust bean, agroforestry

1. INTRODUCTION

Studies on African parklands and more generally on farmlands have focussed mainly on the issues of land tenure, and especially on security of tenure, investment incentives, and productivity (Barrows and Roth 1990; Bruce and Migot-Adholla 1994; Besley 1995; Brasselle et al. 2002; Place and Otsuka 2002; Smith 2004). Although the majority of these studies have not produced clear results on the postulation that land tenure security (through land registration, entitlement and private property rights) improves productivity by encouraging investments, it is clear that the prevailing systems of tenures do influence the behaviour of individuals and households managing the land, and resources therein (Bruce and Fortmann 1988; Besley 1995; Hansen et al. 2005). In the case of agroforestry, this issue becomes critically important as trees form an inseparable part of the system, and they have been used not just as investments in themselves but also on the land, as they often strengthen and secure tenure rights over the land where they are planted (Fortmann 1985; Berry 1988; Sjaastad and Bromley 1997). Despite their interconnectedness, land and tree tenure systems are often quite distinct, providing individuals and households with a set of rights to one resource regardless of their tenure rights over the other (Fortmann 1985; Fortmann and Bruce 1988; Rocheleau and Edmunds 1997). However, very few studies have focussed on the impact of tree tenure regimes on the management and ecology of parkland tree species such as shea and locust bean, particularly how those tenure arrangements influence the behaviour of individuals and households managing and utilising these trees in these landscapes.

This article aims to help fill that void by assessing the impact of tree tenure and other socioeconomic characteristics on the management and utilisation of these trees. Through the use of an econometric model, the article identifies the major

socioeconomic and institutional determinants of the shea and locust bean tree densities in Northern Ghanaian parklands, and quantifies their impacts. The primary objective is to explore the differences in tenure systems with regards to shea and locust bean trees in the three main traditional areas in the Northern Region in Ghana, and to investigate whether (and how) the tenure arrangements and other socioeconomic factors in these areas influence the management and utilisation of the two tree species in the agroforestry parklands.

Although the benefits and costs of having trees on the farmlands might be the primary determinant of how individuals and households manage such trees, institutional arrangements such as the prevailing system of land and tree tenures also play a crucial role in influencing their behaviour – either directly through the constraints these institutions place on them or by influencing the streams of costs and benefits from these trees (Bruce and Fortmann 1988). Moreover, the separability of land and tree tenures common in these regions adds to the complexities in our understanding of the effects of various socioeconomic and institutional factors in the management and utilisation of these tree species in these parklands. Taking the case of agroforestry parklands in Northern Region in Ghana, and selecting the study sites to cover the three major traditional areas in the region, this study attempts to build a greater understanding of the tree tenure systems in these traditional areas. In addition, through a comparative analysis of the tree tenure regimes in place, the study aims to assess the incentive structures present within the institutional arrangements regarding these trees, and how they influence individual/household behaviour with regards to the management of these species, ultimately impacting not

just on the densities of these trees on the farmlands, but also on the benefits to these households.

This paper is structured as follows. Section 2 sets up the theoretical and analytical framework based on previous studies of land and tree tenure in agroforestry parklands, especially on shea and locust bean trees. Section 3 describes the study sites and methodologies for data collection and analyses and the results are presented and discussed in Section 4. The major findings of the study are summarised and conclusions presented in the final section.

2. TREE TENURE IN AGROFORESTRY PARKLANDS

Agroforestry parklands (interchangeably termed 'farmed parklands') have long been the mainstay of semi-humid and semi-arid sub-Saharan African landscapes, where mature trees of selected few species are found scattered across the farmlands or fallows (Pullan 1974). In West African parklands, two of the most common tree species left on these farmed or fallow lands are shea and locust bean (Pullan 1974; Boffa 1999). Although resembling the savannah landscapes, these parklands are very much anthropic in nature, as humans have been managing these parklands for centuries, as early travellers to the region such as Mungo Park noted (Park 1799). Active (and often intensive) management of these parklands, as Pullan (1974) posits, have an impact on the ecology of tree species they contain. As population pressure and intensification of agriculture has decreased the overall number of trees, they have also led households to protect selectively particular tree species, commonly multi-purpose economic species such as shea and locust bean, on their farmlands (Blench 1999; Lovett and Haq 2000; Maranz and Wiesman 2003). Thus the

management and ecology of these tree species are inextricably linked to the behaviour of individuals and households cultivating and managing these parklands.

The separability of land and tree tenure in Africa is well recognised (Fortmann 1985; Fortmann and Bruce 1988; Rocheleau and Edmunds 1997). These studies, primarily anthropological or sociological in origin, point clearly to the impacts these tenure systems have on the management and utilisation of trees, both in farmland and fallows, especially through their influence on the behaviour of individuals and households inhabiting these lands. Furthermore, as with the land tenure, tree tenure systems are likely to impact how individuals and households protect, plant and manage trees in their farmlands (Dewees 1995; Said and Sibelet 2004; Hansen et al. 2005; German et al. 2009). However, very few studies have examined these impacts in depth, and those who have tried to study the impact of land use practices on the ecology of the trees have largely ignored the tenure systems (for example, Lovett and Haq 2000; Maranz and Wiesman 2003; Kelly et al. 2004; Djossa et al. 2008).

Studying the size-class and spatial distribution of shea trees on farms, fallows and forests in Mali, Kelly et al. (2004) report a varying distribution pattern of shea trees in these three land-use systems, concluding that farming practices have an impact on the ecology of shea trees. Lovett and Haq's (2000) study of shea trees in Northern Ghana reports a higher proportion of larger shea trees on farmlands than on unmanaged woodlands and they argue that anthropic selection of these trees on farmlands over the long-term have made these trees "semi-domesticated". Maranz and Wiesman (2003) also conclude that human land-use practices have a significant impact on the distribution of shea trees in savannah parklands in sub-Saharan Africa, and call these parklands "anthropogenic landscapes". Through a comparative study

of the stand structure and distribution of shea trees on farmland and nature reserve in Benin, Djossa et al. (2008) conclude that although shea trees, especially mature ones, were better protected in farmlands, a lack of saplings is likely to have an adverse impact on their long-term population on the farmlands. All these studies identify a key factor influencing the ecology of trees in agroforestry parklands: land use practices by the households, especially agricultural practices with selective management of trees such as shea. However, none of these studies looks into how those households' behaviour might have been influenced by the prevailing systems of tenure, especially the customary laws and institutions that might regulate their management practices or create economic incentives (or disincentives) with regards to both the land and the trees therein. This study expands on these studies by adding another dimension – that of tenure systems - to these well-accepted postulations that human practices influence the ecology of parkland species like shea and locust bean. This study examines the tenure systems in place, especially with regards to these two tree species in three major traditional areas in Northern Ghana, and assesses the impacts of these tenure arrangements on the behaviour of individuals and households managing these trees on their farmlands. It makes a distinctive contribution by applying a simple model to explore the determinants of shea and locust bean tree densities on the farmlands in the study sites in order to analyse quantitatively the impact of tenure and other socioeconomic factors on the ecology of these trees.

Modelling shea and locust bean tree densities

The model assumes that the density of shea and locust bean trees depends on five main factors – the biophysical characteristics of the landscape (soil, rainfall, humidity etc.), socioeconomic characteristics of the households using the land (landholding, household size, income etc.), the prevailing system of tenure and

resource governance at the local level that influence individual/household behaviour in managing these trees (land and tree tenure rules), land use practices (use of tractors, farm-fallow rotation), and the importance of these trees to the households (income from these trees) (Fig 1). The model can be represented in a general form as:

$$D_i^j = f\left(B_i^j, H_i^j, T_i^j, L_i^j, Y_i^j\right)$$

Where, j represents the tree species (mature and young shea or locust bean), D = tree density; B = matrix of biophysical characteristics; H = matrix of household characteristics; T = matrix of tenure and governance related variables; L = matrix of factors related to land use practices; and Y = benefits from the trees.

The analyses follow the framework laid out in the model schematic in Figure 1. The relationships between land and tree tenure in the management of shea and locust bean trees on farmlands are explored. Furthermore, the influences of tree tenure in the utilisation, and in the benefits and costs from these trees to the households are analysed. Household characteristics that are likely to influence land use practices as well as the management and utilisation of shea and locust bean trees are also explored. Finally the models for tree densities are estimated.

This study focuses primarily on the socioeconomic and institutional aspects of agroforestry systems in Northern Ghana, so the primary data collection was mainly geared towards gathering household and community-level socioeconomic and tenure-related information through household surveys, key informant interviews and focus group discussions (explained in Section 3). The focus of the study combined with logistical reasons prevented the biophysical data on the study sites (such as soil characteristics on the farmlands, temperature, precipitation etc.) from being

collected. Consequently, the models assume all the study sites to have similar biophysical characteristics (which is true up to a certain extent as they are in same ecological/vegetation zone of Ghana). Nevertheless, by using the associate species (shea for locust bean and vice versa) as a proxy, the models try to capture the variations in biophysical characteristics within these study sites.

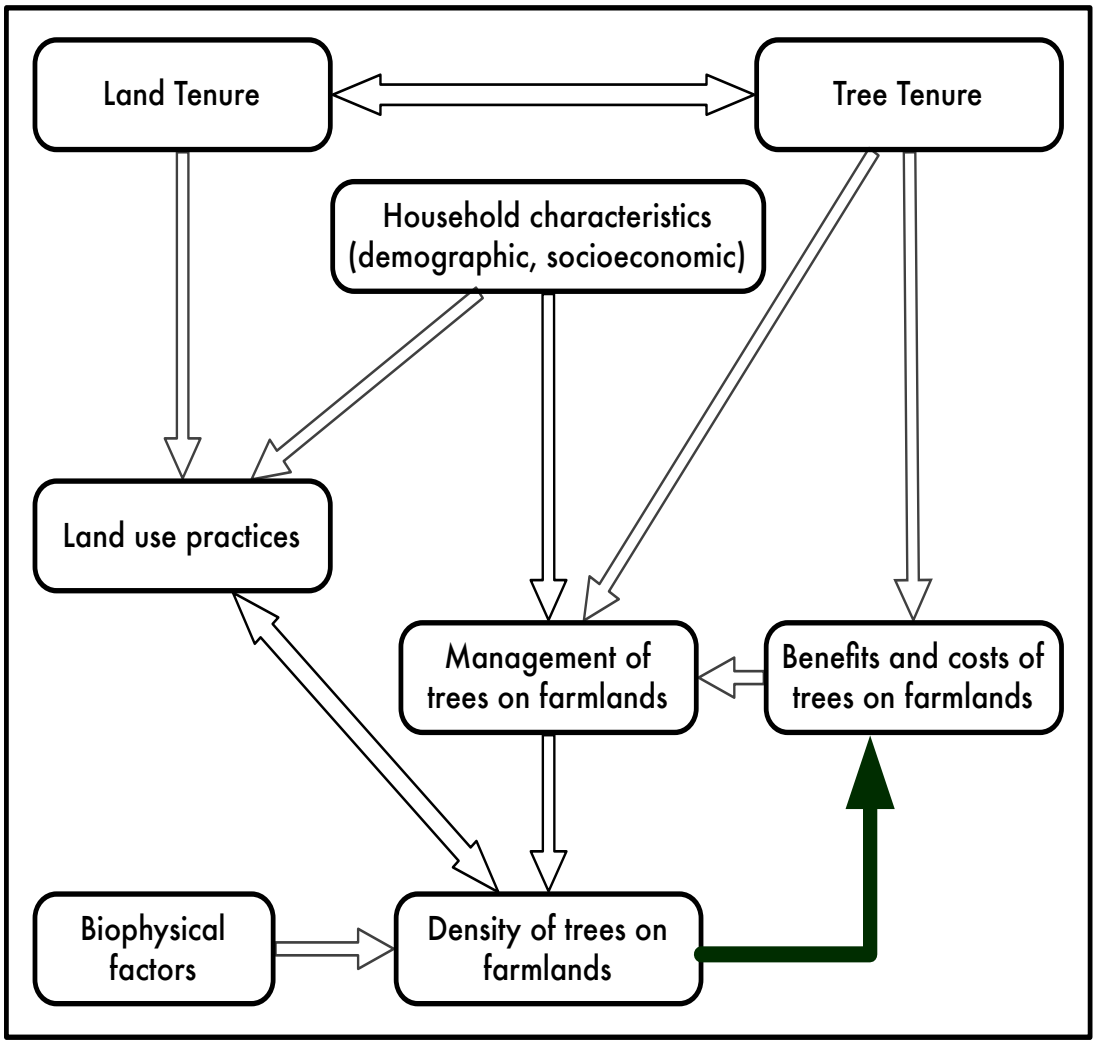

Fig 1: A schematic of the model showing the influences of various factors on the density of trees on agroforestry parklands. The dark arrow indicating that ultimately the densities of trees also affects the benefits and costs of having trees on the farmlands.

3. STUDY SITES, DATA COLLECTION AND ANALYSIS

Study sites

The primary purpose of this study was to cover the variations in tree tenure regimes across the Northern Region in Ghana, and the obvious solution was to select study sites that covered the main ethnic areas within the region. Three sites, Cheyohi & Kpachi, Yipala and Gbimsi, were selected for the in-depth surveys to represent three main traditional areas in the region – Dagomba, Gonja and Mamprussi respectively (Fig 2).

Cheyohi (9º 26', 0º 59') and Kpachi (9º 25', 0º 58') are two small communities within Tolon-Kumbungu district in the Dagomba traditional area. The communities are ethnically homogenous with all Dagomba households (102 in Cheyohi, and 29 in Kpachi) with a total population of 1802 at the time of the survey. Located within commuting distance of Tamale, households in these communities had relatively easy access to the markets, and were aware of the commercial potential of both shea and locust bean trees, which was important in capturing the external influences in the management and use of these tree resources. Moreover, being next to Nyankpala, a fast-growing town with an increasing land scarcity, research in these communities allowed an examination of tree tenures in the context of resource scarcity and external pressures.

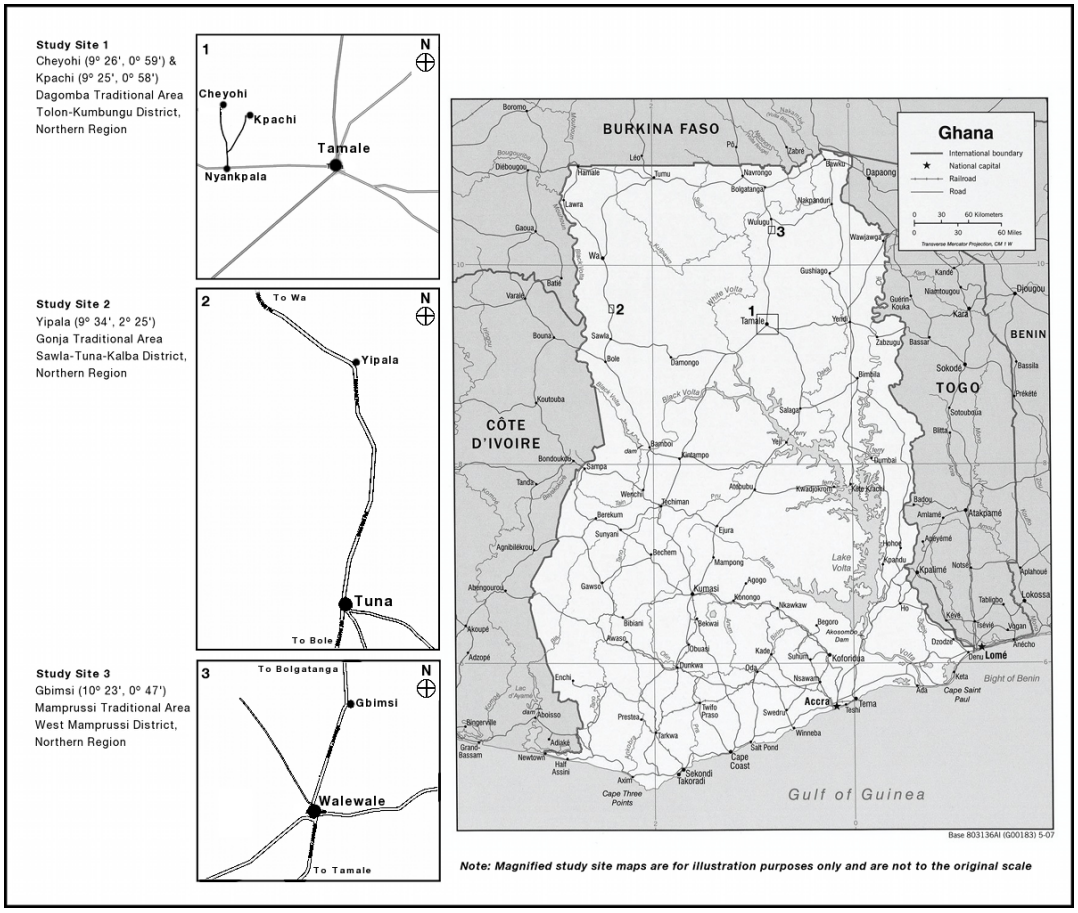

Fig 2: Map of Ghana showing the three study sites in the Northern Region. The enlarged study sites are for illustrative clarity, and are not to the actual scale.

Yipala (9º 34', 2º 25') is a community of mixed ethnic groups in Sawla-Tuna-Kalba district within the Gonja traditional area. The community has a Gonja chief, *Yipalawura*, but is otherwise diverse with Gonja, Wala, Dagarti and Lobi ethnic groups residing in the community, and a few Fulani households on the outskirts. Yipala lies on the Bole-Wa road with relatively easy access to a small market town of Tuna, and a bigger town-centre Wa, which is the regional capital of the Upper West Region. The community is spread on either side of the main road, with almost all of the Gonja and Wala households residing on the eastern side of the road where the houses are built close to each other. Lobi-Dagarti households, who were classed as settlers (in-migrants), are on the western side of the road with their dwellings

spread across a large area with households far apart. Yipala had a total of 161 households (excluding Fulani households that were not considered a part of the community proper), with a total population at the time of the survey of 1813.

Gbimsi (10º 22', 0º 47') is one of the largest settlements in the West Mamprussi district within the Mamprussi traditional area. It had 565 households and a total population of 6002 at the time of the survey. The community is divided into nine sections, called "*fong*", by the local community leaders themselves. The community is composed largely of Mamprussi households, rest of the households belonging to ethnic groups such as Frafra, Mossi, Kasina and Talensi. Seven of the nine sections are entirely populated by Mamprussi households, while the remaining two are mixed communities primarily of non-Mamprussi households.

In all study sites, a stratified random sampling was conducted to select the households for the survey. The stratification was based on the membership of the community in Cheyohi & Kpachi; on the membership of the sections (*fong*) in Gbimsi; while it was based on the ethnic group in Yipala. The objective was to have a proportional representation of all major segments of the population within each study site in the final sample for the surveys. The final number of households surveyed was 80, 85, and 82 respectively in Cheyohi & Kpachi, Yipala, and Gbimsi. Primary data were collected during October-December 2007 in Cheyohi & Kpachi and Yipala, and during August-September 2008 in Gbimsi.

Data collection

Primary data was collected in all the study sites through (i) key informant interviews and focus group discussions (FGDs), (ii) a household questionnaire survey, and (iii) a census of shea and locust bean trees. Initial visits to the study sites were made to

gain familiarity with the study area, local stakeholders and key issues, and to identify key informants in the community. The semi-structured key informant interviews concentrated on gathering community-level information, and they also helped in identifying the major local stakeholders with interest in land and trees (Grimble and Wellard 1997).

The FGDs on the other hand focussed on stakeholder-specific information. In all the study sites, at least three focus group discussions were held to obtain information from major stakeholders – the farmers, women (who collected sheanut and locust bean), and shea butter processing women. These focus group discussions followed a semi-structured discussion guide to incorporate major issues related to the particular stakeholder. For example, FGDs with farmers focussed more on local agricultural production systems, management practices regarding trees on farms, their general views on trees on farmlands, perceptions about the mechanised farming methods and so on.

The structured household questionnaire survey sought to gather detailed information on demographic and socioeconomic characteristics of the households, respondents' views on land and tree tenures, and perceptions of the effects of trees on the crops. The initial versions of the survey questionnaires were pre-tested, and revised based on the feedback from pre-testing to prepare the final version (Glewwe 2005a, 2005b). From each household, the household head (or the member responsible for providing for the household), and the head woman were interviewed. The household-level information related to income (on and off-farm), expenditure and agricultural-production were collected for the 12-month period leading up to the survey using a

recall method. The information was recalled by the main respondents, with the help of relevant members of the household when necessary.

Finally, a census of shea and locust bean trees was carried out on the farmlands of all the households surveyed. The census was restricted to the farmlands that were within the three communities surveyed, as some households, especially those from Cheyohi & Kpachi, had additional farmlands in outside communities. An exhaustive count of mature (fruiting and old non-fruiting) and young (taller than 1 metre, yet-to-fruit) trees of both species was carried out for all the households surveyed. For all households, the tree census on their farmlands was conducted with the help of a member of the household who was aware of the plot boundaries on all sides. The data collected from the household surveys were coded, entered, and analysed in SPSS 16.0 (SPSS Inc. 2008).

Framework for data analysis

The study focuses on the comparative analyses of the study sites in terms of demographic and socioeconomic characteristics, tenure systems (land and tree tenures, focussing primarily on tree tenure), and the density of shea and locust bean trees on the farmlands. The study also investigates the potential relationships of the demographic, socioeconomic and tenure-related variables with the management of and appropriation of benefits from these trees within and across the sites.

For the qualitative data, such as the respondents' perceptions regarding the tenure systems, impact of trees on crops and so on, qualitative data analysis techniques including ordering, ranking, crosstabulations are used to understand the variations within and across the study sites. For quantitative data, descriptive statistical methods, and comparative analysis techniques such as Independent samples t-test,

ANOVA were used to analyse the variables of interest. Finally, in order to analyse quantitatively the impact of socioeconomic and institutional factors on the management of trees on the farmlands, a series of regressions were performed with the density of shea and locust bean trees as the dependent variables. The explanatory variables included the size of the landholding, household income from shea and locust bean trees, income from other off-farm sources, variables capturing aspects of land and tree tenures, and other peculiarities of the study sites.

4. RESULTS AND DISCUSSION

Landholding, tenure and livelihood systems

Table 1 summarises basic household characteristics in all the study sites. While Cheyohi & Kpachi had the largest household size and available household labour on average, households in Yipala and Gbimsi had significantly larger landholdings and cultivated land ($p<0.001$ in ANOVA). Households in Gbimsi were the least food secure, those in Cheyohi & Kpachi had medium food self-sufficiency, while those in Yipala were the most secure. The main respondents in all three sites were overwhelmingly illiterate and had agriculture as their main occupation.

The characteristics of the main non-irrigated farm plots, used to grow staple crops in the three study sites, gives us an idea of the pattern of landholding, land use and access to and rights over land (Table 2). The average area of the main farm plot was lowest in Cheyohi & Kpachi, and highest in Gbimsi – the same pattern as the average landholding overall. In terms of ownership, 98.8%, 100% and 84.1% of the respondents surveyed in Cheyohi & Kpachi, Yipala, and Gbimsi respectively said they owned the land – almost all without legal documents. The level of rights to land followed the ownership pattern in all study sites – however, a notable difference

Table 1: General characteristics of the households surveyed in all three study sites

		Cheyohi & Kpachi	Yipala	Gbimsi	Total
Total HH Surveyed		80	85	82	247
Household head's age (median)		60	45	51	50
Indigenous to the site (%)		80 (100%)	71 (83.5%)	73 (89%)	224 (90.7%)
Household size (median)		11.5	6	8	8
Household labour (14-70 years) (median)		7	2	4.5	4
Male as main respondent		79 (98.8%)	80 (94.1%)	77 (93.9%)	236 (95.5%)
Main respondent's education	Lowest	Illiterate (92.5%)	Illiterate (92.9%)	Illiterate (80.5%)	Illiterate (88.7%)
	Highest	Senior secondary (1.2%)	Junior secondary (4.7%)	University degree (1.2%)	University degree (0.4%)
Agriculture as the respondent's main occupation		100%	100%	96.2%	98.8%
Total landholding (mean in ha)		4.67	8.58	8.63	7.29
Total farmland cultivated during 12 months leading to the survey (mean in ha)		2.47	4.34	4.84	3.90
Food security (months of food self-sufficiency)	Up to 6	3 (3.7%)	1 (1.2%)	58 (70.8%)	62 (25.1%)
	6-9	58 (72.5%)	4 (4.7%)	23 (28%)	85 (34.4%)
	9-12	19 (23.8%)	21 (24.7%)	1 (1.2%)	41 (16.6%)
	12+	0	59 (69.4%)	0	59 (23.9%)
Off-farm income to the household (mean in nominal GH¢)		480	189	893	517

between the sites was that while the respondents in Yipala said they could only use their land as collateral for the loans, almost all of the respondents who had claimed ownership over their land at the other two sites said they could use their land as collateral as well as sell it (Table 2). The majority of the respondents/households had inherited the land that they were farming in all three sites. Most of the households in Cheyohi & Kpachi had continuously farmed the same plot of land for more than 10 years, while in Yipala and Gbimsi the proportion of households surveyed spread almost evenly with regards to the period of continuous farming (Table 2).

Table 2: Landholding, use and rights for the main non-irrigated farm plot in the study sites.

		Cheyohi & Kpachi	**Yipala**	**Gbimsi**
Households with plots		80 (100%)	85 (100%)	82 (100%)
Average landholding (ha)		1.01	1.73	3.15
Ownership	Yes (w/ papers)	1 (1.2%)	0	4 (4.9%)
	Yes (w/o papers)	78 (97.5%)	85 (100%)	65 (79.3%)
	NO	1 (1.2%)	0	13 (15.9%)
Rights to sell or use as collateral	Security	0	84 (98.8%)	5 (6.1%)
	Sell	0	0	5 (6.1%)
	Both	79 (98.8%)	0	60 (73.2%)
	No rights	1 (1.2%)	1 (1.2%)	12 (14.6%)
Use obtained through	Inherited	79 (98.8%)	68 (80%)	64 (78%)
	Used free of charge (from chief or landowner)	0	17 (20%)	8 (9.8%)
	Sharecropped	0	0	8 (9.8%)
	Rented	1 (1.2%)	0	2 (2.4%)
Years under continuous farming	1-5 years	4 (5%)	31 (36.5%)	30 (36.6%)
	6-10 years	6 (7.5%)	23 (27%)	23 (28%)
	More than 10 years	70 (87.5%)	31 (36.5%)	29 (35.4%)

The analysis of the landholding and land use pattern suggests that compared to the other two sites, Cheyohi & Kpachi has serious land scarcity. This not only shows in the actual area of landholding in these communities (Max of 6.8 ha compared to 22 ha for Yipala and 14 ha for Gbimsi), but also in the number of years the households

were continuously farming the same plot. For the households in Cheyohi & Kpachi, land scarcity meant they were unable to leave any land fallow (only 20% of the households had some fallow land) to follow the traditional farming system of fallow-farm rotation in these parts (Boffa 1999; Lovett and Haq 2000). Moreover, having to farm continuously the same plots of land meant they had to rely on expensive chemical fertilisers to maintain soil fertility. For the households in these communities, who rely on agriculture for sustenance, land scarcity and reduced land fertility could have serious impacts on household food security.

Households in all the communities surveyed supplemented their agricultural production/income with off-farm income in various forms, such as daily wage labour, trading, collection and sale of non-timber products, especially sheanuts. The average household income from these off-farm sources was highest for Gbimsi at about GH¢ 893 for the 12 months period prior to the survey, and about GH¢ 480 and GH¢189 respectively for Cheyohi & Kpachi and Yipala – the former being significantly higher than the latter two (p-value<0.001 in ANOVA). When looked at together with the level of household food sufficiency in these sites, it becomes clear that households in Gbimsi, with lowest food sufficiency, rely heavily on off-farm income to sustain their livelihoods, while in Yipala with the highest food sufficiency they rely on it the least. This supplementing of agricultural income by the rural households, especially those facing food-insecurity, with off-farm income is similar to findings from other studies (see for example, Reardon 1997; Ellis 1998).

Tree tenure, and management of shea and locust bean trees

The responses regarding ownership of shea and locust bean trees on the farmlands (Table 3) reveal that shea trees generally belong to the household heads with rights

to the land. Only three respondents in Gbimsi said shea trees on their farmland belong to the landowner. These were the households that had gained access to the farmland under a sharecropping agreement, and had no rights over the trees. Locust bean ownership mirrored shea ownership in Yipala and Gbimsi; however, in Cheyohi & Kpachi, because of a different system of tenure, all the locust bean trees on the farmlands of the common households belonged to the tree-chief (*Dohannaa*). Only the community chiefs and sub-chiefs (19 among the households surveyed) owned locust bean trees on their farmlands themselves (Table 3). This distinct system of tenure for locust bean trees in Dagomba is quite similar to other systems in West Africa where locust bean trees are considered the property of the original landowner or the village chief regardless of who is using land at present (Schreckenberg 1996; Boffa 1999).

Table 3: Ownership of shea and locust bean trees on the farmlands in three study sites

Ownership of:	**Owned by:**	**Frequency of the responses in the study sites**			
		Cheyohi & Kpachi	*Yipala*	*Gbimsi*	*Total*
Shea trees	Household head	80 (100%)	85 (100%)	78 (96.3%)	243 (98.8%)
	Landowner	0	0	3 (3.7%)	3 (1.2%)
	Total (N)	80	85	81	246 (100%)
Locust bean trees	Household head	19 (23.8%)	82 (100.0%)	78 (96.3%)	179 (73.7%)
	Landowner	0	0	3 (3.7%)	3 (1.2%)
	Chief	61 (76.2%)	0	0	61 (25.1%)
	Total (N)	80	82	81	243 (100%)

The primary access and harvest rights over shea and locust bean trees, not surprisingly, follow the ownership pattern in all three communities – with these rights going to the members of the households that had ownership over the trees. This meant the primary harvest rights over locust bean on the farmlands of the common landholders went to the tree-chiefs in Cheyohi & Kpachi. Secondary

harvest rights amounted to the rights to collect fruits and nuts from these trees from the farmland or fallow, after the members of the households with the primary harvest rights had carried out the first round of collection for the day. But households with ownership over the trees rarely allowed secondary harvest rights to members of the community.

Although households did have well-defined rights over shea fruits and nuts within their farmland and recent fallows, traditionally, fruits and nuts from economic trees like shea, especially on old fallows, were considered a common resource and anyone from within the community was allowed to pick them (Boffa 1999). However, in all the study sites, the households that had left the fallows not only claimed exclusive rights over those lands, but also over the resources therein, preventing other members of the community from harvesting fruits and nuts from the trees therein. This indicates increasing proprietary rights over land and resources within these communities. Even in Yipala, where the Gonja customary laws dictated that fallow lands over two years old are considered communal land where any households within the community could collect tree-products such as sheanuts (Anonymous 1991, no date), indigenous households, who had left their land fallow for more than two years, were found to claim and preserve exclusive rights over those lands, often leading to conflicts with women from the settler households.

The right to plant trees in these communities is important, as in many instances, individuals and households can not only strengthen their existing rights over the land, but also claim ownership over the new plots of lands where they plant the trees (Fortmann 1985; Berry 1988). However, indigenous economic species like shea and locust bean trees were rarely planted, mainly because they were already abundant

through self-regeneration, but also because households in these communities reported that planting of these indigenous trees did not increase their land tenure security. They reported planting exotic species such as cashew instead as those trees increased their tenure security over the land. Nevertheless, this study shows that in the communities surveyed, planting of shea and locust bean trees was not forbidden, but it came with restrictions, depending on the tenure status of the land and the trees. All the households (in Gbimsi) who said they were not allowed to plant shea and locust bean trees on the land said it was because they were not the landowners. This arrangement is similar to those throughout the region where households are often not allowed to plant trees on borrowed or rented lands (de Zeeuw 1997; Boffa 1999; Augusseau et al. 2006). One respondent in Yipala who said he was not allowed to plant shea and locust bean trees on the land believed it was forbidden by the traditional laws.

All of the respondents in Gbimsi who said they were allowed to plant shea and locust bean trees said they could do so without restrictions. In Cheyohi & Kpachi, the respondents said they could plant shea trees on their land without any restrictions. However, only the households of chiefs and sub-chiefs could plant locust bean trees on their land without restrictions. For common households, they could plant locust bean trees but could not claim ownership over the trees planted, as all locust bean trees on their lands, either grown wild or planted, belonged to the tree-chief. This obviously created huge disincentives to those households wanting to plant or protect young locust bean trees on their farmlands, an issue explored below. In Yipala, however, 98% of the respondents believed that they could plant shea and locust bean trees on their land provided they did not lay perpetual ownership claim over the land where the trees were planted and over the trees themselves. However, their response

could be indicative of the fact that planting indigenous trees like shea and locust bean would not strengthen their claim to the land (Personal communication with Chief of Yipala, 10 November 2007). This is a community that has virtually no land scarcity, and hence no land transactions in terms of buying and selling of land. The only way to gain access to the land was through the membership of the community as an indigene or acquiring land through the consent of chiefs and elders as a settler, again free of charge. Although the households had secure tenure over the lands they were farming and the indigenous households also claimed similar tenure rights over the fallow lands they left, they had the notion that once they stopped farming completely or stayed away from the community for an extended period, other households in the community could use their lands or that chiefs and elders could allocate those land to the new settlers. However, planting exotic tree species on the land did strengthen tenure security over the land, and some households in Yipala were starting to establish cashew plantations instead of leaving land as shea/locust bean parklands. Although these plantations have the potential to provide the households with considerably higher cash income in the long run, in addition to securing their tenure over the land, the practice could have a negative impact on indigenous trees like shea and locust bean as they were removed to reduce competition with the planted exotic trees.

Despite possessing the rights to plant the trees, only 20 households from all three sites (8.1% of total respondents) had planted shea trees and only 16 households (6.5%) had planted locust bean trees. In contrast, 90 households (36.4%) had planted other tree species like mango and cashew on their land. In order to understand the potential incentives that might encourage the surveyed households to plant trees, three hypothetical questions were asked to the respondents regarding whether they

would plant shea or locust bean trees: (i) if improved varieties of seedlings of these species were available?; (ii) if they had unrestricted access/use rights over the trees planted?; and (iii) if they had full ownership over the trees planted including rights to cut? The examples of improved varieties proposed to the respondents were general rather than specific, based on the general perceptions about what constituted "improved variety" obtained during preliminary field visits, pilot survey and focus group discussions. These perceptions of "improved varieties" generally included trees producing sweeter fruits, or nuts with high fat content or larger seeds in case of locust bean.

Table 4: Responses to the various incentives to plant shea and locust bean trees on the land

Would plant more shea trees on the land if:		**Frequency of responses in the study sites**			
		Cheyohi & Kpachi	*Yipala*	*Gbimsi*	*Total*
improved varieties of seedlings were available?	Yes	100%	92.9%	92.7%	95.1%
	No	0	7.1%	7.3%	4.9%
	Total (N)	80	84	82	246
if they had an unrestricted access/use rights over the trees planted?	Yes	100%	100%	100%	100%
	Total (N)	79	81	82	242
if they had full ownership over the trees planted including the rights to cut?	Yes	100%	100%	100%	100%
	Total (N)	79	81	82	242
Would plant more locust bean trees on the land if:					
improved varieties of seedlings were available?	Yes	23.8%	90.5%	96.3%	70.7%
	No	76.2%	9.5%	3.7%	29.3%
	Total (N)	80	84	82	246
if they had an unrestricted access/use rights over the trees planted?	Yes	100%	98.8%	100%	99.6%
	No	0	1.2%	0	0.4%
	Total (N)	79	80	82	241
if they had full ownership over the trees planted including the rights to cut?	Yes	100%	100%	100%	100%
	Total (N)	79	80	82	241

As Table 4 shows, all respondents in Cheyohi & Kpachi, and over 90% of the respondents in other two sites said they would plant shea trees on their land if they had access to improved varieties of the seedlings. Overall, less than 5% of the respondents said this incentive alone would not encourage them to plant shea trees on their land. In contrast, all the respondents in all three sites said they would plant shea trees on their land if they had unrestricted access/use rights or full tenure rights over the trees planted. As a follow up question, the respondents were asked which of these incentives they would consider as being the most important while making decision on whether to plant these trees. For an overwhelming majority of the respondents in Cheyohi & Kpachi (86.2%) and Gbimsi (79.3%), access to improved varieties would be the most important incentive (Table 5). This shows that the majority of respondents in both sites felt secure about their existing tenure rights over shea trees on their land.

Table 5: Responses about the "most important factor" in deciding whether to plant shea and locust bean trees on the land

Most important factor considered		**Frequency of responses in the study sites**			
		Cheyohi & Kpachi	*Yipala*	*Gbimsi*	*Total*
Shea trees	Improved varieties	**86.2%**	0	**79.3%**	54.5%
	Unrestricted access	3.8%	0	12.2%	5.3%
	Full ownership	1.2%	**100%**	8.5%	37.4%
	Other	8.8%	0	0	2.8%
	Total (N)	80	84	82	246
Locust bean trees	Improved varieties	23.8%	0	**86.6%**	36.7%
	Unrestricted access	1.2%	0	7.3%	2.9%
	Full ownership	**75%**	**100%**	6.1%	60.4%
	Total (N)	80	83	82	245

In contrast, all of the Yipala respondents said the most important incentive for them would be the "full ownership" over the shea trees planted. As discussed earlier, despite secure access to land and trees at present, households in Yipala seemed to

feel insecure regarding the security of tenure of indigenous tree species such as shea. A contributory factor could be that planting of these indigenous tree species is less likely to strengthen their tenure rights over the land, which is important because the Gonja customary laws states all fallow land over two years should revert to the community (Anonymous 1991, no date). So, where the Gonja customary laws are followed as stated, unless the households plant exotic species on their land, they would lose their exclusive tenure rights over the land they leave fallow for over two years. Most of the respondents in Gbimsi who chose unrestricted access or full ownership as the most important incentive for them to plant these trees were from settler households with less secure tenure rights over land, and some without access to shea trees on the land they were farming at present.

The responses to the hypothetical scenario of incentives offered to the households to plant locust bean trees varied considerably in Cheyohi & Kpachi, which was not surprising given the unique tenure system in place for locust bean trees in the area. Only 19 respondents, all from the households of chiefs or sub-chiefs said they would plant locust bean trees on their land if they had access to the improved varieties (Table 4). In contrast the proportion of positive response for this incentive was more than 90% for both Yipala and Gbimsi. However, as expected all the respondents in all the study sites said they would plant locust bean trees on their land if they had unrestricted access or full ownership over the planted trees. Access to improved varieties would be the most important incentive for only the households of chiefs and sub-chiefs in Cheyohi & Kpachi (19 out of 80), while for the rest, full ownership over the trees planted would be the most important factor (Table 5). This shows that security of tenure over the trees is one of the most important factors in farmers' decision to plant these indigenous tree species. For households with already secure

tenure over locust bean trees, access to improved varieties was the most important incentive (as with shea trees above). Whereas for those with no tenure rights over these trees at present, full ownership over the planted trees would be the most favourable incentive. Similarly, in Yipala perceived insecurity of tenure over these indigenous tree species in the long run might have led respondents to choose "full ownership" as the most important factor in deciding whether to plant locust bean trees. For most respondents in Gbimsi, who already had secure tenure rights over land and trees on their land, availability of improved varieties would be the most important incentive to plant locust bean trees, with most of the respondents with less secure tenure at present choosing "full ownership" as the most important factor. These results support the argument by Bruce and Fortmann (1988) that protection, preservation and planting of trees occur only under the favourable tenure rules and incentive structures, especially those that are not costly to the farmers.

The right to cut trees on the farmland (i.e., dispose of the resource) at will indicates having a strong tenure right over these resources. All the respondents in Cheyohi & Kpachi reported having the rights to cut shea trees on their land, however, only 19 respondents, all from the households of chiefs and sub-chiefs, reported having the same rights for locust bean trees. For those who said they had the rights to cut shea trees, 98% of the respondents said they had unrestricted rights to these trees, whereas 75% of those with rights to cut locust bean trees had unrestricted rights. The remaining respondents said they could cut these trees for traditional ceremonies. In contrast, 95% of the respondents in Gbimsi said they could cut both shea and locust bean trees. The remaining 5% of the respondents could not cut the trees as they did not have full tenure rights over the land they had access to (i.e., rented and/or sharecropped lands). In Gbimsi, a majority of the respondents (80%) who had the

rights to cut these trees said they had such rights to cut old and non-fruiting trees or trees for traditional ceremonies. The remaining said they had unrestricted rights to cut these trees. Yipala seemed somewhat different than the other two sites. Only one respondent at this site believed he had the rights to cut shea and locust bean trees on his land. The remainder said they had no rights to do so, as they believed the trees were protected by traditional/customary rules. Although the current Yipala chief said he had advised the households to protect indigenous economic trees like shea and locust bean on their farmlands, he also mentioned that there was no strict traditional rule forbidding the removal of *some* trees, including shea, to prepare land for farming. Moreover, despite mentioning they were not allowed to cut these trees, field observation showed some of these households have had to cut some shea trees to clear land for farming. Of course, as reported by studies across the region regarding selection and preservation of few economic species in the parklands (Boffa 1999; Maranz and Wiesman 2003), these households also cleared most of the other species first, leaving just shea and locust bean trees. However, if the field was not sufficiently open to farm at that point, they did remove some shea trees.

Table 6: Respondents in the study sites having the rights to cut shea and locust bean trees on their land (farm and fallow).

Have rights to cut:		**Frequency of responses in the study sites**			
		Cheyohi & Kpachi	*Yipala*	*Gbimsi*	*Total*
Shea trees	Yes	100%	1.2%	95.1%	64.6%
	No	0	98.8%	4.9%	35.4%
	Total (N)	80	84	82	246
Locust bean trees	Yes	23.8%	1.2%	95.1%	39.8%
	No	76.2%	98.8%	4.9%	60.2%
	Total (N)	80	84	82	246

Finally, the respondents were asked about their management practices regarding shea and locust bean trees on their land, such as pruning/cutting of the branches or

removing some trees from the farm. All the respondents in Cheyohi & Kpachi said they removed some shea trees in case they had too many trees in the farm. Some of the respondents also reported heavily pruning some shea trees to reduce the shade on crops. As for locust bean trees, only 19 respondents, all from the households of chiefs or sub-chiefs, said they removed some trees or pruned them. Tenure restrictions regarding this tree meant that common households were not allowed to remove the trees or even to cut live branches. Some respondents reported removing dry branches from locust bean trees with the chief's permission, but the majority of the households in Cheyohi & Kpachi left the locust bean trees on their land untouched. In contrast, households in Gbimsi responded identically about their management practices for both shea and locust bean trees – with just over a fifth of respondents saying they removed some trees from the farmland. About 74% of the respondents reported heavily pruning the trees or cutting branches to reduce the shade for better farming, while 5% said they often started a new farm once the old farm had too many shea trees. However, starting a new farm was obviously not an option for the households in Cheyohi & Kpachi as they had severe land scarcity and most households had no fallow land left. In Yipala, only a fifth of the respondents reported removing some shea and locust bean trees from the farmland. The rest of the respondents said they normally started a new farm as the shea trees in the old farm started to get crowded and create too much shade. According to these respondents, that condition usually came about only after 5-10 years of continuous farming on those plots by which time the plots would have lost their fertility and they would have to start a new farm anyway. The fact that about two-third of the households in this community had farmlands with less than 10 years of continuous farming, mostly between 1-5 years, supports their argument. Indeed of all the sites

surveyed, Yipala came the closest to representing what is often termed as the traditional method of farming in these parklands in sub-Saharan Africa with cyclic farm-fallow rotation (Schreckenberg 1999; Lovett and Haq 2000; Augusseau et al. 2006).

Utilisation and appropriation of benefits from shea and locust bean trees

Both shea and locust bean trees provided a multitude of products to the households in all the study sites as was expected from the two major indigenous economic tree species in these agroforestry parklands. Almost every part of these two trees was utilised. About 60% of the households surveyed used leaves from these trees as fodder for their livestock, mainly sheep and goats. Fruits from these trees were an essential part of their diet towards the end of the dry season. This was the time when they usually prepared land for farming and many households had shortages of staple foodstuffs such as maize. Bark and roots from these trees were used as medicine, and 67% of the respondents reported using these to cure ailment, most commonly stomach-ache. Of the households surveyed, 98% reported benefitting from sheanuts and locust bean in some form during the 12 months prior to the survey. Two thirds of the respondents, mainly from Cheyohi & Kpachi and Gbimsi reported using branches from these trees as a source of firewood for cooking, while almost a third used branches as building materials while constructing their huts. Finally, about half the respondents reported using trunk from these trees as building materials, while about 17% reported obtaining firewood from the tree trunks.

Although both these trees, as multipurpose species, provided a plethora of useful products as described above, the main benefits from these trees were indeed their fruits and nuts/seeds. Figures 3 and 4 show the average collection of shea nuts and

locust bean in the study sites by the households surveyed. Households in Yipala and Gbimsi were found to collect more shea nuts than those in Cheyohi & Kpachi on average – the difference being statistically significant between Gbimsi and Cheyohi & Kpachi (p-value=0.006). In the case of locust bean seeds, households in Gbimsi were found to collect more compared to the other sites, the difference with Yipala being highly significant (p-value<0.001).

For sheanuts, the difference between Cheyohi & Kpachi and other two sites is likely to be mainly due to land scarcity in the former communities, which meant the households had less land to collect the sheanut from, mainly their own farm plots. There was very little fallow land in Cheyohi & Kpachi, and the women had to travel far outside the community to collect from the bush. The unique tenure system for locust bean trees in Cheyohi & Kpachi, combined with the low number of locust bean trees overall is likely to be the main reason for low average collection in these communities compared to the other two.

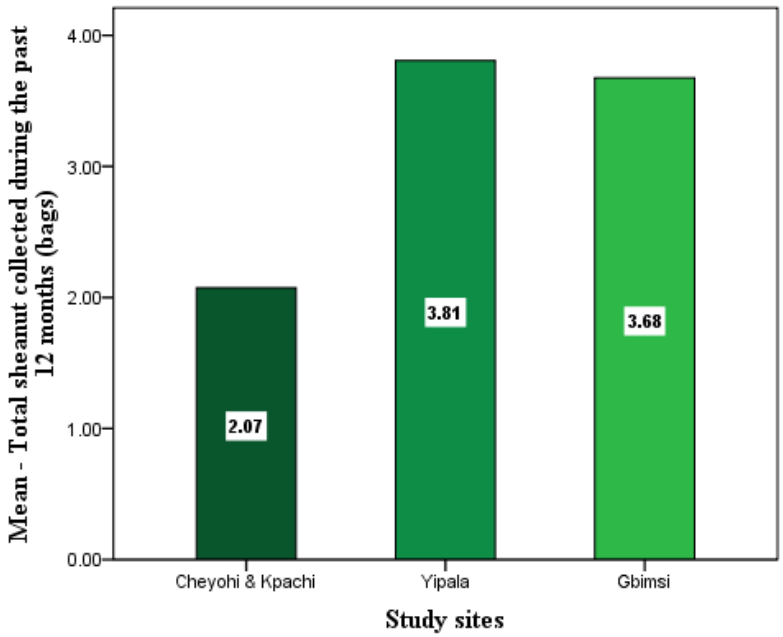

Fig 3: Average collection of bags of sheanut per household in the study sites during the past 12 months prior to the survey. The average is calculated only from among those households collecting sheanut - 76, 70 and 81 respectively from Cheyohi & Kpachi, Yipala and Gbimsi.

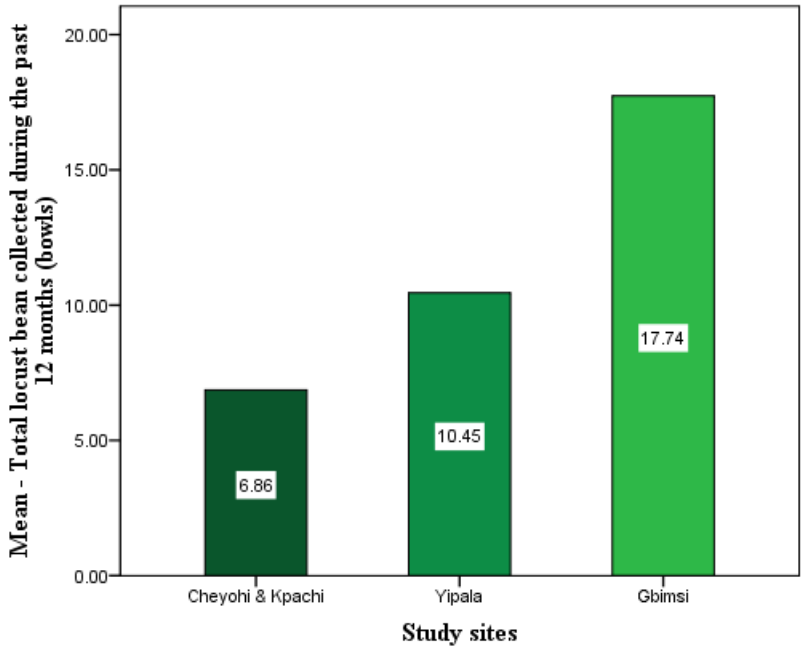

Fig 4: Average collection of bowls of locust bean seeds per household in the study sites during the past 12 months prior to the survey. The average is calculated only from among those households collecting locust bean - 73, 11 and 57 respectively from Cheyohi & Kpachi, Yipala and Gbimsi.

The total cash income from shea (nuts and butter) for the women (and subsequently to their household) was found to be significantly higher for Gbimsi than the other two sites (Figure 5, p-value=0.001). Despite collecting the most sheanuts on average compared to the other two sites, and significantly higher than Cheyohi & Kpachi, the average shea income for the households in Yipala was lower than that for Cheyohi & Kpachi. The main reasons for lower average shea income per household in Yipala compared to the other two sites were because: (i) majority of the households surveyed in Yipala were selling sheanuts without adding much value to the product, while a significant number of households in the other two sites were selling butter thereby adding significant value to the sheanuts; (ii) being a relatively rural community, households in Yipala were receiving slightly lower price for their sheanuts on average compared to the other two sites; and (iii) being a rural community, the households were also consuming more of the sheanuts rather than using replacement vegetable oils from the markets. In contrast, households in Gbimsi were found to earn considerable cash income from shea – the maximum reported total income from shea being GH¢3840 for a household. As expected, the income from locust bean in the three study sites resembled the average collection of locust bean seeds, with households in Gbimsi earning significantly higher income (Figure 6, p-value=0.001). Average income from locust bean for households in Cheyohi & Kpachi was negligible, which was expected as only 3 households out of a total sample of 80 actually received income from locust bean. Again, the unfavourable tenure structure for locust bean trees for most households is the most likely cause for them not being able to get any benefits from this tree in Cheyohi & Kpachi. However, as with average shea income, the ANOVA results did not show a

significant difference between the average locust bean income in Cheyohi & Kpachi and Yipala.

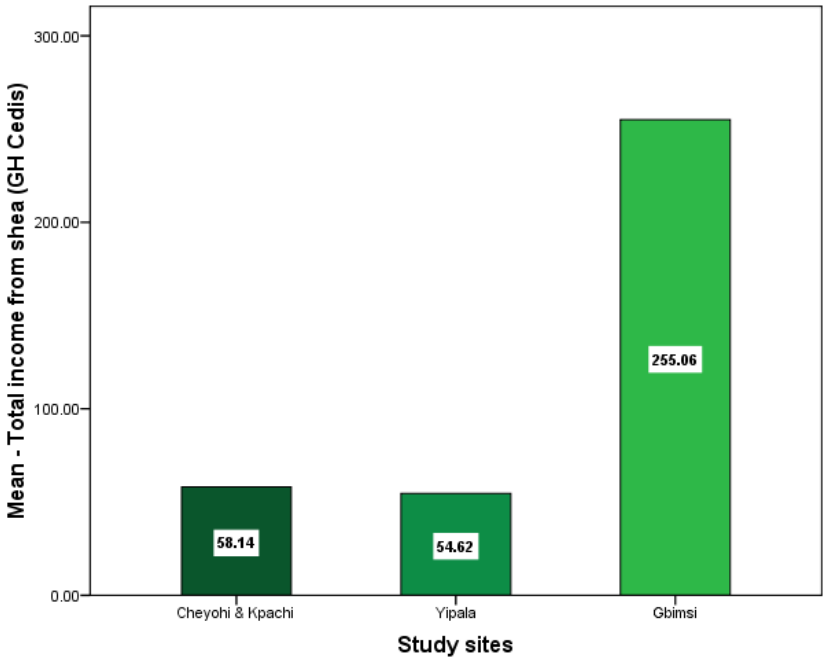

Fig 5: Gross average cash income from shea (nuts and butter) to the women/households in the study sites during the past 12 months prior to the survey

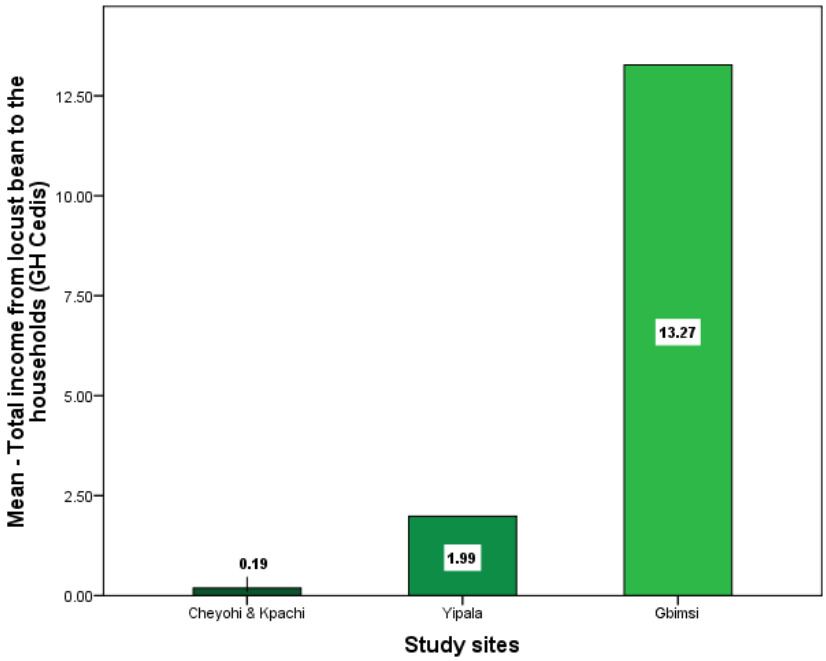

Fig 6: Gross average cash income from locust bean to the women/households in the study sites during the past 12 months prior to the survey

Although the comparative analysis of the average shea and locust bean income to the households in three study sites gives us an idea about the utilisation and benefits appropriation from these two tree species in these sites, it does not tell the whole story, especially about the contributions of these two tree species to household income. In other words, it is essential to explore the proportional contribution of these two species to the household income across the study sites to understand the true value of these species to the households. The contribution of the income from shea (nuts and butter) to the households as a percentage of their total off-farm income was as high as 100% (i.e., total off-farm income from shea) for all three sites. The highest contribution of locust bean to the off-farm income of the household was at 31.58% in Gbimsi, 20% in Yipala and just 3.53% in Cheyohi & Kpachi. Furthermore, the results from the ANOVA multiple comparisons of these income contributions across the study sites show that the households in Yipala received a significantly greater contribution to their total off-farm income from shea (at an average of 71.16%) than either of the other two sites (23.9% in Cheyohi & Kpachi, and 41.17% in Gbimsi).

In comparison to the other two study sites, despite the good access road, Yipala was still considerably underdeveloped with fewer employment opportunities. Although Yipala had the highest food sufficiency compared to the other two sites, mainly because there was no shortage of farmlands and the only constraint for farming was the available labour, there were very few other sources of cash income to the households. Thus, shea was almost the only source of cash income for many of the households in this community, which is reflected in the average contribution of this species to the off-farm household income at more than two-thirds. The average contribution of locust bean to the total off-farm income was however largest for the

households in Gbimsi, and significantly so compared to the other two sites. In terms of the magnitude, however, the average contribution for all three sites was negligible, especially when compared to the contribution from shea (Figures 5 and 6). These results clearly show that the contribution of shea to the household was significantly greater than that of the locust bean.

At this point, it is also important to discuss the costs of having shea and locust bean trees on the farmlands as perceived by the respondents, especially the male respondents managing the farmland. A majority of respondents (56.2%) said shea trees had a negative impact on maize yield, while 29.5% said it had no effect. Only 14.3% of the respondents (almost exclusively from Gbimsi) said shea trees helped increase maize yield. Furthermore, the majority of the farmers also perceived that shea trees had a negative impact on other crops (yam, beans, groundnut, millet and guinea corn), with a significant minority saying shea had no effect on these crops. The perceptions regarding the effect of locust bean trees on maize yield were divided, however, with about a third each of the respondents saying the tree helped increase, decrease or had no effect on the maize yield. However, looking at individual sites, most Gbimsi respondents said locust bean trees helped increase maize yield, while a majority in Yipala said locust bean had no effect. By contrast, most respondents in Cheyohi & Kpachi said locust bean negatively impacted maize yield. A significant majority of the farmers in Gbimsi perceived a positive impact of locust bean trees on the yields of crops like yam, beans, groundnut, millet and guinea corn. In contrast most farmers in Cheyohi & Kpachi and Yipala thought locust bean trees had either negative or no effect on the yield of these crops. Overall, the majority of farmers in Cheyohi & Kpachi and Yipala perceived a negative effect from both shea and locust bean trees on the crop yields, while most of those in

Gbimsi perceived these trees to have a positive impact on crop yields. Although the actual crop yields on the farmlands with and without these trees were not measured in this study, it is interesting to note that the majority of the farmers' perceptions regarding the negative impact of these trees on the crops matches results from other field studies within the region (Kater et al. 1992; Kessler 1992; Wilson et al. 1998; Boffa et al. 2000).

Densities of shea and locust bean trees

Table 7 summarises the densities of mature and young shea and locust bean trees in the study sites. The variations in the densities of shea and locust bean trees in three study sites were statistically significant (p-value<0.001 in ANOVA). Average mature shea tree density was lowest in Yipala (21.16/ha), followed by Cheyohi & Kpachi (26.82/ha), with the highest in Gbimsi (36.85/ha) – significantly higher than the former two sites (p-value<0.001 in ANOVA). The average density of shea trees across the three study sites was about 28 trees per hectare, a figure within the range reported by other studies in the region (Osei-Amaning 1996; Lovett and Haq 2000). For young shea trees, Yipala had the highest density at about 15/ha, significantly higher compared to about 2/ha for Cheyohi & Kpachi and Gbimsi (p-value<0.001 in ANOVA). The density of mature locust bean trees, on the other hand, was significantly higher in Cheyohi & Kpachi at 2.81/ha (p-value<0.001 in AVOVA) compared to that in Yipala (0.95/ha) and Gbimsi (1.36/ha). Finally, density of young locust bean trees was significantly higher in Yipala at 1.23/ha on average compared to 0.20/ha in Cheyohi & Kpachi and 0.66/ha in Gbimsi. Overall, significantly lower young tree densities for both the species on the farmlands in all study sites

correspond to the findings reported by other studies across the region (Lovett and Haq 2000; Kelly et al. 2004; Djossa et al. 2008).

Table 7: Density of mature and young shea and locust bean trees on the farmlands at the three study sites

		N	Mean	Std. Dev.	Min	Max
[f1i_vp_pha] Number of mature shea trees per ha of farmland	Cheyohi & Kpachi	80	26.82	18.335	1	99
	Yipala	85	21.16	13.833	2	95
	Gbimsi	82	36.85	13.988	0	78
	Total	247	28.20	16.746	0	99
[f1i_yvp_pha] Number of young shea trees per ha of farmland	Cheyohi & Kpachi	80	2.24	2.721	0	12
	Yipala	85	14.78	18.389	0	119
	Gbimsi	82	1.97	3.203	0	20
	Total	247	6.47	12.556	0	119
[f1i_pb_pha] Number of mature locust bean trees per ha of farmland	Cheyohi & Kpachi	80	2.81	2.974	0	14
	Yipala	85	.95	1.521	0	7
	Gbimsi	82	1.36	1.171	0	8
	Total	247	1.69	2.172	0	14
[f1i_ypb_pha] Number of young locust bean trees per ha of farmland	Cheyohi & Kpachi	80	.20	.736	0	4
	Yipala	85	1.23	3.355	0	26
	Gbimsi	82	.66	1.533	0	13
	Total	247	.71	2.229	0	26

Determinants of shea and locust bean tree densities

In order to investigate the socioeconomic, tenure-related and site-specific determinants of the density of shea and locust bean trees in the study sites, four different models were estimated: mature shea, young shea, mature locust bean, and young locust bean tree density. The following equation shows a generic version of the models estimated:

$$D_i^j = \beta_0^j + \beta_i^j \sum X_i^j + \varepsilon^j$$

Where j=mature shea, young shea, mature locust bean, and young locust bean trees. The dependent variable on the left is the density of trees, *d*, on the farmland of the households surveyed. The right hand side of the model shows the set of *i*th

explanatory variables, *x*, plus a constant and the error term for each model. All the models were estimated in SPSS 16.0 (SPSS Inc. 2008) using OLS regression. Backward elimination technique was used to exclude insignificant variables while increasing explanatory power of the models. The best model was selected based on the initial assumption about the basic model (see Section 2 and Table 8) and the comparison of the explanatory power of the models using adjusted R-square statistics. The explanatory variables used in all four base models are described in Table 8.

Table 8: Definition of explanatory variables and their inclusion in the various models

Variables	**Explanation**	**Used in the initial model**			
		mature shea	*mature locust bean*	*young shea*	*young locust bean*
1 total_farm	Total area of farmland held by the household (irrigated + non-irrigated)	√	√	√	√
2 shea_income	Total income to the household from shea (nuts and butter)	√		√	
3 locust_bean_inc	Total income to the household from locust bean		√		√
4 off_farm_inc	Total off-farm income of the household (excluding shea and locust bean)	√	√		
5 hh_labour	Household labour availability (number of household members between 14-70 years of age)	√	√	√	√
6 tractor	Dummy for the use of mechanised ploughing in farming (1, if tractor is used, 0 otherwise)	√	√	√	√
7 cheyohi_kpachi	Dummy for the study site (1, if the household is from Cheyohi/Kpachi, 0 otherwise)		√		√
8 yipala	Dummy for the study site (1, if the household is from Yipala, 0 otherwise)			√	
9 gbimsi	Dummy for the study site (1, if the household is from Gbimsi, 0 otherwise)	√			

10 low_food_sec	Dummy for low food security (up to 6 months) (1, if the food security is low, 0 otherwise)	√		√	
11 cut_shea	Dummy for rights to cut shea trees (1, if the household has the right to cut shea trees on the farmland, 0 otherwise)	√		√	
12 cut_locust	Dummy for rights to cut locust bean trees (1, if the household has the right to cut locust bean trees on the farm-land, 0 otherwise)		√		√
13 shea	Mature shea tree density on farmland		√	√	
14 locust_bean	Mature locust bean tree density on farmland	√			√
15 other_trees	Number of other tree species on the farmland	√	√		

The econometric outputs of the two models related to shea – mature and young tree densities – are reported in Table 9. The estimation of the base model including all the explanatory variables for the mature shea tree density model resulted in small and highly insignificant coefficients for the dummy for tractor use (tractor), dummy for the rights to cut shea trees on farmland (cut_shea), number of other tree species on the farmland (other_trees), and household labour supply (hh_labour). These were dropped from the final model. All the remaining variables were significant in the final model (p-value<0.05). The goodness of fit of the model as shown by adjusted R^2 is 0.24, and the F-test shows that the model is statistically significant overall. The model estimation suggests that an additional hectare of farmland in use by the household is likely to reduce the mature shea density by about one tree per hectare, other factors staying the same. The result is not surprising given the fact that availability of land is likely to give farmers more room to cut some shea trees to improve yield, while small farmland holding will not give such opportunity given the significant contribution of shea trees in household income. As expected (based on

the ANOVA results for comparison of tree density across sites), mature shea density is likely to be significantly higher in Gbimsi than in the other two areas. This could be due to a number of reasons as the site dummy is likely to capture a mixture of site-specific characteristics. However, based on the field observation and analysis of other variables and responses, it is likely that the relatively lower land scarcity compared to Cheyohi & Kpachi in combination with fewer tenure restrictions (or perceived restrictions) compared to Yipala regarding this tree could be a major factor. In addition, easy access to two main markets (Bolgatanga and Walewale) is likely to have increased the opportunity costs of having shea on the farm given their economic importance. Off farm income (off_farm_inc) displays the expected positive sign, implying that higher non-agricultural income to the household is likely to encourage them to keep more trees as farmers rely less on farming and clearing of the trees. Similarly, low food security (low_food_sec) also displays the expected positive sign as households with already less than 6 months of food production are likely to rely more on additional sources of food and income such as shea, and are likely to better protect them. Finally, as an "associate species", the mature locust bean tree was expected to have a positive influence on mature shea tree density, which the estimation output confirms with high significance. As the model lacks biophysical factors likely to influence mature shea tree density, it is believed that the inclusion of mature locust bean tree density, being an associate species, should capture some of those factors as a proxy.

Table 9: Determinants of shea tree density

Variables	Dependent Variable: mature shea tree density		Dependent Variable: young shea tree density	
	Coefficients (Std. Error)	*P values*	*Coefficients (Std. Error)*	*P values*
(Constant)	23.061 (1.91)	0.000	-5.14 (2.166)	0.018
total_farm	-1.013 (0.327)	0.002	-0.858 (0.22)	0.000
shea_income	0.006 (0.003)	0.036		
off_farm_inc	0.003 (0.001)	0.044		
gbimsi	8.398 (3.197)	0.009		
low_food_sec	7.001 (3.265)	0.033		
locust_bean	1.621 (0.441)	0.000		
shea			0.198 (0.041)	0.000
hh_labour			0.65 (0.207)	0.002
yipala			17.57 (1.597)	0.000
	F = 14.09		F = 33.72	
	R^2 = 0.26	Adjusted R^2 = 0.24	R^2 = 0.35	Adjusted R^2 = 0.34

The estimate from the model for young shea tree density gives a higher goodness of fit at an R^2 value of 0.34, as well as higher overall significance (Table 9). All the explanatory variables in the final model are highly significant. Of the variables in the base model, total shea income (shea_income), off-farm income (off_farm_inc), dummy for the rights to cut shea trees (cut_shea), dummy for tractor use (tractor), and dummy for low food security (low_food_sec) were dropped from the final model owing to their low and highly insignificant coefficients. Dropping these variables also improved the model's goodness of fit significantly. As with the estimation for mature shea tree density, the total farmland holding shows a negative and significant relationship with the young shea tree density. Again, as argued in case of mature shea tree density, this could be due to the fact that in a larger landholding, farmers could open up the farmlands a bit more to increase yield while not losing too much of the shea trees, thereby reducing the overall tree density. Another important determinant of the young shea tree density, the mature shea tree density (shea) also

shows a positive relationship as expected and is highly significant. The model estimate shows that increasing mature shea tree density by about 5 trees per hectare is likely to increase the young shea tree density by one unit, other factors remaining the same. The site dummy "yipala" showed a highly significant and positive impact on young shea tree density as expected. The model predicts that young shea tree density in Yipala is likely to be higher than other two study sites by about 17 trees per hectare, other factors staying the same. Finally, household labour supply (hh_labour) showed a significant positive impact on young shea trees. Initially, this variable was expected to have a negative impact on young shea tree density, for the fact that having greater household labour supply was thought to increase intensively farmed plot, due to available labour as well as to provide necessary food for the household. However, the estimation shows a significant positive impact of this variable on young shea tree densities. One potential reason for this effect could be the likelihood that having higher labour supply within the household is likely to reduce the use of expensive hired tractors to prepare farmlands for planting, which are thought to reduce greatly the survivability of young shea trees. This negative effect of tractor ploughing on shea regeneration is reported too by Lovett and Haq (2000) in Bole, also in the Northern Region of Ghana.

The econometric output of the mature and young locust bean tree density models is reported in Table 10. Although both the models show relative low goodness of fit, the overall model significance is high for both. The total area of farmland, although it has a negative coefficient as expected, is highly insignificant. As expected, the main determinants for the mature locust bean tree density were site dummy for the study site Cheyohi & Kpachi (cheyohi_kpachi), and mature shea tree density (shea) – both showing a highly significant positive impact. The fact that Cheyohi &

Kpachi have distinct tenure regime for locust bean trees with tree-chiefs in place, thereby protecting the mature trees from being cut down by the ordinary landholders, is likely to have a huge impact in making this variable highly significant. It is likely that this dummy could capture other site-specific characteristics, however, comparative analysis of tree densities and of the tenure systems makes us believe that the distinct tenure rules regarding locust bean trees is likely to be the defining factor. The model predicts higher mature locust bean tree density for Cheyohi & Kpachi by more than one tree per hectare compared to the other two study sites controlling for the other factors. As expected, shea tree density, as an associate species, has a highly significant positive impact on mature locust bean tree density. However, the magnitude is quite small, which could be due to the fact that average shea tree density on the farmland is significantly higher than locust bean trees in all of the study sites. Moreover, as discussed previously, inclusion of associate species like shea should also be taken as a proxy for local biophysical characteristics, which the model does not capture directly due to the lack of field data for these sites.

Table 10: Determinants of locust bean tree density

Variables	**Dependent Variable:** mature locust bean tree density		**Dependent Variable:** young locust bean tree density	
	Coefficients (Std. Error)	*P values*	*Coefficients (Std. Error)*	*P values*
(Constant)	0.523 (0.357)	0.144	1.069 (0.302)	0.000
total_farm	-0.043 (0.045)	0.342	-0.146 (0.47)	0.002
cheyohi_kpachi	1.619 (0.286)	0.000	-2.34 (0.375)	0.000
shea	0.029 (0.008)	0.000		
hh_labour			0.132 (0.047)	0.005
cut_locust			-0.918 (0.299)	0.002
locust_bean			0.383 (0.064)	0.000
	F = 18.11 Adjusted R^2 = 0.17	R^2 = 0.18	F = 12.68 Adjusted R^2 = 0.19	R^2 = 0.20

In the case of young locust bean tree density, all the variables in the final model were of the expected sign and highly significant (Table 10). From the base model, only two variables – locust bean income (locust_bean_inc) and dummy for the tractor use (tractor) – were dropped in the final model as the estimated coefficients for those variables were small in magnitude as well as highly insignificant. The total farmland held by the households had a negative impact on the young locust bean tree density. The site dummy for Cheyohi & Kpachi (cheyohi_kpachi) shows a significant negative impact on the density of young locust bean trees. This was expected as this site had a distinct tenure regime for locust bean trees, which meant all the trees belonged to the tree-chief. The common households' perception towards this tree species was found to be mostly negative. Furthermore, the neglect towards these trees was apparent from the responses by these households regarding threats to locust bean. Based on observation and household surveys, it appears that these common households remove locust bean seedlings and saplings from their farmlands when preparing land for farming. Thus it is no surprise that young locust bean tree density is likely to be less for Cheyohi & Kpachi by more than two trees per hectare compared to other two sites keeping other factors constant. The highly significant positive impact of household labour availability (hh_labour) could be due to the fact that use of expensive hired tractors is likely to be lower for these households thereby reducing the impact of mechanised farming on these young trees. As expected mature locust bean tree density has a highly significant positive impact on young tree density, as without these mature trees, there would be no regeneration of these young ones. Finally, the dummy for the rights to cut locust bean trees also had a significant negative impact on young locust bean tree density. This could just be an indication of the fact that compared to young shea trees, young locust bean have lower

opportunity costs associated with the lower benefits that the households in all sites seem to appropriate from this species. Thus, where the households had the rights to cut locust bean trees, young locust bean trees might be the ones to be sacrificed in favour of shea trees.

5. CONCLUSIONS AND POLICY IMPLICATIONS

This study attempted to analyse the impact of tree tenure arrangements in three major traditional areas – Dagomba, Gonja and Mamprussi - of the Northern Region in Ghana on the management and use of shea and locust bean trees on the farmlands. It used a comparative analysis of socioeconomic characteristics, landholdings, and land use and tenure systems in three representative study sites from these traditional areas to assess their similarities and differences in terms of land use systems, management of trees on the farmlands, farmers' perceptions regarding these trees, utilisation and benefits appropriation from these tree species, and their densities on the farmlands. Finally, regression models were used to identify and quantify the major determinants of the densities of shea and locust bean trees on the farmlands across the study sites.

Similar landholding and land tenure patterns were found in all three study sites, with inheritance being the main mode of access to land. Cheyohi & Kpachi in Dagomba traditional area, which was next to a fast-growing town of Nyankpala, had a severe scarcity of land. This resulted in a lack of fallow land in the community, subsequently increasing the use of chemical fertilisers by the farmers to maintain soil fertility. Among the other study sites, Yipala in Gonja traditional area had virtually no land scarcity and no recorded land transactions, while Gbimsi in Mamprussi traditional area seems increasingly to be facing land scarcity, mainly due to

population pressure, resulting in least household food security among the study sites. However, this severe food-insecurity in Gbimsi seemed to increase the diversification in livelihood activities, especially from non-farm sources (including shea and locust bean), as studies on rural livelihood and income diversification suggest (Reardon 1997; Ellis 1998; Barrett et al. 2001). Any policies targeted towards improving the livelihoods of these rural households, therefore, have the potential to make a significant positive impact by targeting their non-farm income activities. More specifically, processing and trade of sheanuts and butter could be improved through programmes such as the provision of micro-credit, as lack of credit is often the limiting factor for these households constraining their income earning potential.

Generally the tenure rules for shea trees in all three study sites were found to be similar, and linked to the household's tenure rights over land. Thus, the households who reported owning certain plots of farmlands also said they had full tenure rights over shea trees therein, although cutting of shea trees seemed to be more severely restricted in Gonja traditional area as respondents in Yipala suggested (see also Lovett and Haq 2000). In contrast the households who were farming on a rented or a sharecropped plot of land (usually by being a settler/migrant to the community) had limited access and use rights over shea trees, a finding similar to those reported in other parts in the region (Augusseau et al. 2006).

The tenure rules for locust bean, however, were very different in Dagomba traditional area, as observed in Cheyohi & Kpachi, with the tree-chief owning all the locust bean trees within a community – the only exceptions being the trees on the farmlands of other chiefs and sub-chiefs. This unique tenure rule for locust bean

trees in Cheyohi & Kpachi was found to have contrasting effects on the mature and young trees. On one hand, mature locust bean tree density was the highest in these communities, primarily because all the locust bean trees on the farmlands were protected. On the other hand, these communities had the lowest density of young locust bean trees, as the non-chief households did not protect the young locust bean trees on their farmland, mainly because they received no tangible benefits (incentives) from these trees, and also because it was easier to remove these trees while young without getting caught by the tree-chiefs. This could have significant negative consequences for the long-term viability of locust bean trees in these communities. Moreover if the households in other communities within the Dagomba traditional area are reacting to this disincentive in a similar fashion, then it could have serious long-term consequences for the locust bean tree population.

Finally the comparative analysis of the various factors across the study areas in relation to tree tenure and density of shea and locust bean trees; and of the determinants of tree densities highlighted a number of important relationships between socioeconomic and institutional arrangements, and the densities of these valuable trees. In all of these areas, access to (and scarcity of) farmland was the major determinant of the tree densities of both species, especially for the density of young trees. With virtually no scarcity of land, Yipala had the highest density of both the young shea and locust bean trees. However, strong economic incentives, as provided by the contribution to the household income from these trees, seem to influence the mature tree density of these species just as strongly. This was clear from the highest average income from shea and locust bean trees to the households, as well as the highest mature shea tree density in Gbimsi. Furthermore, low food security and hence the need to diversify the income source for these households,

seem to provide additional impetus for the preservation and utilisation of these tree species on the farmland. Although tenure rules regarding the ownership of these trees influence their densities, as seen in the case of locust bean trees in Cheyohi & Kpachi, these tenure rules, especially if they produce disincentives for the protection of the young trees, will have negative consequences in the long run.

Based on the results from this study, what major policy implications, if any, can we draw regarding the management and utilisation of these valuable tree species in these agroforestry parklands? Firstly, it is clear that the tree tenure arrangements regarding the ownership (or lack thereof) of the planted trees as well as the tenure security of the land where the trees are planted could have contrasting implications regarding the farmers' willingness to plant and protect trees on their farmlands. On the one hand, if planting indigenous tree species like shea and locust bean did not lead to increased land and tree tenure security (especially in areas like Yipala where current land and tree tenure security is perceived to be weak) that could be a disincentive to continue planting them. On the other hand, lack of tenure security over the indigenous species, even when they are planted, could also lead to increased planting of exotic species like mango and cashew, which not only increase land tenure security but also have the potential to provide income comparable to shea in the long run. Moreover, unique tree tenure rules, such as those governing the ownership of locust bean trees in Dagomba tradition, seem to be creating huge disincentives, especially in protecting and planting this species, with potential long-term negative consequences for the population and ecology of this species in this traditional area. Thus, any policies promoting the protection and planting of indigenous economic trees like shea and locust bean should take these peculiarities related to tree tenure into consideration so as to provide the right incentives to these rural households. As

studies on adoption of agroforestry and plantation of trees in agroforestry suggest, land and tree tenure arrangements that provide the necessary incentives are just as important as the economic benefits that these agroforestry practices accrue for the success of agroforestry policies and programmes (Neef and Heidhues 1994; Otsuka et al. 2001; Hansen et al. 2005; Suyanto et al. 2005; German et al. 2009).

However, it is also evident from this study that the households in every site were favourable to planting indigenous tree species, especially trees with secure tenure while providing significantly higher income to the households such as shea, if improved varieties of seedlings were to become available. Furthermore, the study highlights the importance of economic incentives in protecting these trees, as the community with the highest return from these trees was also the one with the highest density. This shows the importance the people in these areas place on these species, a factor that could be positively harnessed to improve ecological conditions not only of these species but also of the parklands more generally. This is especially encouraging at a time when there is an increasing interest in measures like carbon sequestration in these parklands to mitigate climate change impacts while providing additional economic benefits to the households (Unruh 1995; Sanchez 2000; Pandey 2002; Montagnini and Nair 2004; Wise and Cacho 2005; Takimoto et al. 2008). However, it is also clear that, as Unruh (2008) argues, without favourable land and tree tenure arrangements, which create incentives to protect and plant these trees, the implementation of any carbon sequestration programme could end up in failure. To conclude, indigenous economic tree species like shea and locust bean have the potential to provide significant economic benefits to the households in these agroforestry parklands, while providing ecological benefits at the local level and beyond; however, policies targeted towards harnessing and improving the economic

and ecological potential of these trees should take into consideration the prevailing tree tenure arrangements regarding these trees, in addition to the local socioeconomic and land tenure factors, if they are to be successful.

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Chapter VII - CONCLUSIONS

Introduction

Agroforestry parklands, where crops are grown alongside economically valuable tree species, are considered the traditional land use practice in semi-humid and semi-arid regions of sub-Saharan Africa (Pullan 1974; Boffa 1999). Moreover, these parklands are generally considered 'anthropogenic' in nature, shaped by human land use practices over hundreds of years (Pullan 1974; Lovett and Haq 2000; Maranz and Wiesman 2003). Although studies have highlighted the complexities in resource use dynamics in agroforestry systems, primarily stemming from different systems of customary land and tree tenure institutions (Fortmann 1985; Berry 1988; Augusseau et al. 2006), most of the focus of the studies have been on the land tenure issues in the region; while the impact of tree tenure on the management and ecology of indigenous economic tree species has been largely ignored. This research aimed to fill our gap in understanding of the impact of tree tenure regimes and other local socioeconomic characteristics on the management, utilisation, and ecology of indigenous economic species in agroforestry parklands by studying the case of shea and locust bean trees in Northern Ghana.

The study uses primary data gathered from three study sites located in three main traditional areas in the Northern Region in Ghana to compare the traditional land and tree tenure institutions in these areas, to assess the incentives available to the households to manage shea and locust bean trees on their farmlands, and the densities of these two species on the farmlands of the households surveyed. The ultimate aim was to understand the differences in tenure regimes and socioeconomic characteristics of the households and community in these three traditional areas, how

those differences influence the utilisation of shea and locust bean trees, their management on the farmlands, and ultimately their ecology.

Throughout the study, and especially through the three main chapters based on the primary field data (Chapters 4, 5, 6), three common themes emerge from the study of tree tenure in agroforestry parklands: (i) importance of shea and locust bean trees to the households, particularly appropriation and distribution of benefits within and across study sites; (ii) gender roles in the management and utilisation of shea and locust bean trees; and (iii) influence of prevailing tenure systems, particularly tree tenure, in the management, utilisation and ecology of shea and locust bean trees in Northern Ghanaian parklands. Each of these themes is discussed below.

Appropriation and distribution of benefits from shea and locust bean trees

The households in all study sites utilised almost every part of shea and locust bean trees, appropriating primarily non-timber products like roots, bark, leaves, fruits, seeds and nuts, for household consumption as well as for sale. However, the most important products from these trees were the seeds (from locust bean) and nuts (from shea), both of which had significant commercial value. Moreover, locust bean seeds processed into *dawadawa*, a local condiment comparable to commercial 'stock cubes', and sheanuts processed into butter, used for cooking locally but also traded from local to international markets, provided value-added products for trade to these rural households. The study, however, revealed that comparatively shea provided significantly higher income on average than locust bean in all study sites, and for almost all households. The main reason was a greater abundance of shea trees in general as well as the bigger markets for sheanuts and butter, both locally and at the

regional and international level. However, in certain traditional areas, specific tenure arrangements related to locust bean trees seem to play a crucial role in the appropriation of benefits from these trees, an issue discussed later. Moreover, in all study sites and in all traditional areas, women were the primary gatherers, processors and traders of non-timber products from both shea and locust bean trees, despite the fact that men had the overall control over these trees on their farmlands. This gendered nature of tenure and its implications for households in general, and for the management and utilisation of these trees on the farmlands is also discussed in a latter section.

The results from the field data analysis, as presented in Chapters 4, 5 and 6, clearly show that these trees make a substantial contribution to household income, both in magnitude and as a proportion of total non-farm income of the households. In fact, for many households the combined income from shea and locust bean constituted their entire off-farm income. In terms of magnitude, households in Gbimsi in Mamprussi traditional area earned more income on average than the other two sites. Indeed, the study revealed that the households in Gbimsi, who had the lowest food security compared to the other two sites, diversified their sources of income the most, with shea and locust bean contributing a significant proportion. The households in Yipala in Gonja traditional area received a significantly greater proportion of their total off-farm income from shea compared to the other two sites; however, this could be because they had few other sources of off-farm income to rely on. Moreover, they also had much better household food security overall compared to the other two sites, which meant they did not rely as much on off-farm income sources for their livelihoods.

In comparison to shea, locust bean trees provided significantly less income, and to fewer households. This was particularly true in Yipala in Gonja traditional area, and in Cheyohi & Kpachi in Dagomba traditional area – however, for different reasons. While at the former site, the majority of the households did not gather or trade locust bean seeds despite having access to trees; at the latter site, very few households had access to these trees as they belonged to the tree-chief. In fact only three households earned income from locust bean at this site, and that too significantly lower compared to income from shea (Chapter 4). Overall, this study revealed that shea trees provided the most income to majority of the households in all study sites. Locust bean, on the other hand, was found to provide significantly lower income and to fewer households.

It is very important to discuss the costs, more specifically the costs perceived by the farmers, in maintaining shea and locust bean trees on their farmlands. A significant majority of the farmers in Cheyohi & Kpachi and in Yipala perceived both shea and locust bean trees to have negative impacts on their crops, with a sizeable number saying these trees had 'no effect' on the crops. It was only in Gbimsi that a significant proportion of the respondents perceived these trees to have positive impacts on their crop yields. However, despite believing shea trees to have largely negative impacts on their crops, all farmers maintained a density of shea trees on their farmlands that was comparable to shea tree densities recorded in the region by other studies (Osei-Amaning 1996; Lovett and Haq 2000). This is most likely due to the fact that the income their households received from shea more than compensated their perceived loss in crop yields. On the other hand, most farmers in Cheyohi & Kpachi could not remove locust bean trees because of tenure restrictions, and hence they had mature locust bean trees on their farmlands, despite perceiving negative

impacts from these trees on their crops. In Gbimsi, most farmers perceived positive benefits from locust bean trees. While in Yipala, although most farmers perceived locust bean trees to have a negative impact on their crops, and very few households actually benefited economically from this species, they still left these trees on their farmlands believing that this species was protected by the Gonja traditional laws. It is thus clear that although economic incentives might be the driving factor in maintaining trees like shea and locust bean on the farmlands, prevailing tree tenure arrangements also play a key role in their maintenance in agroforestry system.

Finally, as land scarcity increases (as observed in Cheyohi & Kpachi, and Gbimsi), the trade-offs between staple crops and indigenous economic trees such as shea and locust bean become more prominent. While, households with low food security could diversify their sources of income and rely on trees like shea for additional income as observed in Gbimsi, they are also likely to be limited by the amount of land available to them. As a consequence, these farmlands are likely to be more intensively managed, with preservation of only a few selected trees, and with virtually no regeneration, as observed by Lovett and Haq (2000) in this region. This could ultimately lead to not only lower, but also unsustainable, density of these tree species on the farmlands, due to the lack of sufficient regeneration to replace the ageing trees.

Gendered nature of tenure

The study of customary tenure arrangements in three traditional areas showed that men had stronger tenure rights over land and trees compared with women. Specifically, being patrilineal society, rights to land passed through male members of the family, and with that the controlling rights to trees on the land. However, women

were the primary gatherers, processors and traders of the products from both shea and locust bean trees in all the study sites, and they had access and use rights (amounting to 'usufruct') to both shea and locust bean trees on their households' landholding. Furthermore, a significant proportion of women respondents reported that they were involved in the management of shea and locust bean trees, including removal of the trees from the farmland, although they had to have the approval of their household heads (primarily male) to remove the trees. This clearly demonstrates that women's rights to these trees often extended beyond usufruct, and that women in these areas had more than just the 'secondary rights' over these resources as had often been argued (see for example, Lastarria-Cornhiel 1997; Hilhorst 2000; Toulmin and Quan 2000). However, it should also be noted that women had usufruct (and stronger tenure rights) to only those trees that their husband or father had full tenure rights over, hence, in case of Cheyohi & Kpachi, women from non-chief households had no access to locust bean trees even on their households' landholdings (Chapter 4). Thus, only the women from the households of chiefs, tree-chiefs and other sub-chiefs could collect products, and benefit from locust bean trees in these communities.

Being the primary collectors of the non-timber products from shea and locust bean trees, women were also the primary beneficiaries. Thus, the household incomes from shea and locust bean trees were in fact women's income, and their contribution to the household economy. As discussed earlier, these two tree species, and particularly shea, provided significant contribution to the household income, often amounting to 100% of the total off-farm income of these rural households. Moreover, in a majority of the households in all study sites, women kept and controlled their income from these trees exclusively. Many of the women reported lending part of their income to

their husband, to be paid usually after the crop harvest, often in kind such as in bags of rice or groundnut or beans. Thus, the income from these trees provided these rural women not just economic independence, but also some power within their households.

The ultimate control over the land and trees, however, rested with the male heads within the household. This meant they made the final decision regarding the management of shea and locust bean trees on their farmlands. It was therefore important for these men to be aware of the importance of shea and locust bean to their household, if they were to preserve and plant these tree on their farmlands. Indeed this study shows that most men were well aware of the importance of these trees in providing income support to their households. For example, in all the study sites, a significant number of male respondents said they already preserved, and would plant shea trees on their farmlands 'to help women' in the household indicating that they were aware of the importance of this species in bringing much needed cash income to their households.

Finally, this study shows that it would be unwise to consider 'women' as a homogenous stakeholder group while analysing tree tenure in agroforestry parklands. Not only were there differences in the women's access to shea and locust bean trees across the study sites in three traditional areas (with their own sets of customary rules), even within a study site, women had differing access to and rights over these trees depending upon the status of their households. More specifically, women from the households of chiefs, tree-chiefs and sub-chiefs in Cheyohi & Kpachi in Dagomba traditional area had access and harvest rights to locust bean trees on their own land and in case of the women from the tree-chief's household, on other non-

chief households' land. In contrast, women from non-chief households had no access to locust bean trees even within their household's landholding. This was a case where the status of the households gave additional tenure rights, and hence the opportunity to appropriate higher benefits from the trees, to the women from those households.

The case of women in another study site, Yipala in Gonja traditional area, was slightly different. In this study site, women from indigenous households organised themselves around informal (*de facto*) tenure rules that they themselves set in order to secure exclusive access to shea trees on fallows that were older than two years. These fallow lands would have reverted back to being community land accessible by all women in the community if they had continued to follow the Gonja traditional laws. These women argued that they should have stronger tenure rights over indigenous economic trees such as shea than women from settler households by virtue of their households' status as being the autochthons. Furthermore, through the support from their menfolks as well as in cooperation with women from other indigenous households, they were able to wield enough power to exclude women from settler households from their older fallows. In addition, they were also collecting sheanuts from the older fallows left by the settler households, invoking the same traditional law that they did not apply to their own older fallows (Chapter 5). The women from settler households had little power to change this situation, as they were found doubly disadvantaged: first by belonging to settler households, and then being women. As a result, women from indigenous households were able to collect significantly more sheanuts, and hence benefit more, compared to those from settler households. These examples highlight the need to understand the vagaries in gendered access to trees in agroforestry, and especially the differences in access to

and benefits appropriation from trees such as shea by different group/class of women within the community.

Tree tenure in agroforestry

The above discussions of the benefits (and costs) from indigenous economic trees to the household, and the gendered nature of access and appropriation of benefits makes it clear that it is ultimately the institutional arrangements, in the form of tenure rules, that determine the access to and benefits from these trees. In terms of individual and household behaviour regarding the management of shea and locust bean trees on the farmlands, although economic incentives had the dominant effect on how they managed these trees on their farmlands, customary tenure arrangements (and more importantly the understanding of and respect towards these tenure rules) also played a key role in determining the behaviour of individuals and households managing these trees. Moreover, the level of economic benefits (incentives) itself depended upon tenure arrangements regarding the access to and rights over trees on the farmlands.

It is important to start with a discussion of the customary land tenure system in the study sites, as tenure rights over shea and locust bean trees on the farmlands often (but not always) depended upon an individual/household's level of rights over the land. Customary system of land tenure in all study sites was remarkably similar. Individuals/households had very strong tenure rights on their landholdings; especially on those inherited from within the family. In the case of settler households (i.e., in-migrants), the strength of tenure rights were based on how the settler had acquired access to the land for farming, although there were subtle differences between the three traditional areas. For example, in Gbimsi in Mamprussi traditional

area, a settler gaining access to land free of charge from the chief or the original landowner had more secure tenure rights over the land compared to settlers who were sharecropping, borrowing or renting their farmland. In contrast, in Yipala in Gonja traditional area, settlers gained access to land free of charge from the chief in consultation with the elders, and once they settled in the community, the traditional Gonja laws dictated that they should be treated the same as the 'citizen farmer' (meaning the indigenous households). In Cheyohi & Kpachi, there were very few settler households, and due to land scarcity, settlers could only rent or purchase land from the indigenous households. The purchased land obviously came with the most secure tenure (bar land disputes), while rented land was much less secure as the original landowner could take it back at the end of a farming season.

As expected, tree tenure, in most cases, reflected the strength of tenure rights over the land. In all study sites, shea trees on inherited land, and on the land received free of charge from the chief belonged to the household with tenure rights over the land. The households who had gained access to land through borrowing, renting or sharecropping arrangements with the original landowners in Gbimsi had varying access and use rights over shea trees on those lands, commonly at the discretion of the original landowner. For example, some landowners let the settler households collect sheanuts from the trees, while others only allowed secondary access. In contrast, a household renting land in Cheyohi & Kpachi had full tenure rights over shea trees, including rights to cut (Chapter 4). In Yipala, all households, autochthons or settlers, had full tenure rights over shea trees on their farmland.

On fallows, tenure rights over shea trees resembled that of the farmland in Cheyohi & Kpachi and in Gbimsi. However, in Yipala, this research found that access to and

rights over shea trees on the fallows older than two years was highly contested, although the same tenure rules as on the farmlands applied on fallows up to two years. Despite the Gonja traditional laws stating that all fallows older than two years reverted to being the community lands giving access to shea trees therein to all households in the community, this study found that women from the indigenous households believed they should have stronger rights over these trees even on their older fallows and were found to secure and preserve their exclusive access to shea trees on such fallows. In addition, these women were also accessing shea trees on older fallows left by settler households, thereby putting settler women at an even more disadvantageous position (Chapter 6). This example shows that it is often the *de facto* tenure rules, created and practised locally, that determine the true level of access to resources such as shea trees, rather than those that are presented as "official" by the traditional authorities.

In contrast to shea trees, tenure rules for locust bean trees varied significantly between Cheyohi & Kpachi and the other two study sites. While in Yipala and Gbimsi, tenure rules for locust bean mirrored that for shea trees, in Cheyohi & Kpachi, all locust bean trees in the community belonged to *Dohannaa*, the tree-chief, except on the farmland and fallows belonging to the chief and sub-chiefs (Chapters 4 & 6). This rule applied to self-regenerated trees, as well as the trees planted by the households. As expected, this rule created a huge disincentive for the farmers wanting to preserve or plant locust bean trees on their farmland. Indeed this study shows that under the present tenure system none of the non-chief households are likely to preserve or plant locust bean trees in Cheyohi & Kpachi (Chapters 4 and 6).

As mentioned earlier, the management of shea and locust bean trees on the farmlands was primarily guided by the economic incentives provided by these trees to the individuals and households. However, directly and indirectly, the prevailing tree tenure regimes were found to influence not only the incentives accruing to these households, but also their management practices, especially in the long term. The management (or lack thereof) of locust bean trees in Cheyohi & Kpachi is a case in point. Furthermore, perceived lack of tenure security over shea and locust bean trees, including those planted by the landholding households, as observed in Yipala, is likely to induce these households to plant exotic economic species such as cashew and mangoes, a trend already visible in this community (Chapter 6). These plantations not only provide long-term security of tenure on the land and trees themselves, but also have the potential to accrue economic benefits comparable to indigenous trees like shea, if not more. Although there are very few exotic tree plantations at present in Yipala, and some shea and locust bean trees are still left within these plantations, these households are unlikely to leave indigenous trees in the long term, especially if the plantations prove commercially successful. This is most likely to have a negative impact on the densities of indigenous economic trees, with subsequent negative impact on the ecology of these trees, an issue discussed in the following section.

Ecology of shea and locust bean trees in agroforestry: what does the analysis of tree densities tell?

The analysis of the benefits and costs of having shea and locust bean trees on the farmlands, and of the various aspects of tenure systems influencing these benefits and costs give us an indication of the level of incentives (or lack thereof) available to the households managing these trees on their farmlands. The ultimate impact of the

management practices, guided by these incentives and disincentives is undoubtedly on the ecology of these tree species on the farmlands. This study analysed the density of these trees on the farmlands as an indicator of their ecological health. The results show not only remarkable differences between the density of shea and locust bean trees within a study site (Chapter 4), but also across the study sites for both these species (Chapter 6).

The perverse incentive that the unique tenure rules for locust bean trees created in Cheyohi & Kpachi in Dagomba traditional area meant that, while mature and old locust bean trees were well protected within these communities, seedlings and saplings of this species were rarely given a chance to survive by the non-chief households, who formed the majority of the households, managing most of the farmlands in these communities. This meant, on the one hand, these communities had the highest density of mature locust bean trees; on the other hand, the density of young locust bean trees in these communities was the lowest among the study sites (Chapter 6). Although the overall density of locust bean trees on the farmland in all three study sites was significantly lower compared to shea tree densities, the other two sites do not demonstrate the stark contrast between mature and young locust bean tree densities found in Cheyohi & Kpachi. Furthermore, comparing the densities of young locust bean and shea trees in Cheyohi & Kpachi, and based on the non-chief households' response regarding the management of these two trees on their farmlands, it becomes clear that the lack of incentives to preserve locust bean trees on their farmland is the root cause of neglect (and often the removal) of seedlings and saplings from the farmlands, subsequently leading to the low density of young trees of this species. In contrast, the density of young shea trees in Cheyohi & Kpachi was comparable to that in Gbimsi, despite severe land scarcity and

significantly smaller landholdings at the former study site, indicating that there were strong incentives to protect shea trees despite land scarcity.

The overall low density of locust bean trees in all study sites compared to shea trees reflects the general characteristics of the agroforestry parklands observed in Northern Ghana, and throughout the region (Hall et al. 1996; Hall et al. 1997). However, this study suggests that it might also be reflective of the fact that locust bean trees provide significantly lower economic benefits to the households compared to the shea trees. Furthermore, when taking into account the farmers' perceived costs of having these trees on the farmland, although shea seems to provide overall positive benefits for all the farmers, locust bean trees are not likely to do so, and most definitely not for the non-chief households in Cheyohi & Kpachi. This lower economic incentives from locust bean compared to shea trees in general, and restrictive tenure regimes for locust bean trees, such as that in Dagomba traditional area, is likely to lead the households to care less about the preservation of this tree species in comparison to shea trees. Thus, in the long term, the density of locust bean trees is likely to decline, especially in areas like Cheyohi & Kpachi, with unfavourable tree tenure regime for most of the households as well as with severe land scarcity. Based on these results, it can be concluded that lack of proper economic incentives (in comparison to shea) and restrictive tenure regime is likely to have a negative impact on the ecology of locust bean trees in the long run in these parklands.

The case of shea trees, however, seems to run the opposite course of locust bean. Not only all the study sites had healthy densities of this species on the farmlands, the study sites with severe land scarcity (Cheyohi & Kpachi), and with increasing land

scarcity and lowest food security (Gbimsi) had higher mature shea tree densities compared to Yipala, the site with the highest level of food security and virtually no land scarcity. This clearly demonstrates that the benefits shea trees provide more than compensated the negative impacts on the crops that the farmers perceived from this tree species, thereby providing sufficient economic incentives to preserve this species on their farmlands. In terms of the density of young shea trees, Yipala had the highest density, almost comparable to the density of the mature trees, while the other two sites had modest young tree densities, and quite low compared to the mature tree densities. The scarcity of land in these sites is likely to be the major factor, as farmlands are more intensively managed, limiting the possibility of natural regeneration of shea, as other studies in the region have also indicated (for example, Lovett and Haq 2000). Furthermore, high density of mature trees currently present on the farmland means that in the long run, a few young trees well protected each year should be enough to at least replace the old and dying stock, and hence maintaining a healthy tree density. Moreover, the response from majority of the farmers in all the sites that they would plant shea trees given the right incentives (such as availability of the seedlings of improved varieties or more secure tenure of the planted trees) shows that in the long run, through positive policy responses, the farmers could be encouraged to maintain these trees on their farmlands. In fact, many farmers were already managing shea trees on their farmlands to suit their needs, such as by transplanting the seedlings and saplings from crowded area, and selectively removing trees, while letting others grow better. Hence, to conclude, based on the current shea tree densities on the study sites, the positive impact of this species on the households, and the active (and positive) management practices of the farmers regarding this species on their farmlands, the ecology of shea trees in

agroforestry parklands is likely to remain healthy, at least in the short run. In the long run, policies must address issues such as the tenure security of the planted indigenous species, support for improved processing and trade of sheanuts and butter, and equitable access to these trees for all the households so that they have sufficient incentives to preserve, plant and protect these trees on their farmlands.

Role of tree tenure in the management, utilisation and ecology of indigenous economic species in agroforestry parklands

This section seeks to place the results from this research in a wider context of resource tenure in Africa, highlighting the unique contribution of this study. The focus is primarily on the understanding of the tree tenure regimes and how they affect the management, utilisation and ecology of indigenous economic trees in agroforestry parklands, which was the main objective of this research.

As argued throughout the thesis, recent years have seen a general consensus among the academics that the management and utilisation of natural resources by individuals, households and communities is shaped by their socioeconomic standings as well and the prevailing institutional arrangements, such as tenure systems, controlling their access to and rights over resources (Berry 1989; Beck and Nesmith 2001; Adhikari et al. 2004; Coomes et al. 2004; Masozera and Alavalapati 2004). Moreover these institutional arrangements are often resource-specific, such as for forestry, water, land and so on, reflecting the characteristics specific to those resources and their uses (Ostrom 1992; Wade 1995; Sarch 2001; Otsuka et al. 2003). Despite this recognition, however, studies on African resource tenure are still highly skewed towards land tenure issues, focussing primarily on the tenure security, investments on land and productivity (Atwood 1990; Barrows and Roth 1990; Feder

and Feeny 1991; Bruce and Migot-Adholla 1994; Besley 1995; Sjaastad and Bromley 1997; Brasselle et al. 2002; Place and Otsuka 2002), while the issues of tree tenure are largely ignored. This becomes particularly problematic when we seek to understand individual and household behaviour regarding the management of indigenous economic trees in agroforestry systems, where trees not only form an integral part of the land use systems, but are often governed by separate tenure regime from that of the land (Fortmann 1985; Fortmann and Bruce 1988).

By focussing primarily on the tree tenure in agroforestry parklands, and investigating the impact of tenure regimes and other socioeconomic characteristics on the management, utilisation and ecology of indigenous economic species, this study contributes to a greater understanding of not only the resource use dynamics within these parklands but also of the human impact on the ecology of these valuable species. More specifically, the findings of this study highlight three important, and inter-related, aspects of resource dynamics in agroforestry parklands: (i) access to and appropriation of benefits from the indigenous economic trees are determined not just by landholding but also by the prevailing tree tenure arrangements, often regardless of the landholding; (ii) the level of access to and benefits (or lack thereof) from indigenous economic trees create incentives (or disincentives) for the management of these trees in agroforestry parkland, particularly on the farmlands; and finally (iii) the management of these trees guided by the incentives (or lack thereof) stemming from socioeconomic and institutional arrangements subsequently affects the ecology of these indigenous economic species. Furthermore the study reveals the gendered nature of tree tenure, and how women negotiate these tenure arrangements vis-à-vis men and vis-à-vis other women in the community,

highlighting their strategic decision-making as well as their inventiveness to cope with their seemingly disadvantageous position.

This study confirms that tree tenure arrangements play a major role in determining who benefits from these indigenous economic trees, and what level of benefits are they able to appropriate, as other studies on institutional aspects of resource use have shown (Fortmann 1985; Berry 1989). Although gender role was crucial in the appropriation of benefits from these trees as women were the primary gatherers, processors and traders of the products, their access also depended on their households' rights over the land and the trees. For example, tenure regimes that restricted ownership and access to certain trees to particular households, such as locust bean trees to the tree-chiefs, created a situation of unequal access and benefits appropriation from these trees between the women from the households of the chiefs and non-chiefs. However, women were also found to be proactive in securing their access to valuable resources like shea trees, creating their own *de facto* tenure rules, often in contradiction to the stated traditional laws. This is a case very similar to that reported by Kevane and Gray (1999), where women were found to use various means to secure tenure rights over land, including manipulation of the prevailing customary rules. In contrast, women with weaker tenure rights and who were not in a position to manipulate the customary rules were found to increase their benefits from the resource by adding value, such as processing sheanuts into butter. This again shows the inventiveness of the women in maximising the benefits from the resource that they have access to. Ultimately though, it was the overall economic incentives as well as the prevailing tenure rules, that determined the household behaviour regarding the management of these trees on the farmlands.

The tenure rules that created disincentives for the households to preserve and plant indigenous economic trees were clear to see in the case of locust bean tree in Dagomba traditional area. However, the study also revealed that despite providing significant economic benefits to the households, they are less likely to preserve and plant these indigenous economic trees if they perceive that their security of tenure over the land and trees will not strengthen by preserving and planting these trees. This of course relates to the security of tenure and investment on land, which, as Sjaastad and Bromley (1997) state, has the tendency to equally impact one-another – tenure security encouraging investment, but investment also improving the security of tenure. Indeed the study revealed some cases where individuals were beginning to establish plantations of exotic tree species such as cashew as they were thought to secure their tenure rights on the land, more so than by preserving or planting indigenous economic trees.

Finally, this study has shown that local socioeconomic characteristics and tenure regimes, by influencing the behaviour of households regarding the management of indigenous economic trees on their farmlands, are likely to impact on the densities of these species in agroforestry parklands. Based on the differing ecological characteristics of shea trees in various land use types, studies have inferred that the land use practices have an impact on the ecology of indigenous economic species in agroforestry parklands (Lovett and Haq 2000; Kelly et al. 2004; Kelly et al. 2007; Djossa et al. 2008). However, this study shows that even within one particular land use type, farmlands for example, the ecological characteristics of these species, such as tree density are influenced by a number of factors including socioeconomic characteristics of the households, size of landholding, and the prevailing tenure arrangements. Furthermore, socioeconomic and tenure-related factors were found to

influence the households' behaviour regarding the preservation and plantation of these species in these parklands, signalling the long-term impacts of these factors on the ecology of indigenous economic trees.

Research relevance and implications

Indigenous economic tree species like shea and locust bean have the potential to play a major role in the poverty reduction and improvement of the livelihoods of rural households in the regions like Northern Ghana, which has consistently been classed as one of the most economically deprived regions in Ghana (Canagarajah and Portner 2003; Whitehead 2006). This research investigated issues that are core to the sustainable management of shea and locust bean trees in this region: the impact of local tenure regimes and socioeconomic characteristics on the management, utilisation and ecology of these species. While doing so, it brought together the views of a number of stakeholders at the local level who are directly involved in the management of these species and in appropriating and benefiting from the products that these trees offer. Moreover, the study demonstrated that not only these stakeholders react to the economic and other incentives; they are also bound by the tenure rules and constraints while managing these resources on their farmlands. Although positive incentives stemming from greater economic benefits and favourable tenure regimes could induce these households to sustainably manage these trees on their farmlands, the study also shows that tenure rules that create perverse incentives or disincentives are likely to have major negative impact on the management and ecology of these valuable species in the long term. It is thus crucial that any policy targeted towards promoting sustainable management of these species

take into consideration the prevailing system of tenure and how that is affecting the behaviour of the households regarding the management of these trees.

Very few studies have investigated the roles of local level institutions in influencing the management and ecology of shea and locust bean trees in the parklands in Northern Ghana. Although the "shea economy" has been the target of numerous government policies in the past, having both positive and negative effects (Chalfin 2004), the socioeconomic and ecological dynamics in the shea economy at the micro level is very little understood. Moreover, Chalfin (2004) has highlighted the inequality in the distribution of benefits from shea, a major (and often the only) source of cash income for the rural poor in Northern Ghana, often in favour of the rich, and at the cost of the poorer households. This study has indeed brought to light some of these inequalities at the community level, although it has been mostly based on the status of the households in the community (chiefs vs. non-chiefs or autochthons vs. settlers) or that related to the gender (men vs. women or between different groups of women), rather than wealth of the household. Nevertheless, it is essential to understand the cause of these inequalities, a number of which this research has highlighted, in order to devise policies that are beneficial to all households, and that promote not only sustainable use of these indigenous tree resources but also their sustainable management through the creation of proper incentives for these households to do so.

Finally, as this research is primarily based on the information collected at a few communities, it is better able to capture the vagaries of socioeconomic and institutional conditions that affect management and utilisation of shea and locust bean at those particular communities. This is a general limitation of any study of this

size and purpose. However, this study has captured a number of general features regarding the management and utilisation of indigenous economic trees under different traditional areas with differing tenure regimes and incentive structures, which could be applicable in other similar settings. Moreover, this could be one of the areas for future research building on this study.

Future research in this area could build on this research on a number of fronts. The growing international market for sheanuts and shea butter has meant that many of these communities will increasingly find better markets for these products in the coming years. Understanding how these growing markets influence the household behaviour in the management of these trees on the farmlands will provide us with the impact of these external factors on the management and ecology of this species. Moreover, in many areas men are starting to get involved in the trade of sheanuts and butter (Chalfin 2004), an activity traditionally considered the women's domain. This could have major implications for not just the economic independence of women in the household, but also on the politics of gender within the households, as men will be encroaching on the women's economic domain, while already controlling most of the resources. Finally, as a research focussed primarily on the socioeconomic aspects of the agroforestry parklands, this study has not been able to fully integrate the biophysical aspects of the parkland dynamics. In recent years, there has been a great progress in integrated analytical techniques such as bio-economic modelling of the management and use of natural resources by human. Future studies can build on studies like this to integrate biophysical factors more comprehensively in the modelling in order to capture all the vagaries of the parkland dynamics, giving a fuller understanding of these valuable resource systems, which could be of great importance to the policy makers.

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Appendices

Appendix 1: Key Informant Interview Guides

Key Informant Interview

Researcher/Interviewer: Mahesh Poudyal **Date of Interview: _____**

Translator/Facilitator: _____ **Village/Settlement: _____**

Name of the Informant: _____ Age: _____

Gender: _____ **Position in the Community:_____**

Tribe: _____ **Lived in the Community for _____ years.**

Language of the Interview: _____

Interview Guide: General

A. The Interviewee

- position in the community
- involvement in the community-level activities
- views on community development

B. System of local governance

- local power structures, hierarchy and leadership
    - traditional leaders and "opinion leaders"
    - working relations between traditional and "modern" authority
- village/community-level decision making
    - decision-making structures & process

C. Conflicts and conflict resolution

- incidences of conflicts in the community (esp. land and tree related)
    - nature of conflict, originating factors
    - actors involved
- conflict resolution
    - process, and actors involved

D. Farming and trees

- Farming and local livelihoods
- Problems/issues in farming
- Marketing farm produce, farming co-operatives
- Trees in farms and their interaction with crops
- Methods of farming and effects of/to trees

E. Land and tree tenure

- Prevailing land tenure systems and their effects on farming
- Prevailing tree tenure systems and their effects on tree management and on farming

F. Current trend and future prospects

- Trend in community development
- Institutional support (from within the community; external support)
    - current level of support
    - need for support (i.e., training)
- Future prospects for the community

Interview Guide: Magazia

A. Being Magazia

- Since when?
- How Magazias are chosen/appointed? By whom?
- Roles and responsibilities as a Magazia

B. Harvest and sourcing of shea nuts

- Yield and harvesting of shea nut in the village/community
- Other local-level sourcing of nuts (traders within the community or local markets)
- Purchase & sale of nuts in larger markets (district and regional markets)
- Problems and constraints on harvesting and sourcing of nuts

C. Processing and marketing of butter

- Current butter processing practices in the community
    - processing infrastructures (grinding mills etc.)
    - processing techniques (traditional, improved/improvised)
    - quality, quantity and constraints in butter processing
    - local butter processing group/co-operatives
- Marketing of the processed butter
    - Current availability of markets (local and national/international)
    - Major constraints in marketing

D. Current trend in shea economy and future prospects

- Trend in local shea economy
- Contribution to local economy (household, village/community)
- Future prospects

Interview Guide: Dohannaa

A. Traditional authority and governance

- System of traditional authority and position as a Dohannaa
    - hierarchy in the system, appointments and successions etc.
    - functioning of the traditional authority and relation with elected bodies

B. Being Dohanna

- Since when?
- How Dohannaas are chosen/appointed? By whom?
- Roles and responsibilities as Dohannaa

C. Traditional tree tenure and management

- rules/regulations regarding trees
    - ownership, use rights, rights of disposal
    - tree plantation
    - relationship between land and tree tenure
- enforcement & violation of rules/regulations
    - enforcement
    - incidences of violation (example of recent incident if any)
    - penalties for violators (recent example if any)
- management of trees (esp. locust bean) under Dohannaa's domain
    - arrangements with the farmers (i.e., management, sharing of the harvest etc.)
    - incentives and incentive-compatibility
        - disincentives for planting/protecting locust bean trees (declining numbers)
        - traditional rules regarding tree plantation and ownership
        - possibility of changing the traditional regulations to create/provide incentives for tree planting (for locust bean)

D. Future prospects for traditional authority and for locust bean trees

- will traditional authority sustain in its present form
- how will locust bean fare in future under the current system

Interview Guide: Chief

A. Traditional authority and governance

- System of traditional authority and position as Chief
    - hierarchy in the system, appointments and successions etc.
    - functioning of the traditional authority and relation with elected bodies

B. Being Chief

- Since when?
- How Chief is chosen/appointed? By whom?
- Roles and responsibilities as Chief

C. Traditional land and tree tenure, and management

- rules/regulations regarding land and trees
    - ownership, use rights, rights of disposal
    - tree plantation
    - relationship between land and tree tenure
- enforcement & violation of rules/regulations
    - enforcement
    - incidences of violation (example of recent incident if any)
    - penalties for violators (recent example if any)
- management of trees (esp. economically valuable trees)
    - arrangements with the farmers (i.e., management, sharing of the harvest etc.)
    - incentives and incentive-compatibility
        - disincentives for planting/protecting trees (declining numbers)
        - traditional rules regarding tree plantation and ownership
        - possibility of changing the traditional regulations to create/provide incentives for tree planting

D. Future prospects for traditional authority and for land and tree management

- will traditional authority sustain in its present form
- how will land and tree managed in future under the current system

Appendix 2: Focus Group Discussion Guides

Focus Group Discussion

Researcher: Mahesh Poudyal **Translator/Facilitator: _____**

FGD ID: _____ **Date & Time: _____**

Village/Settlement: _____ **Language of FGD: _____**

Participants

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

FGD Topics-Guide: Farmers

A. Situation regarding farming in the community

- Farming and local livelihoods
- Problems/issues in farming
- Marketing farm produce
- Farming co-operatives

B. Farming and trees

- Trees in farms and their interaction with crops
- Methods of farming and effects of/to trees
- Impacts of trees in the household economy

C. Land and tree tenure

- Prevailing land tenure systems and their effects on farming
- Prevailing tree tenure systems and their effects on tree management and on farming

D. Current trend and future prospects

- Trend in local-level farming and in local agro-economy
- Institutional support in farming (from within the community; external support)
    - current level of support
    - need for support (i.e., training)
- Future prospects for farming in the community

FGD Topics-Guide: Sheanut collectors and shea butter processors

A. Harvest and sourcing of shea nuts

- Yield and harvesting of shea nut in the village/community
- Other local-level sourcing of nuts (traders within the community or local markets)
- Purchase of nuts from larger markets (district and regional markets)
- Problems and constraints on harvesting and sourcing of nuts

B. Processing and marketing of butter

- Current butter processing practices in the community
    - processing infrastructures (grinding mills etc.)
    - processing techniques (traditional, improved/improvised)
    - quality, quantity and constraints in butter processing
    - local butter processing group/co-operatives
- Marketing of the processed butter
    - Current availability of markets (local and national/international)
    - Major constraints in marketing

C. Current trend in shea economy and future prospects

- Trend in local shea economy
- Contribution to local economy (household, village/community)
- Future prospects

Appendix 3: Household Questionnaire Survey

Institutions in Natural Resource Management: Ecological and Socio-economic Implications for the Management of Valuable Tree Species in Agroforestry Parklands

(Case of Shea and Locust Bean Trees in Northern Ghana)

Questionnaire for Household Survey

A. INTERVIEW DETAILS

Interview ID: _____ Start Date & Time: _____End Date & Time: _____

Researcher: Mahesh Poudyal Interviewer: _____

Date of Interview: _____ Village: _____

District/Region: _____/_____

Name of Household Head: _____

Age: _____ Tribe: _____

Language of Interview: _____

B. RESPONDENT AND DWELLING

B1. Name of the Respondent: _____

[This is the MAIN respondent to this survey questionnaire (i.e., who is responsible for answering majority of the questions). The section "WOMEN AND TREES" should be completed by interviewing the "head" woman of the household. The respondent should not be a relative, staying temporarily in the respective household. If the MAIN respondent is not same as the head of the household, please note the relation to the household head below.]

B2. Is respondent the head of household? Yes [ ] >>Go to B3 No [ ] >>Go to B2(i)

B2(i) What is the respondent's relation to the household head? _____

B3. Type of Dwelling and Ownership:

Type of Dwelling	**Number**	**Ownership (1=owned, 2=rented, 3=provided)**	**Roof Type (1=thatch, 2=tin/tile, 3=concrete)**
Several Huts/Buildings [Same Compound]			
Several Huts/Buildings [Different Compound]			
Room(s) [Compound House]			
Single Family House			
Other (Specify) _____			

B4. How many rooms does this household occupy? [ ] [Do not include bathrooms, toilets, kitchen]

B5. Residency in the village.

B5(i) Is this household indigenous to this village or a settler?

Indigenous [ ] >>Go to Section C Settler [ ] >>Go to B5(i)-a.

B5(i)-a. How long have you lived in this village?

Since _____ AD = _____ years.

C. DEMOGRAPHIC INFORMATION

C1. General Information about the respondent(s)

ID	Name	Age	Gender (M/F)	Relation to HH Head	Education (code)	Occupation (code)
R1						
R2						
R3						

C2. Household information [Interviewer: DO NOT REPEAT the information about the respondents here]

ID	HH Member	Age	Gender (M/F)	Relation to HH Head	Education (code)	Occupation (code)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

Education codes:

Illiterate = 0 **Literate (informal, i.e., adult class) = 1** **Primary education (P1-P5) = 2**
Middle School/JSS = 3 **High School/SS = 4** **Training college = 5**
Vocational/Technical = 6 **University degree = 7** **Koranic = 8**

Occupation codes:

Agriculture = 1 **Business/Trading = 2** **Clerical (Public) = 3**
Clerical (Private) = 4 **Construction = 5** **Professional/Managerial = 6**
Wage labour = 7 **Agriculture+Trading = 8** **Agriculture+Clerical = 9**
Agriculture+Wage labour = 10 **Other (Specify) = 11**

C3. Has any member of your household been living/working out of home for more than three months in the past 12 months?

YES [ ] >>Go to C3(i) NO [ ] >>Go to Section D

C3(i) Please provide the following details about their place of stay and occupation.

ID	HH Member	Age	Gender (M/F)	Occupation (see code above)	Place of Work	Period of Stay
1						
2						
3						
4						
5						

D. LAND HOLDING, TENURE AND PRODUCTION SYSTEMS

D1. Land holding summary: Please provide the following landholding and tenure information

Land/Plot Type	Distance from dwelling*	Unit (e.g., acre)	Area	Own-ership (code)	Right to sell or use as collateral? (code)	Use ob-tained through (code)	How many years under continu-ous farming or fallow?
Irrigated Plot 1							
Irrigated Plot 2							
Irrigated Plot 3							
Non-irrigated Plot 1							
Non-irrigated Plot 2							
Non-irrigated Plot 3							
Fallow 1							
Fallow 2							
Fallow 3							
Other (_____)							
Other (_____)							

*** If the respondent can't tell the distance, ask the time it takes to walk to the plot from the dwelling and record that time.**

Ownership: Yes (with deed) = 1; Yes (without deed) = 2; NO = 3

Right to sell/use as collateral: Sell = 1; Security = 2; Both = 3; No right = 4

Use obtained through: Rented for cash or kind = 1; Sharecropped by the HH = 2; Used free of charge (from chief or landowner) = 3; Inherited from within the family = 4; Other = 5 (Specify)

D1(i) If any member of the household has rented in OR sharecropped in any land for cash or kind during the past 12 months, please provide the following information.

	Unit (e.g., acres)	Area	Amount paid to landowner (incl. payment in kind)	Proportion of the harvest given to the landowner
Rented IN				
Sharecropped IN				

D2. Does any member of the household own any land?

YES [ ] >>Go to Q. D2(i) NO [ ] >>Go to Q. D3

D2(i) Total land owned

Area	Unit (e.g., acres)

D2(ii) If any of the land owned was purchased during past 12 months

Area Purchased	Unit (e.g., acres)	Amount paid (incl. payment in kind)

D2(iii) If any of the land owned was sold during the past 12 months

Area Sold	Unit (e.g., acres)	Amount received (incl. payment in kind)

D2(iv) If any of the land owned was Rented Out during the past 12 months

Area Rented Out	Unit (e.g., acres)	Amount received (incl. payment in kind)

D2(v) If any of the land owned was given out for Sharecropping during the past 12 months

Area Sharecropped Out	Unit (e.g., acres)	Amount received (incl. payment in kind)	Proportion of the harvest received

D3. Please provide information on the area of land that you cultivated in the past 12 months, crops planted, and production and sale of crops during the past 12 months.

Crops	Area cultivated	Total production	Quantity Sold	Price per unit (cedis)	Quantity purchased	Price per unit (cedis)
Maize						
Rice						
Yam						
Cassava						
Millet/Guinea corn/Sorghum						
Groundnut						
Beans/Peas						
Okro						
Pepper						
Tomatoes						

D4. In an average year, how long does your crop production meet your household food demand?

[ ] < 3 months [ ] 3-6 months [ ] 6-9 months [ ] 9-12 months
[ ] > 12 months

D5. Did you cultivate more or less land this year (past 12 months) compared to average years?

MORE [ ] >>Go to D5(i) LESS [ ] >>Go to D5(i) ABOUT THE SAME [ ] >>Go to D6

D5(i) Please provide the main reason(s) for cultivating more/less land this year (past 12 months) than on average years.

[Interviewer: Note a maximum of THREE reason(s) in the order of their importance]

RANK	Reasons
1	
2	
3	

D6. How do you make decision on which land to farm?

[Ask and note a maximum of THREE major decisive factors, ranking them in order of their importance]

RANK	Decisive Factors
1	
2	
3	

D7. Did you clear a fallow or bush to start farming this year (past 12 months)?

YES [ ] >>Go to D7(i) NO [ ] >>Go to D8

D7(i) What was the area cleared and how?

	Area cleared for farming	Method (e.g., fire, tractor, hand clearing)
Fallow		
Bush		

D8. How did you prepare your land for planting crops?

Method	Area	Remarks
Hand clearing & ploughing		
Ploughing with tractor		
Ploughing with draught animals		
Other (_____)		

D9. Did you use tractor to prepare land for farming in the last 12 months?

YES [ ] >>Go to D9(i) NO [ ] >>Go to D10

D9(i) Which plots did you use the tractor in?

IRRIGATED/RICE FIELD [ ] NON-IRRIGATED/DRY FIELD [ ] BOTH [ ]

D9(ii) What were the expenses for using the tractor in the past 12 months?

Access	Total area (acre)	Cost/unit area (cedis)	Total Cost (cedis)	Maintenance costs if own the tractor (cedis)
Own				
Hire				
Other (_____)				

D10. Did you use any paid labour in farming during the past 12 months?

YES [ ] >>Go to D10(i) NO [ ] >>Go to D11

D10(i) How many man-days did you use paid labour for and what were the costs?

Activity	**Total labour used (man days)**	**Unit cost**	**Total cost**
Land preparation			
Planting			
Weeding			
Harvesting			
Other (_____)			

D11. Do you have land(s) that are left fallow?

YES [ ] >>Go to D11(i) NO [ ] >>Go to D11(ii)

D11(i) What is the minimum and maximum number of years that you leave your land fallow? Please provide reasons.

	Time left fallow (Years)	**Reasons**
Minimum		
Maximum		

D11(ii) What are the main reasons for not leaving land to fallow?

[Ask and note a maximum of THREE major decisive factors, ranking them in order of their importance]

RANK	**Reasons**
1	
2	
3	

D12. Were your household involved in any conflict over land during the past 12 months?

YES [ ] >>Go to D12(i) NO [ ] >>Go to D13

D12(i) Please describe the conflict and how it was resolved?

Conflict	**Resolution**

D13. Has any member of the household owned any livestock during the last 12 months?

YES [ ] >>Go to D13(i) NO [ ] >>Go to Section E

D13(i) Please read out and fill the following details about the livestock kept in the past 12 months.

Livestock	**Current stock**	**Sold in past 12 months**		**Purchased in past 12 months**	
		Quantity sold	**Total value (cedis)**	**Quantity purchased**	**Total value (cedis)**
Draught animals (e.g., donkey, bullock)					
Cattle					
Goats					
Sheep					
Pigs					
Rabbits					
Chicken					
Other poultry (e.g., guinea fowls)					
Other (_____)					
Other (_____)					

E. OFF-FARM PRODUCTION/INCOME

E1. Besides crop and livestock income, what are the other sources of your household income?

Sources	**No of HH member involved**		**Income per month (cedis)**		**Total months worked in the past 12 months**	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
Business/Trading						
Service						
Wage (day) labour						
Cottage industry						
Remittances						
Pension						
Other (_____)						

E2. Are you or any member of your household involved in collection/production and sale of following products?

Products	**Sale quantity**	**Cost**		**No HH members involved**		**Income (cedis)**	
		Labour	**Capital**	**Men**	**Women**	**Men**	**Women**
Firewood							
Charcoal							
Wild Fruits & Nuts*							
Honey							
Other (_____)							
Other (_____)							

***Except shea nuts**

E3. Which of the following assets does your household own?

Asset	Number	Value if sold today?	
Motorbike			
Bicycle			
Television			
Radio			
Sewing machine			
Other (_____)			
Other (_____)			

F. TENURE, MANAGEMENT AND USE OF SHEA AND LOCUST BEAN TREES

Now I am going to ask you about the shea and locust bean trees in your farm and fallow land.

F1. Number of trees & perceptions on tree population

F1(i) How many shea and locust bean trees are there in your land?

[Fill this information after a census of trees with the help of one of the household members, preferably those who work on the land on a regular basis.]

Land Type	Shea (*Vitellaria paradoxa*)			Locust bean (*Parkia biglobosa*)		
	Mature§	Young‡	Seedlings*	Mature§	Young‡	Seedlings*
Farm						
Fallow						

§ [All fruiting trees and non-fruiting old trees] **‡ [Young non-fruiting trees]**

*** [Get the Best Estimate if there are too many seedlings to count]**

F1(ii) How many non-fruiting mature (old) trees are there in your land?

Shea _____ Locust bean _____

F1(iii) What other trees are there in your land?

Trees Present (Write either local or scientific name)	Number in Farm*	Number in Fallow*

*** Estimated number of other tree species: 1 to 10 = 1; 11 to 20 = 2; More than 20 = 3**

F1(iv) Based on your observation of the trees in your land, please respond to the following statements regarding changes in tree population in recent years.

Codes: Increase = 1; Decrease = 2; About the same = 3; Can't tell/Don't know = 4

Statements	Farm	Fallow
The number of fruiting shea trees now compared to five years ago		
The number of young (non-fruiting) shea trees & seedlings now compared to five years ago		
The number of old (non-fruiting) shea trees now compared to five years ago		
The number of fruiting locust bean trees now compared to five years ago		
The number of young (non-fruiting) locust bean trees & seedlings now compared to five years ago		
The number of old (non-fruiting) locust bean trees compared to five years ago		

Codes: Increase = 1; Decrease = 2; About the same = 3; Can't tell/Don't know = 4

F1(v) What are the major threats to shea and locust bean trees in your land?

[Interviewer: Ask the respondent to choose THREE most important factors and note them in order of their importance (for example, 1 for the first factor considered, 2 for the second factor, and so on)]

Threats	**Shea**	**Locust bean**
Uneven age distribution (i.e., too many old trees and not enough young ones; or otherwise)		
Fire (both natural and induced)		
Damages from mechanical ploughing (e.g, use of tractors)		
Damages from traditional ploughing		
Cutting of branches (for firewood or support for yam etc)		
Deliberate killing (e.g., by cutting roots, by induced fire, or ring bark)		
Felling of trees (for firewood, timber etc.)		
Other (.....)		

F2. In your experience, what effects shea and locust bean trees have on your crops?

Crops	**Effects***	
	Shea	**Locust bean**
Maize		
Millet/Guinea corn		
Beans		
Yam		
Groundnut		
Other (_____)		
Other (_____)		

*** Effects: Increase in yield = 1; Decrease in yield = 2; No effect = 3; Other (Specify) = 4**

F3. Tree Tenure and Management

F3(i) Who owns shea and locust bean trees in your land, and how are the access/harvest determined?

Ownership and Access: Self (Incl. HH Members) = 1; Landowner = 2; Chief = 3; Other = 4 (specify)

Land Type	**Shea**			**Locust bean**		
	Ownership	**Access/Harvest Rights**		**Ownership**	**Access/Harvest Rights**	
		1st Priority	**Other**		**1st Priority**	**Other**
Farm						
Fallow						

F3(ii) Are you allowed to plant shea and locust bean trees in your land?

Shea: YES [ ] >>Go to F3(ii)-a. NO [ ] >>Go to F3(ii)-b.

Locust bean: YES [ ] >>Go to F3(ii)-a. NO [ ] >>Go to F3(ii)-b.

F3(ii)-a. Under what conditions/restrictions are you allowed to plant these trees?

Conditions/Restrictions	**Shea**	**Locust bean**
Unrestricted		
No claim to ownership over the tree(s) planted		
No claim to ownership over the land where the tree is planted		
Other		

F3(ii)-b. Why are you not allowed to plant the trees?

Reasons	Shea	Locust bean
I am not the landowner		
Custom/tradition dictates that these trees should not be planted		
Other		

F3(iii) Have you or any member(s) of your household planted shea, locust bean or other trees in your farm or fallow land?

Trees	Planted (YES=1; NO=2)	Where? **	Purpose(s) for planting (if YES) OR Reason(s) for not planting (if NO)
Shea			
Locust bean			
Other (Specify)			

Codes: ** On boundaries = 1; In Farm or Fallow = 2; In homestead farm = 3; Other (specify) = 4

F3(iv) Would you plant more shea trees in your land if improved varieties (e.g., high yielding, fast fruiting) of seedlings were available?

YES [ ] >>Go to F3(v) NO [ ] >>Go to F3(iv)-a

F3(iv)-a. If NO, why?

F3(v) Would you plant more shea trees in your land if

SN	Factors	YES=1 | NO=2
1.	you had unrestricted access/use rights over the trees that you plant	
2.	you had the full ownership over the trees that you plant, including the rights to cut	
3.	[other reason(s)] (_____)	

F3(vi) What would be the most important factor in your decision to plant more shea trees?

Improved Varieties [ ] Unrestricted access [ ]

Full ownership [ ] Other (_____) [ ]

F3(vii) Would you plant more locust bean trees in your land if improved varieties (e.g., high yielding, fast fruiting) of seedlings were available?

YES [ ] >>Go to F3(viii) NO [ ] >>Go to F3(vii)-a

F3(vii)-a. If NO, why?

F3(viii) Would you plant more locust bean trees in your land if

SN	Factors	YES=1 | NO=2
1.	you had unrestricted access/use rights over the trees that you plant	
2.	you had the full ownership over the trees that you plant, including the rights to cut	
3.	[other reason(s)] (_____)	

F3(ix) What would be the most important factor in your decision to plant more locust bean trees?

Improved Varieties [ ] Unrestricted access [ ]

Full ownership [ ] Other (_____) [ ]

F3(x) Are you allowed to cut shea and locust bean trees in your land?

Shea: YES [ ] >>Go to F3(x)-a. NO [ ] >>Go to F3(x)-b.

Locust bean: YES [ ] >>Go to F3(x)-a. NO [ ] >>Go to F3(x)-b.

F3(x)-a. Under what conditions/circumstances/restrictions can you cut these trees?

Conditions/Circumstances/Restrictions	**Shea**	**Locust bean**
Unrestricted		
Old and non-fruiting trees		
During traditional festivals/ceremonies (e.g., birth, death, pacifying gods)		
Other		

F3(x)-b. Why are you not allowed to cut these trees?

Reasons	**Shea**	**Locust bean**
I do not own the land		
I do not own the trees		
This tree is protected by traditional/customary rules		
This tree is protected by government regulations		
Other		

F3(xi) Are you allowed to cut the branches of shea and locust bean trees (i.e., prune the trees), for example, to provide support for yam, or for firewood?

Shea: YES [ ] >>Go to F3(xi)-a. NO [ ] >>Go to F3(xi)-b.

Locust bean: YES [ ] >>Go to F3(xi)-a. NO [ ] >>Go to F3(xi)-b.

F3(xi)-a. Under what conditions/circumstances/restrictions are you allowed to cut branches?

Conditions/Circumstances/Restrictions	**Shea**	**Locust bean**
Unrestricted		
Old and non-fruiting trees		
If trees are creating too much shade in the farm		
Other		

F3(xi)-b. Why are you not allowed to cut branches from these trees?

Reasons	**Shea**	**Locust bean**
I do not own the land		
I do not own the trees		
Cutting branches is prohibited by traditional/customary rules		
Cutting branches is prohibited by government regulations		
Other		

F3(xii) Do you cut branches (prune) shea and locust bean trees in your farm fallow for following purposes? **Code: YES = 1; NO = 2**

Reasons for pruning/cutting branches	**Shea**	**Locust bean**
For firewood		
To reduce shade		
To get support for yam		
To promote tree health (i.e., better/faster growth, fruiting, removing mistletoe)		
Other		

F3(xiii) What would you do if there are too many trees in your farm?

Actions taken	**Shea**	**Locust bean**
Remove some trees		
Heavily prune the trees		
Start a new farm		
Other		

F3(xiii)-a. If you remove some shea and locust bean trees from your farm, how do you decide which trees to remove?

[Rank a maximum of THREE main factors considered for each tree species (for example, 1 for the first factor considered, 2 for the second factor considered, and so on)]

Factors considered	**Shea**	**Locust bean**	**Remarks***
At Random			
Age			
Yield			
Too much shade			
Fruit sweetness			
Nut size			
Butter yield/quality (for shea)			
Tree health (i.e., no mistletoe)			
Other (.....)			

*** Record any additional information provided - for example when the factor considered is Age, whether it is Old trees or Young trees/seedlings**

F3(xiii)-b. How do you remove the trees from your farm?

Felling live trees [ ] Fire (complete burning) [ ]
Fire & Felling [ ] Other (specify) [ ]

F3(xiv) How many shea or locust bean trees have you cut during the past 12 months, and in the last 5 years and why?

	Shea	**Locust bean**	**Reason(s) [e.g., building timber, for sacred rites, farm clearing)**
Past 12 months			
Last 5 years			

F4. Do you know if other people (neighbours, other tribes) cut shea & locust bean trees in your area? If they do, why?

	People cutting trees	**Reason(s)/Purpose(s) for cutting trees**
Shea		
Locust bean		

F5. Were you or any member of your household involved in conflict over tree ownership or use during the past 12 months?

Shea YES [ ] >>Go to F5(i)&(ii) NO [ ] >>Go to F6

Locust bean YES [ ] >>Go to F5(i)&(ii) NO [ ] >>Go to F6

Other trees YES [ ] >>Go to F5(i)&(ii) NO [ ] >>Go to F6

F5(i) Please describe the nature of conflict.

F5(ii) How was the conflict resolved?

F6. Use of shea and locust bean trees

F6(i) Please provide information on your use of shea trees

Products / Uses	**Food**	**Fodder**	**Fuelwood**	**Medicine**	**Manure**	**Building Material**	**Other (Specify)**
Leaves							
Flowers							
Fruits							
Nuts							
Bark							
Roots							
Branches							
Timber							

F6(ii) Please provide information on your use of locust bean trees

Products / Uses	**Food**	**Fodder**	**Fuelwood**	**Medicine**	**Manure**	**Building Material**	**Other (Specify)**
Leaves							
Flowers							
Fruits (pods)							
Seeds							
Bark							
Roots							
Branches							
Timber							

G. HOUSEHOLD AWARENESS/PARTICIPATION/SOCIAL CAPITAL

G1. How many voluntary community groups or organisations do you or any members of your household regularly participate in? **[Interviewer: Provide some examples]**

_____ groups (Please record the following details)

Group/Organisation	Participant from the HH	Year Joined

G2. Are you or any members of your household on a management or organising committee for any of these groups?

YES [ ] >>Go to G2(i) NO [ ] >>Go to G3

G2(i) Are any female members of the household involved in a management committee?

YES [ ] NO [ ]

G3. How often do you or members of your household participate in scheduled meetings of these organisations?

Always [ ] Usually [ ] Sometimes [ ] Rarely [ ] Never [ ]

G4. Do you or any member of your household represent your village/community at the local government (for example District Assembly)?

YES [ ] >>Go to G4(i) NO [ ] >>Go to G5

G4(i) Are you or any members of your household in decision-making bodies at the local government?

YES [ ] >>Go to G4(i)-a. NO [ ] >>Go to G5

G4(i)-a. How often do you or members of your household participate in scheduled meetings of these decision-making bodies?

Always [ ] Usually [ ] Sometimes [ ] Rarely [ ] Never [ ]

G5. Is any member of your household part of labour-exchange/-sharing group?

YES [ ] >>Go to G5(i) NO [ ] >>Go to G6

G5(i) Please provide the following information about your participation in labour exchange.

Group/Organisation	Participant from the HH		Frequency of participation	
	Male	Female	Per month	Total (per yr)

G6. How many religious or other informal, non-family events in the community have you attended in the last year? (e.g. festivals, dances, sports, village meetings, birth/marriage/funeral ceremonies, etc.)

None [ ] 5 or less [ ] 10-20 [ ] More than 20 [ ]

G6(i) If none, why?

H. WOMEN AND TREES

H1. Perceptions about shea and locust bean trees in the parkland

H1(i) Based on your observation of the trees in your and/or your husband's land, please respond to the following statements regarding changes in the population of shea and locust bean trees in recent years.

Codes: Increase = 1; Decrease = 2; About the same = 3; Can't tell/Don't know = 4

Statements	**Farm**	**Fallow**
The number of fruiting shea trees now compared to five years ago		
The number of young (non-fruiting) shea trees & seedlings now compared to five years ago		
The number of old (non-fruiting) shea trees now compared to five years ago		
The number of fruiting locust bean trees now compared to five years ago		
The number of young (non-fruiting) locust bean trees & seedlings now compared to five years ago		
The number of old (non-fruiting) locust bean trees compared to five years ago		

H1(ii) What are the major threats to shea and locust bean trees in your/your husband's land?

[Interviewer: Ask the respondent to choose THREE most important factors and note them in order of their importance (for example, 1 for the first factor considered, 2 for the second factor, and so on)]

Threats	**Shea**	**Locust bean**
Uneven age distribution (i.e., too many old trees and not enough young ones; or otherwise)		
Fire (both natural and induced)		
Damages from mechanical ploughing (e.g, use of tractors)		
Damages from traditional ploughing		
Cutting of branches (for firewood or support for yam etc)		
Deliberate killing (e.g., by cutting roots, by induced fire, or ring bark)		
Other (.....)		

H2. Tenure systems, access to land and trees, and influence in management decisions

H2(i) What is the situation regarding your access to land?

Have access to own plot of land [ ] Access to husband's land [ ]

Access to father's or other male relative's land [ ] No access to land [ ]

H2(ii) What is the situation regarding your access to shea trees?

Trees on own plot of land [ ] Trees on father's or other male relative's land [ ]

Trees on husband's land [ ] Trees on neighbour's or other villager's land [ ]

Trees on common land or bush [ ] No access to trees [ ]

H2(iii) Are you allowed to plant shea trees in the plot of land that you farm or on your husband's farm?

YES [ ] >>Go to H2(iii)-a NO [ ] >>Go to H2(iv)

H2(iii)-a. Have you planted any shea trees? If so how many?

YES [ ]: In past 12 months [ ] In last 5 years [ ] NO [ ]

H2(iv) Are you allowed to cut shea trees in your plot or on your husband's farm?

YES [ ] NO [ ]

H2(v) Are you involved in any kind of decision making and/or implementation regarding the management of trees in your plot or your husband's farm, especially the shea trees?

[Provide examples of the type of tree management activities]

YES [ ] >>Go to H2(v)-a. NO [ ] >>Go to H2(vi)

H2(v)-a. What management activities are you involved in and at what level?

Management issues	**Involved in (YES=1; NO=2)**		
	Information sharing/Planing	**Decision making**	**Implementation**
Pruning/cutting branches			
Removing unwanted seedlings/saplings			
Planting/transplanting of seedlings			
Controlled burning			
Cutting trees			
Other (_____)			
Other (_____)			

H2(vi) Are you satisfied with the current/prevailing land and tree tenure system in your community?

YES [ ] >>Go to H3. NO [ ] >>Go to H2(vi)-a.

H2(vi)-a Why are you not satisfied with the current system? What changes would you like to see?

H3. Harvest and Sourcing of Shea Nuts and Locust Bean

H3(i) Where do you or other women in this household harvest/collect shea nuts and locust bean from? **[Interviewer: Ask and list a maximum of THREE MAIN Sources]**

Product	**Source 1**	**Source 2**	**Source 3**
Shea Nuts			
Locust Bean			

Source code: Own farm/fallow = 1; Husband's farm/fallow = 2; Father's farm/fallow = 3; Other male relative's farm/fallow = 4; Any other relative's farm/fallow = 5; Neighbour's farm/fallow = 6; Other villager's farm/fallow = 7; Communal land/forest = 8; Other (Specify) = 9

H3(ii) How much shea nuts and locust bean did you harvest/collect from each source in the past 12 months? **[Enter the source code in each column header from the response above]**

Product	**Source 1 (_____)**	**Source 2 (_____)**	**Source 3 (_____)**
Shea Nuts			
Locust Bean			

H3(iii) Did you sell any shea nut or locust bean during the past 12 months?

Shea YES [ ] >>Go to H3(iii)-a. NO [ ] >>Go to H3(iv)

Locust bean YES [ ] >>Go to H3(iii)-a. NO [ ] >>Go to H3(iv)

H3(iii)-a. What quantity did you sell and at what price?

Product	**Unit (Bowl or Bag or Kg)**	**Quantity sold**	**Price/unit (Cedis)**	**Total Income (Cedis)**
Shea Nuts				
Locust Bean				

H3(iv) Did you buy any shea nut or locust bean during the past 12 months?

Shea YES [ ] >>Go to H3(iv)-a. NO [ ] >>Go to H4

Locust bean YES [ ] >>Go to H3(iv)-a. NO [ ] >>Go to H4

H3(iv)-a. What quantity did you buy and at what price?

Product	**Unit (Bowl or Bag or Kg)**	**Quantity purchased**	**Price/unit (Cedis)**	**Total Cost (Cedis)**
Shea Nuts				
Locust Bean				

H4. Shea Butter Processing and Marketing

H4(i) Please provide following details on your shea butter processing enterprise during the past 12 months.

Month	**Quantity of nuts processed**	**Unit**	**Total butter production**	**Quantity sold**	**Price/unit**	**Total income**
Jan						
Feb						
Mar						
Apr						
May						
Jun						
Jul						
Aug						
Sep						
Oct						
Nov						
Dec						

H4(ii) Please provide the costs incurred during the past 12 months in your shea butter processing enterprise.

Activity	**Method/Means**	**Unit (bag, bowl)**	**Cost per unit**	
			Labour time	**Monetary cost**
Crushing of nuts				
Roasting of nuts				
Milling of nuts				
Kneading the paste				
Boiling the oil				
Filtration				
Weighing				
Packaging				
Sale of butter				
Other(_____)				

H4(iii) Please provide the following information about the nearest market(s) for your shea nuts/butter?

Distance to the market	**Travel time or cost for return trip**	**Frequency of visit**	**Months of visit to the market***	**Average nuts/butter sale in one visit**	
				Quantity	**Unit (e.g., bowl or calabash)**

*** Jan = 1, Feb = 2, and so on.**

H4(iv) Who controls the proceeds from shea nuts/butter sale?

Self [ ] Husband [ ] Joint [ ] Other (_____) [ ]

H4(v) Do you lend any part of the proceeds from shea nuts/butter sale to your husband or the head of the household?

YES [ ] >>Go to H4(v)-a. NO [ ] >>Go to H4(vi)

H4(v)-a. How do you get paid for the money you lend?

[List a maximum of THREE main ways of payment in order of their use, i.e., the most common mode of payment coming first and so on]

Rank	**Ways of payment**	**Remarks**
1		
2		
3		

H4(vi) Do you produce and market any other shea products (except nuts and butter)?

YES [ ] >>Go to H4(vi)-a. NO [ ] >>Go to H5.

H4(vi)-a. What other shea products do you produce and market? What was the income in the past 12 months?

Products	**Income in the past 12 months**	

H6. What are your other sources of cash income except from shea products?

Sources	**Income in the past 12 months**	

H6. Membership in butter processing group, cooperative

H6(i) Are you a member in any shea butter processing or other groups?

YES [ ] >>Go to H6(i)-a. NO [ ]

H6(i)-a. Please provide your membership details for all the groups that you are involved in.

Group/co-operative	**Member since**	**Membership fee**	**Position***

***Position code: General membership = 1; Management committee = 2 (i.e., chair, treasurer)**

H6(i)-b. How often do you participate in the group activities?

Activities	**Frequency of participation**	**Total days/year**
General Meeting		
Labour sharing in butter processing		
Labour sharing in farming		
Other (_____)		

Appendix 4: List of Key Informants and Focus Groups in the Study Sites

1. Cheyohi & Kpachi

Key Informants

Name	Age/Gender	Position in the community	Date of interview
Mohammad Salifu (Cheyohi)	43/M	Community Facilitator/Opinion Leader	22-10-2007
Alhaji Tia (Cheyohi)	38/M	Opinion Leader/Unit Committee Member for District Assembly	26-10-2007
Fuseini Iddrisu (Cheyohi)	25/M	Community Youth Group Chairman	27-10-2007
Fati Alhassan (Cheyohi)	[N/A]/F	Magazia	25-10-2007
Bojuli Nporo (Kpachi)	78/M	Dohannaa	19-11-2007
Hazara Abdulai (Kpachi)	26/F	Assistant to the Magazia	19-11-2007
Alhassan Dawune (Cheyohi)	70+/M	Dohannaa	27-10-2007

Focus Groups

FGD 1 - Farmers - 23-10-2007
Participants:
1. Yakubu Abu
2. Mohammad Naporu
3. Sayibu Nindoo
4. Dawuda Alhassan
5. Sayibu Salifu
6. Munkaila Alhassan
7. Fuseini Alhassan
8. Isahaku Yidana
9. Iddi Ibrahim
10. Nuhu Mohammad

FGD 2 - Farmers - 24-10-2007
Participants:
1. Musah Salifu
2. Iddrisu Imoro
3. Abubakari Mohammad
4. Abubakari Abdullah
5. Osman Ibrahim
6. Inusah Mohammad

FGD 3 - Women collecting, processing and trading sheanut and butter - 25-10-2007
Participants:

1. Samata Alhassan
2. Mariyama Mahama
3. Sanatu Alhassan
4. Fatimata Yakubu
5. Hafishetu Iddrisu
6. Rahi Sayibu
7. Hazara Imoru
8. Afisetu Haruna

2. Yipala

Key Informants

Name	Age/Gender	Position in the community	Date of interview
Mose Dramani	42/M	Community Facilitator	10-11-2007
Alfred Mahama Yahaya	76/M	Chief (*Yipalawura*)	10-11-2007
Laud Jimah	27/M	Teacher	10-11-2007
Dramani Sobilantey	~50/M	Trader/Opinion Leader	30-11-2007

Focus Groups

FGD 1 - Farmers - 04-11-2007
Participants:

1. Salifu Seiku
2. Mumuni Gbolo
3. Labi Lariborgu
4. Seidu Gormna
5. Dramani Salia
6. Adamu Forgor
7. Kwame Mumuni

FGD 2 - Women from Indigenous Households - 29-11-2007
Participants:

1. Saboyu Dramani
2. Mwengu Jenche
3. Mumuni Teneh
4. Habiba Issahaku
5. Hawa Yaya
6. Bakoni Naa
7. Salia Fatimah
8. Ayisheu Fushemi
9. Forgor Dangkeri
10. Ajara Davi

FGD 3 - Women from Settler Households - 30-11-2007
Participants:

1. Memuna Alhassan
2. Dakpera Tobitey
3. Baboyina Oblentey
4. Tenyene Legira
5. Asana Nuhu
6. Mery Subilantey
7. Sala Nuhu
8. Ajara Yussif
9. Ajata Dansiri
10. Hawa Abu
11. Lonkor Dosiri
12. Dousima Salifu

3. Gbimsi

Key Informants

Name	**Age/Gender**	**Position in the community**	**Date of interview**
Linus Nandua Sardi	51/M	Assemblyman (to District Assembly)/ Opinion Leader/Community Facilitator	27-08-2008
Sulley W Yidana	46/M	Community Chairman/Opinion Leader	28-08-2008
Zenabu Siyaku	~50/F	Magazia	28-08-2008
Imam Yussif	~50/M	Chief Imam/Community Elder	29-08-2008
Mahamadu Mahami	~55/M	Section Leader (Wudafong)/Opinion Leader	29-08-2008
Musah Boukary	52/M	Section Leader (Kaywafong)/Community Elder	29-08-2008
Yamusah Azafu	60/M	Chief (Gbimsi Naa)	01-09-2008
Francis Asakiya	~70/M	Section Leader (Abunafong)	08-09-2008

Focus Groups

FGD 1 - Farmers - 03-09-2008
Participants:

1. Mahamudu Wumbla
2. Abu Sumani
3. Abdul Rahaman Boura
4. Amina Musah (F)
5. Michael Wuni
6. Seidu Wuni

FGD 2 - Farmers - 04-09-2008
Participants:
1. Seidu Mahami
2. Medgida Tia (F)
3. Zenabu Siyaku (F)
4. Salifu Tibla
5. Mahamudu Mahami
6. Ibrahim Tia
7. Fuseini Mahamudu
8. Abusamadu Yidana
9. Mary Salifu (F)
10. Haadi Mahamudu (F)

FGD 3 - Farmers - 04-09-2008
Participants:
1. Imoro Yidana
2. Musah Fari (F)
3. Fati Inusah (F)
4. Boukary Adam
5. Salifu Yidana
6. Medgida Napari (F)
7. Medgida Wuni (F)

FGD 4 - Women collecting, processing and trading sheanut and butter - 05-09-2008
Participants:
1. Fatimata Moari
2. Amina Amidu
3. Fusiata Tia
4. Alimatu Alhassan
5. Rachia Yidana

FGD 5 - Women collecting, processing and trading sheanut and butter - 05-09-2008
Participants:
1. Chimsi Tia
2. Mariama Wunduo
3. Alimatu Ishaku
4. Pouwama Wuni
5. Abiba Imoro
6. Bugri Imoro
7. Lamishi Sulemana
8. Samata Toka
9. Lamishi Albert