

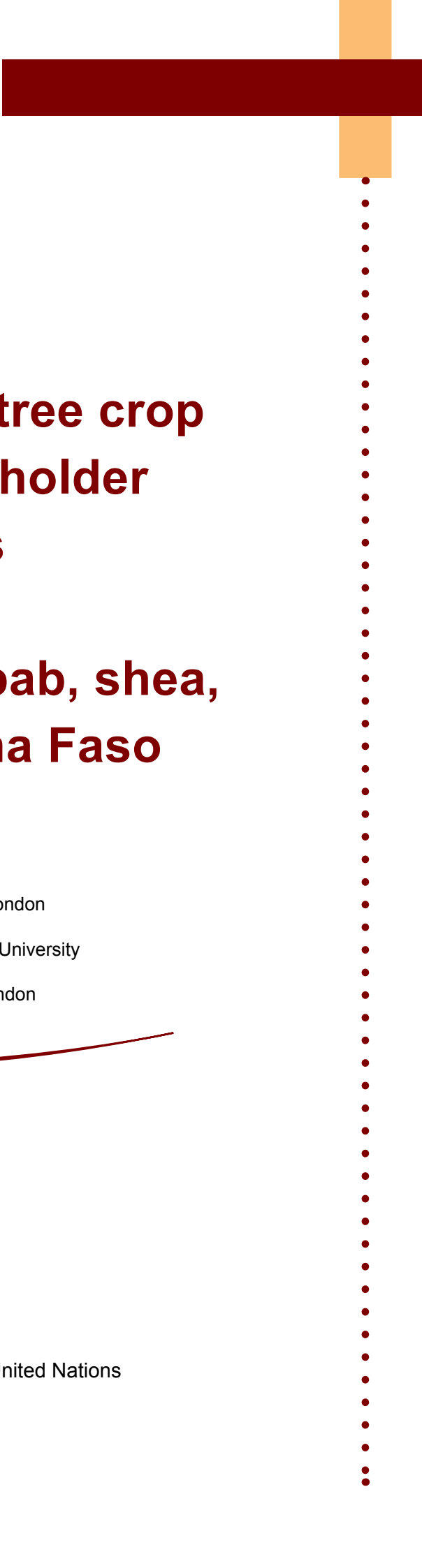


Food and Agriculture Organization
of the United Nations

FAO COMMODITY AND TRADE POLICY RESEARCH
WORKING PAPER NO. 49

THE CONTRIBUTION OF TREE CROP PRODUCTS TO SMALLHOLDER HOUSEHOLDS

A CASE STUDY OF BAOBAB, SHEA, AND NÉRÉ IN BURKINA FASO




The contribution of tree crop products to smallholder households


A case study of baobab, shea, and néré in Burkina Faso

by

Camilla Audia, SOAS, University of London
Bartélémy Kaboret, TREE AID
Rebecca Kent, Canterbury Christ Church University
Tony Hill, TREE AID
Nigel Poole, SOAS, University of London



Food and Agriculture Organization of the United Nations
Rome, 2015



The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

© FAO, 2015

FAO encourages the use, reproduction and dissemination of material in this information product. Except where otherwise indicated, material may be copied, downloaded and printed for private study, research and teaching purposes, or for use in non-commercial products or services, provided that appropriate acknowledgement of FAO as the source and copyright holder is given and that FAO's endorsement of users' views, products or services is not implied in any way.

All requests for translation and adaptation rights, and for resale and other commercial use rights should be made via www.fao.org/contact-us/licence-request or addressed to copyright@fao.org.

FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org.

Contents

ACKNOWLEDGEMENTS	1
SUMMARY	2
INTRODUCTION	3
<i>Market access</i>	3
<i>Household decision making</i>	4
<i>Aim and objectives</i>	4
THE SAHELIAN REGION: THE BURKINA CONTEXT	5
<i>Environment</i>	5
<i>Social organization</i>	5
<i>Resources management</i>	6
<i>Tree foods</i>	6
METHODOLOGY	7
<i>Research approach</i>	7
Sampling	8
Quality control	9
RESULTS	9
<i>Sample overview</i>	9
Household demography	9
Education	10
Communication assets	10
Transportation assets	11
Water	11
Household fuel	11
Agricultural land	11
Livestock ownership	12
TREE RESOURCES BY HOUSEHOLD	12
<i>Baobab</i>	13
Access and collection	13
Processing and utilization	15
Sales	16
Replanting and regeneration	17
<i>Shea</i>	17
Access and collection	17
Processing	18
Sales	19
Replanting and regeneration	20
<i>Néré</i>	20
Access and collection	21
Processing	22
Sales	22
Replanting and regeneration	22

KEY RESULTS AND IMPLICATIONS	23
<i>Sample features</i>	23
<i>Access to, and productivity of, assets, subsistence and production for sale</i>	26
<i>The connectivity of smallholders to markets</i>	26
<i>The functionality of markets</i>	27
CONCLUSIONS, IMPLICATIONS AND DEVELOPMENT OPPORTUNITIES	27
<i>Utilization</i>	27
<i>Species differences and regionality</i>	28
<i>Developmental implications</i>	28
<i>Further research</i>	28
BIBLIOGRAPHY	29
APPENDIX	31
FIGURES	32
Figure 1. Tree product usage - Passoré (northern site)	13
Figure 2. Tree product usage - Zoundwéogo/Nahouri (southern site)	13
Figure 3. Collection of baobab - Passoré (northern site)	14
Figure 4. Collection of baobab - Zoundwéogo/Nahouri (southern site)	14
Figure 5. Utilization of baobab - Passoré (northern site)	16
Figure 6. Utilization of baobab - Zoundwéogo/Nahouri (southern site)	16
Figure 7. Responsibility for shea collection – northern and southern sites	17
Figure 8. Responsibility for shea processing - Passoré (northern site)	17
Figure 9. Responsibility for shea processing - Zoundwéogo/Nahouri (southern site)	18
Figure 10. Responsibility for néré collection – Passoré (northern site)	21
Figure 11. Responsibility for néré collection – Zoundwéogo/Nahouri (southern site)	21

Acknowledgements

This report is part of an initiative by the Trade and Markets Division of the Food and Agriculture Organisation (FAO) to analyse patterns of smallholder market participation. It was prepared by Nigel Poole and Camilla Audia, SOAS (University of London), in collaboration with Bartélémy Kaboret and Tony Hill of TREEAID and Rebecca Kent of Christ Church Canterbury University.

Authorship is listed alphabetically.

Thanks for assistance in data collection are due to M. Inoussa Savadogo (Passoré), M. Halidou Sawadogo (Zoundwéogo and Nahouri), and M. Yves Basson (Gourma), and to El Mamoun Amrouk and Jamie Morrison who provided guidance and input on the methodological framework, and comments on drafts.

Summary

This document examines the contribution of tree products derived from baobab (*Adansonia digitata*), shea (*Vitellaria paradoxa*) and néré (*Parkia biglobosa*) to smallholder livelihoods where these non-timber forest products form a significant part of the subsistence economies of smallholder households in the Sahelian region. The benefits are access to nutritious foodstuffs particularly during the *soudure* hunger season and are also commercialised.

Besides a literature review, participant observation and key informant interviews, a questionnaire was developed for household level data collection which focused on the processes within the household, including decision-making about selling and consumption of tree products. The fieldwork was conducted in the Northern and Southern parts of Burkina Faso. The questionnaire focused on the following objectives, to:

- Understand the decision-making processes within the households
- Identify the factors taken into consideration for the selling and or home consumption decisions regarding the chosen tree products
- Assess average quantities of tree products collected, consumed at home or sold
- Identify the preferred markets for the sale of such products and determine the seller-buyer mechanisms and the ways of accessing those markets
- Determine the options for, and uptake of, appropriate technology for processing, storage and transportation of the tree products.

The study puts a special emphasis on the role and contribution of women to tree products utilization, particularly through access to markets.

It is hoped that the results of this research can help to improve the evidence base underpinning patterns of smallholder participation in tree food markets, and more widely, of livelihood strategies in the region, enabling conclusions and policy recommendations to be drawn to enhance benefits from, and alleviate constraints facing, commercial tree crop activities.

Introduction

This report examines the contribution of non-timber forest products (NTFPs), an important part of the subsistence economies of smallholder farmers, most notably in the Sahelian region of Sub-Saharan Africa. The research concerned three of the most important NTFPs in Burkina Faso: baobab (*Adansonia digitata*), shea (*Vitellaria paradoxa*) and néré (*Parkia biglobosa*). It investigated the determinants of smallholder market participation choices, and contributes not only to knowledge about the subsistence and commercial use of tree products by rural people, but also supplements the knowledge of household decision making practices.

Market access

According to Wiggins and Keats (2013), the contribution of rural smallholders to reducing poverty and hunger in low income countries depends on sustainable access to markets. The primary focus of terms such as market participation and economic inclusion is to consider the multiple ways and the extent to which smallholder farmers are able to sell their output to buyers who may be itinerant assemblers and traders, agents for larger scale procurement systems, to traders in markets or direct to consumers. Recognising that many smallholders in developing countries are net purchasers of staple food products, of equal interest is how rural people balance the decisions of whether to sell or consume their produce. Research conducted on the attributes of smallholder farmers and the conditions required to enable smallholders to link with markets (Amrouk *et al.*, 2013) considered that there are three sets of factors which condition smallholder market access. These include:

- household and householder characteristics: the level of education and resource endowments, the level of technology, land size and quality, and the stock of other productive assets. They also include household structure, consumption needs, risks faced, which make up the vulnerability context
- sectoral factors such as the prevailing physical and institutional infrastructure such as roads, electricity, communications, market, rules of law, which drive price incentives and the decision to invest in technology and generate surpluses
- macro policies through their impact on prices and trade incentives.

Recognition has recently been given to rural heterogeneity, and provides a warning against a tendency to gloss over inter- and intra-household heterogeneity, that is, the differences between and within households, among men and women, old and young, high and low status (Poole, Chitundu, and Msoni, 2013). The importance of analysing contextual 'locality' and 'particularity' were highlighted. Summarising (Barrett, 2008 and Arias *et al.*, 2013), smallholder farmers and their contexts differ according to:

- i. access to, and the productivity of, assets, including natural resources, labour, and capital, subsistence needs and the ability and willingness to increase production for sale in markets;
- ii. the connectivity of smallholders to different markets, in terms of geographical proximity knowledge, asymmetries and power relationships, and transaction costs;
- iii. the functionality of these markets in terms of volumes transacted, limited integration with regional or international markets, volatility and riskiness of returns to the producer.

Household decision making

A variety of modelling approaches have been developed to handle the complexities of intrahousehold decision making (Beckett, 2013). These household models illuminate likely household power, gender and intergenerational relations, and help to suggest and explain how different household members participate in livelihood activities. The models enshrine different assumptions about people's behaviour.

Essentially there is a unitary model approach whereby the household is considered to be a single decision making unit led by a dominant and sometimes benevolent male (Becker, 1976). Within the unitary model, efficiency concerns revolve around maximising benefits for the household overall, by making investments with the best returns. Equity issues are those which affect, for example, distributional issues among children (Haddad, Hoddinott, and Alderman, 1997). Other models assume collective and/or consensual decision making by individuals within a multi-person household, and bargaining models, which assume non-cooperative behaviour. An alternative approach is that of independent individual models of decision-making (Grossbard, 2010), which can fall within a spectrum from pure individualism to pure cooperation. Research requires both quantitative and qualitative analytical approaches, and also for economics to merge with other relevant disciplines, specifically anthropology and nutrition (Bouis and Pena, 1997; Gittelsohn and Mookherji, 1997; Guyer, 1997).

A key strategy within rural households in Burkina identified by Tincani (2012) was the dynamic of negotiation and renegotiation by women of entitlements to food and other resources. Both prudence and opportunism are appropriate at different seasonal and lifecycle stages as means of adapting to changing household and environmental conditions. In effect, balancing rigid social norms against a constant renegotiation of power dynamics enables household decision makers to avoid a 'rigidity trap' - a consequence of constraints such as undue risk aversion, and a 'poverty trap' - a consequence of lack of opportunities, or unwillingness to take advantage of opportunities.

This research follows up questions posed by Tincani about decision making and tree crop utilization for consumption and/or sale, and adds ethnographic as well as socio-economic detail through a contribution that is primarily qualitative.

Aim and objectives

The aim of this study was to explore the determinants of smallholder market participation choices based on case studies in West Africa, and thereby contribute not only to knowledge about the subsistence and commercial use of tree products by rural people, but also to supplement the knowledge on household decision making practices. This work hypothesises that tree foods have potential for a greater contribution to poor rural people's subsistence and engagement with markets. The objectives were to:

- Highlight the role of women (all the respondents of the questionnaire were selected women of the households) in different processes within the household, such as:
- Decision-making about selling and consumption of tree products;
- Collecting products from the trees;
- Processing the tree products for both home consumption or selling and the related decision-making process;
- Long-term storage of the products;
- Selling process: access to markets, travel to markets, market prices, relationships between buyers and sellers.
- Map the existing decision-making processes within the households in order to assess the

factors taken into consideration for the selling and or home consumption decisions regarding the chosen tree products.

- Assess average quantities of tree products collected, consumed at home and sold.
- Study the preferred markets for the sale of such products and determine the seller-buyer mechanisms and the ways of accessing those markets.
- Find out the uptake on appropriate technology for processing, storage and transportation for the tree products.

The Sahelian region: the Burkina context

Environment

The Sahel is hunger-prone and environmentally, nutritionally and socio-politically fragile. Resilient food systems need to be preserved and strengthened as the effects of climate change are likely to impact them severely. Evidence from the literature on the role of tree foods and from current literature on food security in the Sahel suggests that tree foods such as those investigated in this research have potential to contribute towards environmental and food security and rural livelihoods, and thus also contribute towards social and political security. The primary sector constitutes almost a third of national GDP; however, it engages 85% of the population. In 2010, 81% of the Burkinabé population was rural¹ with agriculture contributing 39% of GDP. Agriculture is vulnerable to climatic conditions and until recently has been said to be amongst the least performing of the Sub Saharan countries (Belemvire, Sawadogo, and Savadogo 2008). Being a low-income, landlocked country with limited natural resources and low agricultural productivity, Burkina is likely to experience some of the worst impacts of climate change in respect of changes in temperature and rainfall patterns, and the occurrence of storms and extreme weather events (UNDP, 2013).

Burkina Faso ranked 183 out of 186 countries in the 2012 UN Human Development Index with 44.6% of the population living below the national poverty line²: 'Against the national poverty line, the rate of impoverishment in Burkina Faso had risen by 5.3% since 1990 at last estimate, while against the international poverty line, the rate had exceeded the MDG target by 1.2%. Child malnutrition rose by 18.6% between 1990 and 2005, leaving the country further from reaching the first MDG target in 2005 than it was in 1990' (Grow Africa Secretariat, 2013).

Social organization

Burkina Faso is inhabited by at least 60 ethnic groups throughout the territory; the Northern region taken into account for the survey, Passoré, is mostly populated by Mossi people. The Mossi represent almost 50% of the total Burkina population, therefore comprising the largest ethnic group (Pierre Englebert, 1996). They reside mostly on the Mossi Plateau situated in the central region of the country, but are present in most villages even scattered in the South-Eastern area. Mossi are characterized by a highly hierarchical society with precise, strict and tight social structures that partly explain the high population density of the Plateau (Tincani, 2012).

According to their lineage, people within a specific village are usually socially organised in *zaka*. Rohatynskyj argues that the *zaka* is the basic productive unit and minimal kinship unit with a double

¹ INSD, *Enquête burkinabé sur les conditions de vie des ménages 2003 et enquête annuelle sur les conditions de vie des ménages (EA – QUIBB) 2005/2007*. The data used in the text are INSD projections for 2010.

² Complete statistics and data are available at the UNDP website Burkina Faso country profile at the url: <http://hdrstats.undp.org/en/countries/profiles/BFA.html>.

significance of conceptual unit of kinship and the actual reality of a group of people living together within one compound; it is seen as a social unit of people who work and live together while sharing resources (Rohatynskyj, 1988). For the purpose of this study, the Mooré term *zaka* has been translated to complex household or 'compound' in English and *concession* in French. Within the *zakse* (pl), up to almost forty people can live in up to seven conjugal family units³, that have been called in this document 'households' in English or *ménages* in French. For this study, single households were taken into account as basic social and productive units to simplify analysis.

Resources management

At village level, the land chief is responsible for the allocation of the plots to the head of each clan, who then distributes the parcels among his people. It is important to highlight that land always belongs to the head of the compound, but he cannot sell it or give it away permanently without consulting the land and village chiefs. In most cases, the land chief himself will decide about land-related transactions. If there are migrants or new settlers in the area, land can be lent to them by any landowner they ask (which means every head of the compound). The land chief can intervene in case of conflict and act as a negotiator (Skinner, 1964).

However, within the family, the head of the compound allocates land rights to his wives and sons; keeping in mind the hierarchy that characterizes the Mossi and Gurunsi societies, it is not uncommon that, given the role of personal and changing preferences of the husband and the precarious nature of the rights, inter-household tensions may arise (Dueppen, 2008; Engberg-Pedersen, 1995).

Moreover, wives and sons only have usufruct rights but do not own land, creating a temporary and uncertain tenure as the rights can be withdrawn at any time and for different reasons, such as the death of the husband or for other reasons not farming the plot. Farming it is a legitimate way to claim under-utilized land (Duperrey, 1984; Hammond, 1966).

It has been said that agricultural and poverty reduction policies need a greater focus on livelihood diversification and more efficient safety nets that target beneficiaries directly rather than through the crop cultivation choices made by individual households (Delpeuch and Vandeplas, 2013). In an unsympathetic agro-ecological, economic and political context which conditions appropriate strategies for smallholder farmers that attention is turning towards more diverse production systems and livelihood strategies. In the search for food and income security in particular for the rural population in Burkina (as elsewhere in the Sahel), understanding the contribution of tree foods is important.

Tree foods

Recent research in Burkina has shown that tree foods are likely to be a key part of cultural food practices with a much greater role to play in food security and nutrition than has been recognised hitherto. It is estimated that tree foods could constitute as much as 40% to meals of rural people in some seasons (Tincani, 2012), and that these 'minor' food items can make a significant nutritional contribution to diets particularly in rural areas: seeds, nuts, leaves and bark are used in sauces which are the basis of Burkinabé cuisine and may provide important micronutrients as part of a seasonal contribution to food supplies and income generation. As such they may contribute to assuaging the negative social and psychological consequences of food security and malnutrition – shame, guilt and powerlessness – identified among the rural poor in northern Burkina (Nanama and Frongillo, 2012).

Table 1 is a calendar illustrating seasonality related to both agriculture and tree food products collection. It is indicative, and details will vary with location and inter-annual variation. However, it shows how dry seasons tend to correspond to NTFP collection, therefore highlighting the importance of those products for household well-being and nutritional contribution.

³ This data emerges from a 1988 field study by Rohatynskyj in a Mossi village situated in the Bam region of Burkina Faso, about 8km Northwest of Kongoussi (Rohatynskyj 1988).

Table 1 Seasonal calendar for tree foods and agriculture

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
• Baobab (<i>A. digitata</i>)	Fruits	Fruits	Fruits		Leaves	Leaves						Fruits
• Soumboula/neré (<i>P. biglobosa</i>)			Fruits	Fruits	Fruits	Fruits	Fruits					
• Shea/karité (<i>V. paradoxa</i>)					Fruits	Fruits	Fruits	Fruits	Fruits	Fruits		
• Intensive agriculture												
• Social/off-farm/income generation												
• Rainy season												
• Hunger season												

Sources: Agence de Promotion de Produits Forestiers Non Ligneux (undated), Ouagadougou, Burkina Faso; Tincani (2012); and own elaboration

Locally, at least, the daily use and collection of tree products is well-known. Their socio-economic, cultural, nutritional and ecological values remain for the most part unexplored. This is one of the direct causes of the lack of knowledge surrounding the chain of management and access rights to those products.

Shea is one tree whose products have been researched to a greater depth. The harvesting, processing and marketing of the West African shea industry is primarily in the hands of women, often individually but also through collective organizations. The domestic and regional markets for shea butter for human consumption and for industrial purposes are huge, and international markets are growing. There is considerable potential for shea to contribute to the economic empowerment of women through enterprise and employment creation in the region, particularly through interventions in value chain development (Kent, Bakaweri, and Poole, 2014; Sidibe *et al.*, 2014).

Methodology

Research approach

The analysis is based on three studies carried on in somewhat contrasting geographic areas of Burkina Faso using a household survey methodology. The first was in a Northern region, represented here by ten villages situated in the Passoré province, all part of the Commune of Gomponsom. The Zoundwéogo and Nahouri provinces are part of the Southern part of the country, the one touching the Ghana border; the ten villages were chosen between four Communes (Pô, Nobéré, Guiba and Gogo) to extend representativeness. Ten villages were also chosen in Eastern Burkina, towards the Niger border, all part of the Commune of Diapangou, in Gourma province.

After discussion with local experts and target households, the chosen trees were baobab (*Adansonia digitata*), shea (*Vitellaria paradoxa*) and néré or locust bean (*Parkia biglobosa*). The tree products include fruits and leaves but also seeds, nuts, and pulp.

A survey methodology was developed and implemented in the three areas of Burkina Faso between July 2013 and December 2014, with analysis, validation and feedback to participating communities and stakeholders undertaken in February 2014. The analysis is primarily descriptive, but the dataset will lend itself to further analysis.

The survey data collection tool was first discussed with the facilitators, selected by local organizations and the NGO TREEAID, who were local experts helpful because of their previous extensive knowledge of the territory.

The survey data were supplemented by comments and notes from key informants and triangulation through reporting to two community validation workshops. A first cross-check was undertaken in the field, and quality control was maintained throughout the data collection process by regular visits by the research assistant and constant phone contact with the facilitators.

Throughout data collection, validation and data entry, information was tested against previous data, experience and knowledge of TREE AID staff, constantly cross-checking for data quality. The local support in each site was ensured by three TREE AID partners; SEMUS in Yako (Passoré), NATURAMA in Nobéré (Zoundwéogo/Nahouri) and AGED in Fada N’Gourma (Gourma).

Sampling

A purposive focus on women was adopted, recognising their critical role in household management and utilization of tree resources, in addition to the need to understand the intricacies of decision making in complex (ie often polygamous) Sahelian households. The sampling process was handled by the local TREE AID partners in each selected region, with selection criteria imposed by the study itself, including:

- Variety of the chosen sites.
- Presence of the selected trees (baobab, shea, néré).
- A sample of 300 households, 100 in each site, with 10 villages per site and therefore 10 households per village.

The local partners (AGED in Gourma, SEMUS in Passoré and NATURAMA in Zoundwéogo and Nahouri) added other criteria, including:

- Not only the presence but also the use and importance of the chosen trees.
- The village capacity to collect and transform the selected tree products.
- The village women-to-men ratio.
- A representative chosen as contact person for each selected village to ensure access to the respondents and to avoid problems with local authorities.
- The households identified through previous questionnaires administered in the same sites in order to avoid delays, unavailability of the respondents, problems with local authorities etc.
- The selected women (respondents) either known to be involved in a group activity or part of an association that collects and transforms those products or has a relevant role within her household.
- The respondents identified taking into account their availability and seasonal responsibilities.

Quality control

The questionnaire was drafted by the research team and then submitted to key local informants. Prior to the data collection an explanatory meeting was held in order to present the project to facilitators

and the local partners. The TREE AID Project Officer PO, the researcher and assistant, representatives from ten of the chosen villages and the three facilitators were present as well as the representative of NATURAMA.

Following a detailed presentation of the work to be undertaken and an explanation of everyone's role in the project, the researcher, the PO and the three facilitators discussed the questionnaire in order to minimize misunderstandings and improve data quality. Questions and answers were thoroughly read, explained, translated and modified according to the aims and objectives of the study as well as the advice of the facilitators. Because of the quantitative nature of the data and the closed multiple-choice questions, the facilitators' help was essential not only in reformulating complicated or delicate questions but also in redacting correct options and plausible answers.

Following testing, a revised version of the questionnaire was retested by the facilitator in the presence of the researcher and a representative from AGED in the Gourma site. Further changes were made to the questionnaire that was then approved by the research team. The final questionnaire was prepared in French and administered in Mooré, the language of the Mossi people, and responses recorded in French. Data were processed, filtered and discussed with enumerators and TREE AID staff to minimize errors, then entered into SPSS and analysed using descriptive statistics.

Results

The survey administration and data analysis led to the assessment of:

- *Ménage* (household) structure, membership, access to goods and utilities;
- Access to different trees and forest resources, non-timber forest products, plantation and replantation techniques, conflicts and rights;
- Responsibility of each member of the *ménage* related to access to resources, collection, transformation, transportation to markets and sale;
- Importance of products within the households;
- Cultural and social factors affecting access to trees, permissions, the decision-making process regarding location and replanting;
- Role of women in handling products, from collection to sale to replantation of the trees, and their status in the household;
- Decision-making regarding sale and home consumption;
- Technologies used to process, manufacture, transport and sell;
- Access to markets: who, what, where and when?

Sample overview

Appendix 1 provides an overview of characteristics of the respondents, including a comparison of the two (northern and Southern) sites which is summarized below.

Household demography

The first important finding concerns the demographic composition of the household. There was an underlying assumption that the sampling would be composed for the main part of polygamous

households or possibly extended households with several generations living together. However, with 33% monogamous households and 67% polygamous, the situation appears to be evolving. Looking at the data regarding the number of co-wives, only 8% of the total interviewees live in a household composed of more than 3 co-wives. Regarding the members and size of the extended households, the results partly confirmed our initial assumption. While 31% of the interviewees said to be living only with their own household, 43% live with three or more family units.

This is explained by a constantly evolving redefinition of the households, as well as by a changing set of values within the communities. The literature widely documents the phenomenon of fragmentation of the households, as a cause and consequence of the increasingly individually-based society (as opposed to a social group-based one). However, the definition of the household itself can vary substantially. The quantitative nature of this study did not provide margin to discuss this aspect further, but the facilitators' notes clearly point out that the perceptions differed between the interviewees, making those results difficult to interpret.

While it can easily be stated that each household is composed of one husband (or none) and a number of co-wives, the children are complicated data to handle. In fact, named children can be part of the family as well as relatives or children entrusted to the family for them to take care of. The reasons of such fluid household and child management arrangements have their roots in the society structure itself and can vary from the children being orphans, or the parents working in town and not being able to look after them during the day. The data do say that there are statistically 1-3 boys or girls aged fifteen and over, and 1-2 younger children per wife interviewed. However, between 20-40% of the women don't have a child falling in those two categories. This is still in line with the national data situating the total fertility rate at six children born per woman (2013 est).

Education

Throughout the sites, 55% of the population was found to be illiterate, yet 27% replied to be able to read and write in a local language (Mooré or Gourmantché). Only 15% had access to primary school, and fewer than 1% held a secondary degree diploma. This is in line with the national data (2007 est.) putting national literacy rate (defined as people aged 15 and over who can read and write) at 28.7%.

Communication assets

Communications are evidently extremely important nowadays; this is proved by the fact that only 4% of the households didn't have access to a mobile phone, while more than 90% had the possibility to use between 1 and 6 phones within the same household, and the remaining 6% counted between 7 and 14 mobile phones to be available to them at home. The high percentage of mobile phones is directly linked to the collected data regarding radio and television access. Most of the local operators have news services via text message, most of the phones used have an incorporated radio and some of the younger members' phones are smartphones with internet access. 40% of the interviewees claimed to have a radio at home, 33% stated they did not have a radio or access to one, and the remaining 27% had more than one within the household. Only 15% of the interviewees had access to a television with local channels. This can be linked to the poor access to electricity, as only one household had power, fewer than 6% had a generator and most of the household power was provided by external batteries (most commonly car batteries regularly recharged locally). However, more than 26% of the interviewees stated that they had at least one solar panel providing electricity for the household. This is increasingly high, especially considering the remote areas taken into account for the survey. Small money making activities are being built around solar panels, such as local points to recharge mobile phones.

Transportation assets

The main means of transportation is still the regular adult bicycle, with only 3 households stating not to have one and almost 70% owning between 1 and 6 bikes per household. The remaining 28% own more than 6 and up to 15 bikes per household. However, 40% of the interviewees also own a motorbike; according to the facilitators and some of the interviewees, this increase in motorbike possession has become possible since the launch and spread of Chinese brands, cheaper and very common throughout the country.

Water

One substantial and important resource for the household still is water, especially in the Northern site, closer to the Sahel. While the percentage of people having access to a well within their home is still less than 5%, more than 98% have access to a well situated in the village, and 32% can also use nearby running water. During the interviews, the coming and going of bikes and donkey carts transporting water for the household was constant. Most of the wells were built by NGOs or associations; their water is usually filtered and safe to drink. This explains why everyone who has indeed access to a well in the village uses this water to drink, wash and cook within the household. It is interesting that 28% of the interviewed women stated that they used rain water, preserved in plastic containers, to wash dirty dishes as well as fresh fruit and vegetables before consuming or selling them. However, the collection of rain water lacks a specific technique and was, for the most part, left to locating containers around the huts.

Household fuel

Unfortunately, in terms of deforestation, the main source of fuel for cooking is still wood, as it was used by all of the interviewees throughout the three sites. A small percentage of households also used charcoal (fewer than 12%) and fewer than 9% resorted to gas-burning fires. This is explained by the immediate price of a gas bottle, often requiring cash up front, although amortized in the long run.

Agricultural land

94% of the interviewed women manage at least one small field, and 44% managed two plots of land. However, other than the personally managed fields, women also worked on the common family field. When more than a single field was managed, it usually meant they had access to a small plot of land close to an artificial dam, easy to irrigate and where they grow garden vegetables such as tomatoes, courgettes and cucumber but also onions and cauliflowers.

The estimates regarding the area of land owned by the whole household and managed by individuals are difficult to interpret, because the perception of the measurements was variable and probably inaccurate. However, it is clear that fewer than 2% of interviewees did not have access to cultivated land. 78% of the interviewees' households work on 1 to 5 plots. According to local key informants, this sense of fragmentation is what depicts reality most precisely. Collected data also added to the picture by discovering that women had access to land through their husbands (64% of the time) or through one or another of various authority structures such as the lineage chief, land chief, village chief or chief of household (32%). Only one woman said she had chosen the plot she cultivates by herself and the remaining interviewees reported that they had discussed and negotiated plot access with their co-wives. Land access literature supports this picture, with men owning and controlling land while women cultivate it without any permanent or secure rights. Intrahousehold negotiation of rights and responsibilities for land thus appear to be negotiated in a manner similar to that identified for food provision (Tincani, 2012).

Livestock ownership

All of the households owned at least two chickens, with the number of fowl owned per household rising to 300 and an average of 30 per household. Nine out of ten households also owned small farm animals (generally goats), up to 150 and averaging 17 per household. 30% did not own any bovines, easily explained by them being the most expensive farm animal to own. The average among the others was 4 cows per households, with a maximum of 50. An average of two donkeys per household has emerged, in line with the donkey being the main draught animal and one often used as a gift for weddings and births. Horse ownership was minimal.

Although there was an initial intention to research livestock ownership, the facilitators highlighted the sensitivity of the question and noted that livestock are owned by the household as a whole; therefore, available data concerned management rather than ownership. And while the decision-making process regarding the household members' role was for the most part a husband's prerogative, women and children were often involved in the care of livestock.

More specifically, chickens and similar fowl were cared for by almost everyone, except for the children in school or other forms of education; this is explained by the fact that it is a daily activity occurring while they are away from the household. Small ruminants are more of a women's and teenagers' responsibility, with very low participation from the husbands (less than 20%).

It is clear, however, that bovines and equines are, overall, masculine activities; the wives were usually involved in the feeding and water distribution (22% of the total) but husbands and children (both boys and girls) starting at age 6 exercised responsibility for those large animals.

According to these data and social background, men were responsible for the overall decision-making process of the household chores and responsibilities in around 96% of the selected *ménages*; however, cumulatively, 24% of the household women (interviewees and their co-wives) also participated in those decisions.

Tree resources by household

The respondents listed the most common NTFPs to which they had access (Figures X and X). When confronted with the results of the study in the validation workshops, however, they insisted on adding a few more that had not been mentioned before probably because they were out of season and more difficult to recall during an interview. A coherent ranking of relative importance of different species was not obtainable, but overall, the most frequently cited trees were:

- Shea (*Vitellaria paradoxa*)
- African Grape (*Lannea microcarpa*)
- Liane Saba (*Saba senegalensis*)
- Tamarind (*Tamarindus indica*)
- Acacia (*Acacia macrostachya*)
- Kapok (*Bombax costatum*)
- Ziziphus (*Ziziphus mauritiana*)
- Baobab (*Adansonia digitata*)
- Balanites (*Balanites aegyptiaca*)
- Néré (*Parkia biglobosa*)
- Yellow Plum (*Ximenia americana*)
- Jackalberry or African Ebony (*Diospyros mespiliformis*)

- Gardenia (*Gardenia erubescens*)
- Marula (*Sclerocarya birrea*)

A major distinction was found between the Northern and the Southern sites:

- the people living in the North, closer to the Sahelian and poorest region of the country, exploited NTFPs significantly more than the South, in quantity as well as in diversity. In fact, the Southern region not only benefits from a slightly wetter climate and a longer rain season; it is also close to the Ghana border (70-100km), with access to a bigger market.
- Moreover, it was clear during the validation workshops that in the South the so-called 'traditional' social and cultural customs were less evident, leaving women with more choices and freedom to exploit the resources.
- The interviewees from the Southern villages proved to have access to larger markets (see later) as well as indicating a more entrepreneurial spirit (higher selling proportion as opposed to home consumption).

Figures 1 and 2 compare tree product usage between the northern and southern sites. The major use of shea, baobab and néré is evident and also the greater range of trees used in the north where agriculture is more constrained by harsh climatic conditions. Comments on the use of the individual trees studied follow.

Baobab

Access and collection

The overall selling and consumption of baobab products differed between the two regions because of their social, cultural and climatic differences. In the Southern site, more than 90% of the interviewees confirmed that they had access to the three NTFPs selected (baobab, shea, néré). However, in the Passoré province, in the North, only 20% of the interviewees mentioned collecting baobab products.

This finding was thoroughly discussed during the validation workshop in Yako, and two explanations were given. First of all, there is a relative lack of baobab trees in the far North, partly because of the climate and partly because of a very low replanting/regeneration response.

Figure 1. Tree product usage - Passoré (northern site)

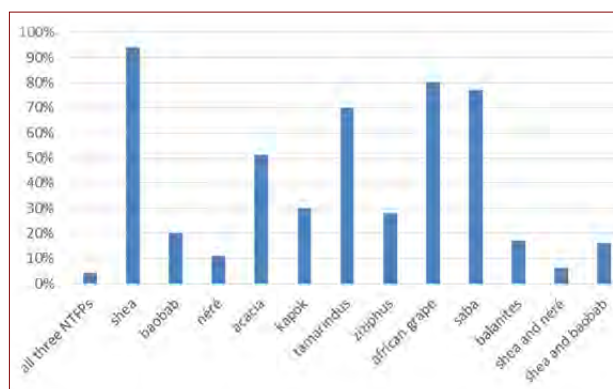
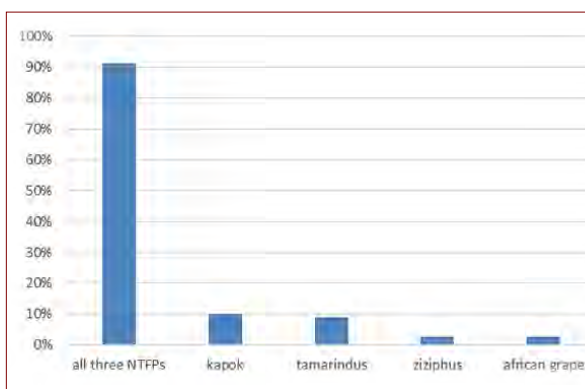


Figure 2. Tree product usage - Zoundwéogo/Nahouri (southern site)



Moreover, in this area where Mossi cultural and social values are very strong and important for the community, baobab is still a man's prerogative. The interviewees being women, they did not, for the most part, participate in collecting or selling baobab leaves or fruits. However, baobab leaves still were found to be a big part of the daily meals, and were bought at the local markets, imported from different areas or from the market gardening fields around the local artificial dam (*barrage*).

Overall, 87% of the respondents that did collect baobab products used the leaves, which is the main ingredient of the sauce for the daily cereal meal, while 35% collected the fruits to be either consumed or sold. Local key informants confirmed that the baobab fruit market is new but growing, in which foreign investors are taking an interest. Nutritionally, it has been called a 'super fruit' because of the high content of carbohydrates, dietary fibre and vitamin B. The transformation process is relatively quick and simple as it is simply a question of getting rid of the seeds and pulverizing the pulp. The powder is usually consumed diluted in water as juice or compacted and aromatized as small bars or biscuits, commonly called "*pain de singe*" (literally: monkey bread).

Figures 3 and 4 illustrate the participation by different household members in baobab collection, from which it is evident that all household members in the North including men and boys play a greater part in baobab collection than in the South, where the responsibility is primarily that of the adult women.

In the North, 98% of the women stated their need to ask for their husbands' or chief of household's permission to collect baobab fruit; it is again explained by the social customs implying that baobab and baobab-related activities are men's prerogative. In the South, 58% of women asked for permission before collecting. It should be clarified that these data apply to the products collected for the purpose of home consumption (as opposed to selling them).

Nevertheless, with men's permission, women were still mainly responsible for baobab leaves and fruit collection, with 78% of the interviewees and 48% of their co-wives collecting the products. During the workshops, it emerged that in both sites baobab (and *néré*) product collection can be a man's activity. This is because of socio-cultural habits as well as practicalities, such as the trees being high and the task being more dangerous. The main reason why it went unnoticed in the survey was that only women were interviewed; moreover, men might keep to themselves their activities in order not to be forced to share the profit with the family.

Overall, there appeared to be no noticeable collaboration between women for the transformation or selling processes of the studied NTFPs. During the workshops it was clear that this is due to difficulties in coordinating personal schedules. (For example, because collecting shea nuts and processing them into butter or soap is an activity that women carry out alongside their daily usual chores, everyone makes time for it individually and according to every household's needs and components). The

Figure 3. Collection of baobab - Passoré (northern site)

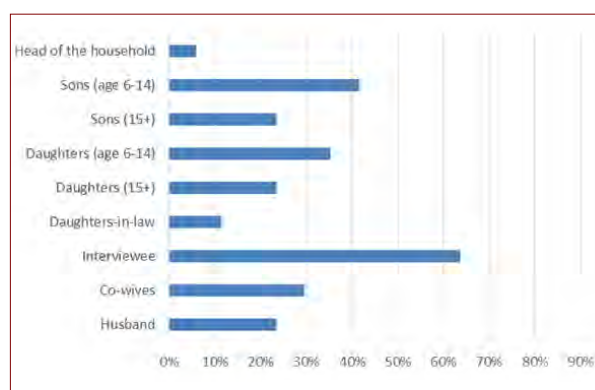
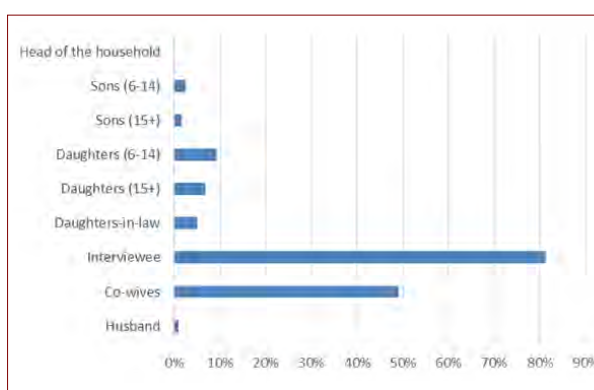


Figure 4. Collection of baobab - Zoundwéogo/Nahouri (southern site)



only collaboration mentioned was between co-wives, as being part of the same household usually presupposes similar daily routines.

While more than 80% of the women collecting baobab leaves cooked them and used them for the sauce, fewer than 35% used or processed the fruit powder. It is indeed in line with the previously mentioned reasons. In confirmation of those data, more than 80% of the interviewees' families said that they ate the leaves regularly at least once a week, while only 4% of them consumed the fruit or the pulp.

Cooking and processing the products is an activity that only women are responsible for; it was either done by the interviewees or their co-wives, daughters-in-law or young girls starting at age 5.

It is important to acknowledge that 95% of the interviewees that gathered baobab leaves also managed to conserve them for months by drying them in the sun and then keeping them in a closed plastic bag in a corner of the woman's hut. The dried leaves were said to be still tasty enough for the sauce and were used regularly especially when cereals stocks started to diminish in the domestic granaries.

Because of the relative lack of baobab trees, of the pulp being for the most part non-commercialized and of the leaves being a major ingredient in the daily meals, the proportion of respondents selling baobab products was very low, at an overall 14% corresponding to both the Northern and the Southern site.

The baobab trees can be either private property or found in the neutral areas around villages, or in the surrounding forests. From the survey it was evident that if the tree is located in someone's field, it is a private tree and so are its products. Therefore, other than people from the same household, and sometimes of the same extended household, nobody can access it. There was an interesting exception to this: if outside people were to access products of a private tree but only to feed their families (as opposed to selling them for profit), it was reported that they would not be sanctioned, but allowed to do so. This is also assuming they negotiated their access to those products with the head of the household. Nevertheless, even in cases of stolen products, the owners usually would take back the fruit or leaves with no further action. If the person were to need them to feed the family, they can keep them and will only be reproached and told not to do it again.

However, if the baobab is in a neutral area, it is for everyone to access and so are its products, usually on a first-come first-served basis. There were hints of negotiations or verbal agreements between people so that everyone can have at least some of the products.

Processing and utilization

Leaves and pulp are usually sold without having been previously washed; the leaves can be sold dried or fresh, with no transformation except being crushed into a powdered form (dried leaves only). The powder is extracted from the fruit manually. The women or men responsible for processing use traditional, local and basic kitchen utensils such as a mortar and pestle, then filtered through a sieve and presented in plates or plastic bags to be sold as units (either of leaves, leaf powder or baobab fruit powder "pain de singe"). The transformation process is for the most part carried on by women, (according to 84% of the interviewees), along with 42% of their co-wives, while 36% of the husbands are involved. The percentage of men involved is to be taken into consideration, especially when compared to shea or néré, as baobab management is an activity in which men play a significant part for practical, social and cultural reasons.

Patterns of utilization of baobab products differ little between the two regions (Figures 5 and 6):

The units of products can be either 1.2 or 5kg bags or traditional plate "yoruba". The price is per unit. Over 80% of the interviewees agreed that the selling process usually follows the collection; however, the validation workshops explained that dried baobab leaves can last up to three years and be reasonably good and nutritionally valuable for up to one year if simply kept in a bag in a dry spot. A good reserve is usually kept for home consumption, but 54% of interviewees admitted to keeping some bags to sell

Figure 5. Utilization of baobab - Passoré (northern site)

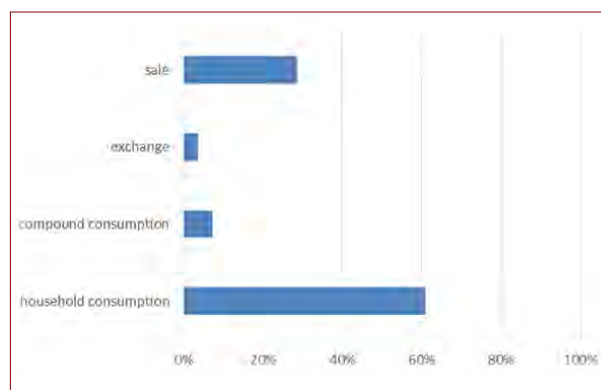
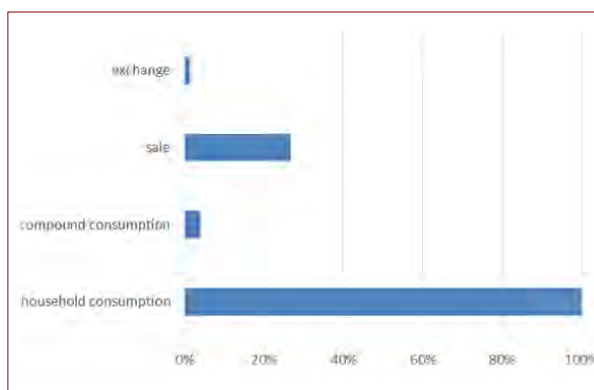


Figure 6. Utilization of baobab - Zoundwéogo/Nahouri (southern site)



after the rainy season, and 68% kept the dried product to sell when there is the need for money in the household. One selling time does not exclude the other. In fact, the interviewed women (44%) as well as their co-wives (44%), daughters-in-law (62%) and older daughters (age fifteen or more, 25%), with help from husbands (25% of the time), decided together how much to keep and when to sell it. It was agreed during the two workshops that unless there were an urgent need for money, it is better to wait for the prices to be higher. This led to the discovery that, indeed, there is a good knowledge of the market prices. Moreover, baobab products are usually exchanged, although in small quantities, against garden vegetables grown near local dams.

Market access was thoroughly discussed during workshops. It needs to be said that since women are the main sellers, they usually managed to sell from their own house or field. This is due to transportation issues but mainly to social and cultural constraints. However, a substantial difference appeared between the Northern region, where those constraints are still strong and the Southern region, where an entrepreneurial spirit has been growing with help of NGO projects and the proximity to the Ghana border. What was declared in the questionnaire as a sale to a “seasonal market” was in fact a door-to-door or field-to-field sale. However, in Nahouri and Zoundwéogo provinces, women did travel between the major cities (Po, Nobéré, and Manga) and cross the border to buy and sell products.

Sales

A delicate matter was asking about who actually got the money. In order not to upset the interviewees, the facilitators were asked not to insist and to generally ask about income and its reutilization. However, the tables on reutilization of income were confused and confusing to analyse. Overall, and with no substantial difference between the sites, the bulk of the evidence suggested that the money is kept by the head of the household, but used towards common needs; only 17% of the women kept the money for themselves. It was made clear that nobody forced the women to give the cash to their husband. Nevertheless, the head of the household was the usual keeper of the returns.

The money was reinvested in different things: to buy more product to process and resell (especially shea nuts, but also baobab fruits and néré powder); to start improvement work in the compound (mainly granary renovations, but also house improvements); to buy clothes; to buy phone credit; to repair or buy means of transportation (usually bikes, sometimes motorbikes); to buy medicine; to pay for school-related expenses.

It was not possible for the facilitator to determine whether the money only came from NTFPs products, as the interviewees were women and were stating what they hoped or thought their husbands would do, with the exception of some money coming from shea butter and soap sales, which was reinvested in new shea nuts directly by the women.

Moreover, and while we tried to ask to make lists in order of how much money was spent and how important it was for the household, the concepts were too vague for the facilitators to explain and too abstract for the interviewees to fully understand. The results of this part of the survey were inconclusive.

Replanting and regeneration

Only 9% of the women interviewed stated that they or someone in their compound replanted a baobab tree in the past years. The data were similar in both sites; however, the reasons differed. In the North, once again, it was for the most part a matter of custom. It was said that baobab trees are old and sometimes sacred trees that communicate with the land genii. They needed to be planted by men only and following a specific rite. Moreover, they tended to be private property and not planted in the forest; they are difficult to grow from the seeds, and needed constant protection from people as well as from animals. While the process is following a slow but steady evolution with the help of NGOs and projects, it is still impossible for a woman to replant a baobab tree. While she might be allowed to support assisted natural regeneration (ANR, or RNA, *régénération naturelle assistée*) until the tree is strong enough, her husband or the owner of the field would then take over responsibility.

This explains why eight out of ten women had to ask for permission to replant; it emerged from the workshops that it is a form of agreement between who wants to plant the tree and who is responsible for the land.

Shea

Shea is one of the major income-generation products along with peanuts, sesame and local beans. This is a common feature of the three sites where the questionnaire was administered, regardless of the different ethnic groups, market access, market size or traditions. Collection is women's responsibility almost entirely (Figure 7), as is processing (Figures 8 and 9):

Access and collection

The data speak for themselves: only three interviewed women out of 200 said that they did not collect shea products to either sell or consume at home. Moreover, while virtually everybody collected the products for home consumption (99%), some (14%) share it with their extended family, and a few (8%) use shea to exchange against other products (mainly baobab leaves). It is a crucial livelihood activity for 83% also to sell shea, either as raw nuts, or as butter or soap.

Figure 7. Responsibility for shea collection - northern and southern sites

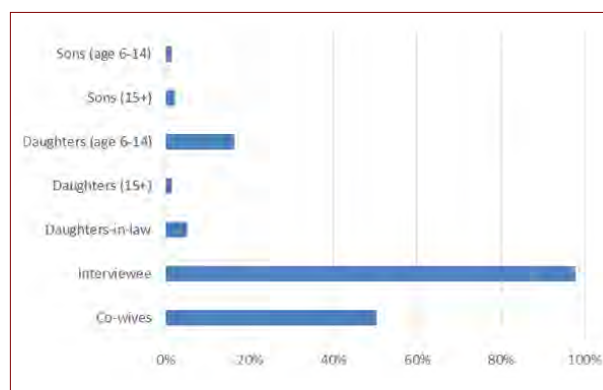


Figure 8. Responsibility for shea processing - Passoré (northern site)

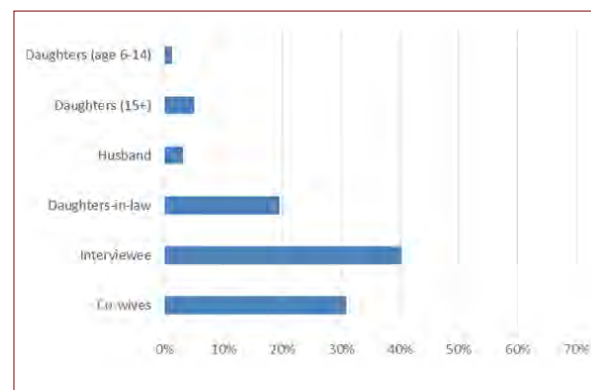
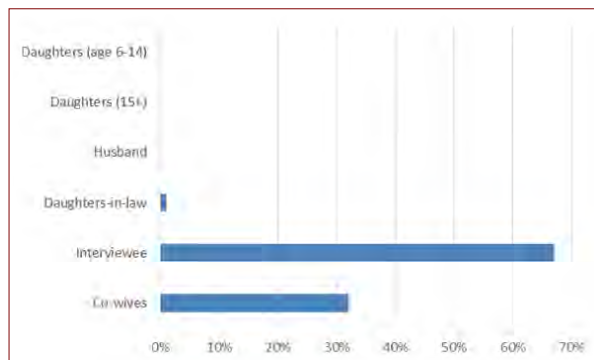


Figure 9. Responsibility for shea processing - Zoundwéogo/Nahouri (southern site)



as the shea fruit is known to contain a healthy dosage of nutrients: nutritional values can vary from tree to tree and in relation to the rainfall, but they have 35-42% Carbohydrate, 1.5-3.8% Protein, 1.1-1.4% fat, 37-44% fibre and range from 173 to 198 cal every 100 gr. The topic was therefore discussed during the workshops. In fact, the questions asked in the survey misled the interviewees. Shea fruits are indeed consumed like mangoes during the season (which lasts approximately a month). It is a crucial month, as it is the very early part of the rainy season, a time where labour in the field has a major energy requirement due to day-long activity. It also coincides with a time where the resources from the previous year's cereals are low or finished and thus the fruits sustain men, women and children considerably during the day. As will be discussed later on, while shea is a tree that usually is private property, fruits are for everyone to collect and consume as long as they leave the nut on the ground.

It was made very clear during the workshops that shea is a women's activity. It is therefore not surprising that men took no part in the collection of the fruits or nuts. However, in the Southern region, it was reported that they still had a role in shea management processes as 88% of the interviewees had to ask permission from their husbands. It might seem confusing that in the North, where tradition is more important and social pressure higher, permission should only be asked of women (either the interviewee or her co-wives, usually the first wife). However, this is due to the concept of private property. In the South, this concept is much more defined than in the North where collective values are still much more important and the domestic group comes first as a whole and the individuals come second.

Therefore, children starting at age 3 or 4 were sent to collect the fruits or the nuts. However, transforming the nuts into butter is a long and complicated process that only women carried out. More than 90% of the interviewees undertook the transformation themselves, most with help from co-wives (50-70%), daughters-in-law (43%) or daughters aged 6 to 15 and over (12%).

Processing

Unless a collective association of shea sellers is in place or a specific project regarding NTFPs and income generating activities using improved technology has been implemented, the shea processing is fully manual. The tools are traditional and basic kitchen utensils. First, the pulp is either eaten or separated by letting the fruits rot in a hole in the ground (usually at the side of each person's field). Mortars or rocks are used to crack the nuts, separate the outer shell and retrieve the kernels; sometimes, in order to ease this process, the nuts are boiled then dried on a clean surface, making it easier for the shells to crack. The kernels can therefore be dried some more and preserved in jute or plastic bags to be either transformed later or sold as raw kernels. To obtain butter, they are crushed before they are put in a big pan or cauldron to be roasted in order to release their grease and oils. Once roasted, they need to be ground. This happens at the mill if possible but more often with a manual grinder, mixed by hand with water added slowly to obtain a smoother paste.

The paste is heated again, for the excess water to evaporate, clarify and leave the butter oils floating to the top. Butter can be preserved either liquid in covered plates or in plastic bags or boxes. However, some women keep it in small quantities submerged in water so that the oils stay together in balls floating in the water.

Sales

Those same women responsible for the processing undertook the selection of the finished product and the decision-making process of how much is sold and how much is kept for the house. There was confusion and/or disagreement regarding the criteria for such choice and the questionnaire results were inconclusive. After further discussion on the matter, however, it was clear that if the women are included in a group or organization for selling the shea products, they will sell the better quality and keep the rest for home consumption. At a smaller household level, the decision varied in relation to the period of the year, the buyer's choices and recommendations, the market prices and level of cereals in the granaries. While the survey tried to focus on knowledge of nutritional values, direct questions during workshops proved that the money from the sale was more important than home consumption as it could contribute to the overall household wellbeing.

The interviewees reported that with their co-wives, and sometimes with oldest daughters and daughters-in-law, they decided when to sell the finished product, which could be butter or soap. Butter and raw kernels were usually sold in '*yoruba*' (traditional plates used as units), while soap was sold by solid unit. It appears that in the North, products were sold equally either after the harvest, during the rainy season, or during the dry season when the prices are higher or when there was a need for cash. The relative abundance of shea trees makes for the product to be available in a quantity that can be kept and sold (especially the kernels) throughout the year. In the South, however, shea usually was sold gradually as soon as it is transformed. This is due to the Nahouri and Zoundwéogo region being relatively richer provinces where the need for a constant income is less important than it is in the Sahelian region. Moreover, access to markets was reported to be easier as bigger markets are closer, making the intermittent sale affordable. During the workshops, the possibility of going to Ghana to sell kernels was mentioned by women coming from the Po area. This shows how open the market is and how many possibilities women have to sell. This was reinforced by the data on market access. Indeed, in the North, most of the products were sold from the village to external buyers who come directly to the households (86%). In the South, in contrast, the majority of the shea butter is sold at a village market, whether in the local village (40%) or in a neighbouring village with a bigger market (72%).

The richer market also explains the report that in Po, only 14% of the interviewees kept shea aside to exchange it with other products, while in the Yako area, over 60% of the women exchanged it against other products, rice and cereals, gumbo, peanuts, leaves, sweet potatoes but also soap and shoes.

Moreover, 98% of women from the Southern site stated that they knew market prices, their oscillations and changes throughout the seasons very well; in the Northern area, 66% stated the same, while the rest agreed to have broad knowledge of the market prices.

The units in which products were sold were generally small: *yoruba*, plates or small plastic bags, units (soap), and therefore the products were either carried (40-45%) or brought to the market place by bike (55-60%). There was no need for larger transportation.

Another example of how socio-cultural pressure impacts on the sale of NTFPs can be found in the percentages of people transporting the products to the markets.

In Passoré, it was evident that whenever it was necessary to go further from the household, men were more involved in product transport than in the South (27% of the interviewees' husbands); this was partly due to limited access to bicycles and partly because women were more likely to remain close to the house to manage household tasks and children.

On the contrary, women in the South go the market themselves (91% of the interviewees and 45% of their co-wives) and handle transportation as part of the sales process.

The money from shea sales was returned to the women in the Southern area. All of the interviewees said that they either kept all the money or shared it with their co-wives or daughters-in-law involved in the process. In the North, income distribution appeared to be more fragmented as more members of the household were involved; all of the women kept at least part of the income, but they shared it with their co-wives (64%), daughters-in-law (40%), daughters (4%), husbands (3%) even if only in small amounts.

Shea income, just like baobab income, was reinvested in a range of assets, similar to the ones from baobab. In fact, it needs to be said that there was confusion amongst the interviewees as most of them didn't know exactly which income was used to buy what. Overall, the results resemble the previous ones: to buy more product to process and, undertake improvements in the compound, buy clothes, medicine, etc.

However, as previously mentioned, most of the women did agree during the workshop that since they were the keepers of the shea income, they mostly reinvested in more semi-processed kernels or utensils.

Replanting and regeneration

While 52% of the women from the Yako area stated that they or someone in their compound had planted a shea tree in past two years, only 20% did the same in Po. When asked about the relatively low replantation rate, women from Po and Nobéré replied that, for one, there is an abundance of shea trees in the region making replantation unnecessary. Secondly, and consequently, there is a lack of shea nurseries in the area; planting from seeds is extremely difficult and women agreed that they do not master the techniques enough to be successful. It needs to be said that, in the North, data are biased by the fact that part of the selected households are or have been part of the Village Tree Enterprises project, therefore were more prepared on replantation techniques. Moreover, the Northern climate causes drier and poorer soils; while shea trees adapt pretty well, they are less abundant, making replantation more important in order to maintain access to shea products and to slow down soil erosion.

Interestingly enough, in the South all the women who replanted had asked for permission. It was either asked of their husbands (12%) or their co-wives (50%). Permissions probably relate more to land ownership: during the workshops, it was said that property rights were linked to where the trees are planted, as anyone who wants to plant a tree needs to inform the land owner. In fact, all the replanted trees were set in someone's personal field. It is likely that the permission was asked to the main cultivator of each field before planting a tree.

In the North, 71% planted shea in the household field, therefore reducing the need for permission as 25% of people replanting trees asked for it to either head of household or the interviewees. It is clear, in that area, that whoever planted a shea tree retained specific rights to its products: 81% of the interviewees replied positively to that question, adding that not only they have total access to the NTFPs, they also have rights over dead wood.

In the South, nobody was said to have specific rights to the planted trees. However, the data were biased by the small quantity of replanted trees and the abundance of shea in the South which allows people to be able to freely collect fruits. The question was asked again at the workshops; women insisted that this was not a question of definition of private property but a matter of not creating a problem between neighbours. While everyone had access to all the trees, because they can be found everywhere, people would collect where they know it would not bother anyone.

Néré

The management of néré, the locust bean tree, needs a specific introduction. In Mossi culture, land belongs to everyone and to no one at the same time; in fact, the concept of land ownership is foreign

to this culture. One can cultivate family land without owning it. At the same time, the *néré* tree is a symbol of land ownership and is strongly linked to gender. This means that until recently planting a *néré* tree meant wanting to own the land, and such an action would be followed by misfortune and death. However, the economic, geographical and climatic constraints, the new national laws adopted over the years and the impact of foreign projects has led to a progressive modification of the local customs. Nevertheless, account needs to be taken of the fact that *néré* often plays a central role in customary laws.

Therefore, data have been analysed and discussed during the workshops with this specificity in mind. Responsibility for *néré* trees rests with men; collection is primarily a responsibility of women, but in the North men continue to participate (Figures 10 and 11):

Access and collection

Because of the heavy socio-cultural pressures, use of *néré* trees is rare in the Northern Sahelian area, the location of one of the study sites. The available data mainly come from the Po and Nobéré area, along with important information collected during the workshops. In fact, in the North, only 9 out of 100 interviewees were said to collect *néré* products from the trees, and none of them would sell it due to the small quantity harvested. However, this does not mean that the seeds and pulp are not consumed; when available they are bought at the local market, and are also available in major markets like Ouagadougou.

Néré is highly prized. Women, even in the North, are extremely conscious of the importance of the *néré* fruit from a nutrition perspective. The flour produced by its pulp is rich in carbohydrates (67.3%), carotenoids (vitamin A, 49%), fibre (11%), and protein (7%). Its seeds have a high protein content (18%) that increases when fermented (up to 27%), fat (13%) and carbohydrates (52%). In Burkina, while its flour is also used, the main used products are the seeds, in their fermented form called *soumbala* (literally, fermented *néré* seed), after a long and tiresome transformation process. It is often used as a base (similar to stock cubes) for the sauce for cereals all year round. During the long dry season, nevertheless, should the leaves for the sauce finish or become rare to find, *soumbala* will provide a rich (in the senses of both taste and nutrition) substitute in which to dip the cereal component of the diet.

However, due to its scarcity, it is expensive when found at the local markets. Mainly for economic reasons, the *soumbala* consumption is low in Northern Burkina Faso. During the workshops, it appeared that it is often replaced by commercial stock cubes, usually less nutritious but cheaper and ubiquitous.

On the contrary, for social, climatic and geographical reasons, in the Southern area, 93% of the interviewees collect *néré* products, and 40% of them also sell it at local markets.

Figure 10. Responsibility for *néré* collection – Passoré (northern site)

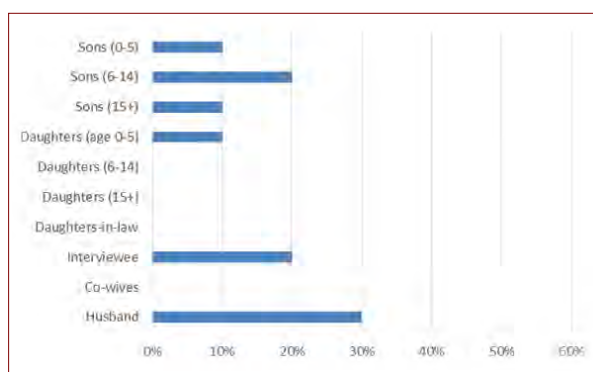
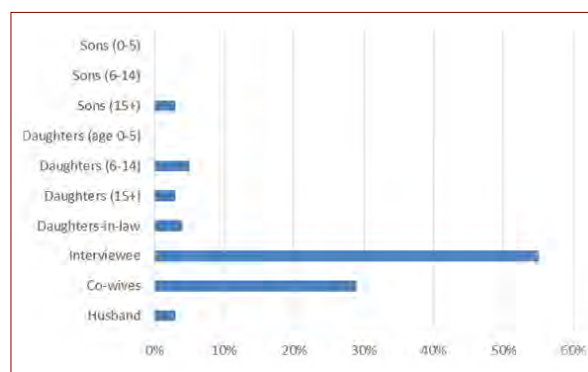


Figure 11. Responsibility for *néré* collection – Zoundwéogo/Nahouri (southern site)



The specific status of the locust bean tree and the advancing privatization of natural resources explain that 70% of the interviewees intending to collect *nééré* products had to ask permission first of their husband, head of the household, lineage or village chiefs.

Similar to baobab and shea, there is no collaboration in the collection of *nééré*, because of everyone's individual schedule.

Processing

Soumbala is the main product from fermented *nééré* seeds; sometimes, the powder (pulp) is used to bake cakes (*tourteaux*): only 7% of the interviewees stated that they used the pulp, a very low percentage considering how rich it is in nutrients.

Turning the seeds into *soumbala* and cooking it or integrating it into a sauce was undertaken exclusively by women (co-wives, daughters-in-law), and they are the ones to decide how much would be kept or sold. Moreover, they handled the transformation and selection process. Men were not completely excluded, but the percentage of husbands helping out was lower than 5%, due to social and cultural reasons but also to the division and management of household chores.

In fact, transformation is made with traditional and basic kitchen utensils and usually takes up to a week. The seeds are first boiled for 24 to 48 hours, to lose their sour taste and facilitate the skinning. They are then washed, skinned and the kernel is cooked for another 1-2 hours to clean them. The skinning process is long and requires much handling, and therefore contamination.

The kernels are then left to ferment in a jar, covered by leaves, at ambient temperature (30-40°C) for 3-5 days.

After fermentation, they are dried under the sun and turned into small balls, mixed with other spices and sometimes dried fish. They can last up to 6 months in that form.

Sales

All of the women from the Po and Nobéré area stated that *nééré* was always kept and sold when needed, either when the prices were higher or when the household could use the money. Women were also responsible for that decision, and they affirmed that they knew market prices extremely well.

The women were accustomed to go to the market by themselves (including co-wives, daughters-in-law), walking or by bicycle; *nééré* is sold at the village market (57%), at another village market (48%), even to villages located further away or larger towns (12%).

Since they handled everything from collection to sale, women were also able to fully keep the income, sharing it with the co-wives when they were part of the process.

Replanting and regeneration

Only 5 out of 200 interviewees - or someone in their household – had replanted a *nééré* tree in the North, where social and cultural pressures are still strong; 30% had replanted trees in the South. When asked about the replantation rate during the workshops, women agreed that they had not mastered the technique and usually failed when trying to replant locust bean trees from the seeds; moreover, a lack of nursery trees was reported. It was also mentioned that the various organizations working in the area mainly concentrated on replanting shea, baobab and other trees rather than *nééré*. The easier availability of seeds of other plants evidently influenced replantation choices.

While co-wives and daughters-in-law were still responsible for the replantation, 24% of the husbands were involved, and they were the ones who gave permission to plant (95%), decide (90% of the time) where the tree must be replanted. the principal household field was the site for 75% of the interviewees.

Everyone who replanted a tree was positive about having specific rights to its products, fruits, leaves, bark and wood.

Key results and implications

The Sahel is hunger-prone and is environmentally, nutritionally and socio-politically fragile. Resilient food systems need to be preserved and strengthened as the effects of climate change are likely to impact severely. Evidence from the literature on the role of tree foods and from current literature on food security in the Sahel suggest that tree foods such as those investigated in this research have potential to contribute towards environmental and food security and rural livelihoods, and thus also contribute towards social and political security.

Sahelian peoples demonstrate the resilience and skills with which rural households manage the complex human, economic and environmental interactions and – except under extreme circumstances – maintain sustainable livelihoods. This research in Burkina Faso on baobab, shea and locust bean reinforces these views and adds new knowledge about the changing ways in which rural people utilise tree resources and incorporate them in their diversified livelihood strategies. It identifies continuing knowledge gaps and suggests ways in which policies towards the tree sector can be enhanced.

The benefits of recent economic growth in Burkina Faso appear to be inequitable: human development indices remain poor, particularly in terms of nutrition among vulnerable populations sectors, and adult literacy is low. Among the populations interviewed, human capacity in terms of formal skills is weak, but there is a propensity and sufficient resources to adopt new technology for transport, communications and power generation. In the South there is evidence of an entrepreneurial attitude. But development of skills and innovation within the specifically rural context of agriculture and natural resources management lags development driven by urban centres and ‘modernization’. Investment targeting rural assets and smallholder strategies is necessary.

Differences were noted between the different regions of Burkina. While most conclusions are based on the similarities and contrasts in Passoré (‘the North’) and Zoundwéogo/Nahouri (‘the South’), data primarily from the validation workshop for people from Gourma (‘the East’) were used to complement those from the North and South. Tree food consumption is much more vital to diets in the North than it is in the South, highlighting the importance of NTFPs as a coping mechanism during the *soudure* period when granaries are empty and the new harvest has not yet taken place.

Assisted natural regeneration (ANR) is a viable way of bypassing the social constraints attached to tree planting and land ownership. While ANR still has to be negotiated with the primary landowner (husband, chief of household, lineage, land, village), women are for the most part allowed to protect naturally grown trees. The landowners do not see ANR as a threat because the land genii ‘allowed the tree to be born in their land’, and nobody planted it to claim the land for him or herself. It has potential to serve as a major strategy against deforestation, and increasing the contribution of trees to livelihoods.

Sample features

Within the sample there was greater literacy in the North but also more polygamy, land fragmentation, dependence on trees – with the exception of baobab which is relatively scarce. Other demographic differences and variations in assets between sites were small, but there are signs of a more advanced shift from ‘traditional’ to ‘modern’ culture in the South in respect of usufruct entitlements to natural resources. There were high levels of access to small assets such as bicycles, motorbikes, radio and mobile phones. There was a low level of access to electric power, paralleled by increasing penetration of solar power sources, and high dependence of village wells for all water supplies.

It is worth reiterating that survey data collection took place over a two month period (Oct-Nov 2013) and the validation workshops within one week in Feb 2014, outside the main harvesting seasons. The reliance on recall by interviewees for data about highly seasonal and sometimes idiosyncratic phenomena means that some relevant information is likely to have been missed or lost. Overall,

Table 1. Summary of insights into tree food utilization, by species and product

	Baobab		Shea	Néré
	Leaves	Fruit	Fruit and nuts	Fruit
Tree	<ul style="list-style-type: none"> Often private entitlements mediated by men, linked to land tenure trees are scarce in the North, ubiquitous in the South is considered a 'man's tree', with strong social rights and obligations, especially in the North 		<ul style="list-style-type: none"> trees are generally private property (related to male land tenure), especially in the North less sense of ownership in the South due to abundance of trees 	<ul style="list-style-type: none"> very important cultural specificities link néré to male land ownership highly prized for nutritional qualities limited in the North, extensive in the South
Product				
Collection	<ul style="list-style-type: none"> by men and women more involvement of men in the north due to social customs 	<ul style="list-style-type: none"> men and women 	<ul style="list-style-type: none"> women and children, universal and exclusive, a 'woman's tree' 	<ul style="list-style-type: none"> women with permission first of their husband, head of the household, lineage or village chiefs Pods freely collected, especially by children significant part of diets during the 'soudure'
Processing	<ul style="list-style-type: none"> by women and girls 	<ul style="list-style-type: none"> mainly by women and girls sometimes by men in the North, if they need cash, because it is a 'man's tree' 	<ul style="list-style-type: none"> women and children men increasingly involved in commercialization because of income-earning potential control of nuts is more defined than of fruit 	<ul style="list-style-type: none"> almost exclusively undertaken by women (co-wives and daughters)

Table 1. Summary of insights into tree food utilization, by species and product

	Baobab		Shea	Néré
Utilization	<ul style="list-style-type: none"> leaves used for immediate food consumption as a constituent of sauces within the ménage sale for immediate cash needs when necessary consumption or sale purchased from market for consumption when desired constitutes a significant part of daily meals 	<ul style="list-style-type: none"> uncommon: prepared as juice or pain de singe commercialized as a powder for beverage limited commercialization so far – patterns differ between North (local markets) to South (larger regional markets) due to socio-cultural constraints affecting marketing activities: travel and logistics shared with needy neighbours exchanged for other food products 	<ul style="list-style-type: none"> home consumption – fruits widely consumed at a crucial time for hunger, the ‘soudure’ often shared within the concession exchanged for other food products, eg baobab leaves, particularly in the North better quality product sold as nuts, butter, soap for cash throughout the year, depending on cash needs and market prices sales to itinerant traders in North, or in markets by men for logistics/cultural reasons diverse marketing systems in the South, mainly by women 	<ul style="list-style-type: none"> seeds and pulp consumed (and purchased) as soubala, the basis for the sauces of many cooked meals limited in the North bought at the market from other regions when possible. However, price makes it less attractive than less nutritive regular stock cubes (Maggi, Jumbo) significant consumption and sales in the South can be stored decisions about consumption and sales made by women
Returns	<ul style="list-style-type: none"> income usually managed by male head for household purposes women sometimes retain income used for a wide range of household expenses and investments 		<ul style="list-style-type: none"> substantial awareness of market prices by sellers income usually retained by women for household purposes often reinvested by women in nuts/kernels to increase production but avoiding the first arduous stage of transformation used for a wide range of household expenses and investments 	<ul style="list-style-type: none"> marketing only in the South through diverse markets income retained by women for household purposes used for a wide range of household expenses and investments substantial awareness of market prices among sellers
Replanting & regeneration	<ul style="list-style-type: none"> difficult and minimal for baobab in the North evident in the South, where agro-ecology is more favourable for cultural reasons, utilization is a male responsibility, also linked to land tenure 		<ul style="list-style-type: none"> more evident in the north, where the trees are less prevalent planting permission is negotiated and linked to land tenure harvesting rights parallel planting rights minimal replanting and ownership in the South due to abundance of trees 	<ul style="list-style-type: none"> negligible replanting in the North some limited replanting in the South

comments from key informants and the results of the validation workshops suggest that there can be substantial confidence in the representativeness and validity of the data.

Access to, and productivity of, assets, subsistence and production for sale

Shea (*Vitellaria paradoxa*), baobab (*Adansonia digitata*) and néré (*Parkia biglobosa*) are among the most significant trees for food consumption and commercialization. Use of tree foods during the *soudure* is a very important resilience and food security strategy, especially in the North. However, rural people utilise many other species. The contribution to diet is defined by both nutrient value and as flavourings to sauces which are the basis of Burkinabé cuisine. (Species-specific summaries have been included above).

Ownership entitlements to trees are linked to land in complex ways, but with significant male dominance, except for shea. Traditional customs and ownership norms are influential in the North, but are changing in the South, where opportunities are greater due to proximity to and engagement with a changing external environment, and a greater abundance of natural resources.

Regarding the modality of decision making within households, it is self-evident that human relationships are complex. This applies at multiple scales: within a typical compound (*concession* - usually male-headed 'extended household'); and within and between the constituent households (*ménages* - female-headed sub-households of wives/co-wives and children); and within and between larger communities.

Household management responsibilities are commonly negotiated and shared. Notwithstanding the strong tradition of male authority, the evidence suggests that decision making is consensual: there is an ethos of *negotiation and consensus* about entitlements to and use of natural assets rather than *bargaining and contestation*. It is highly improbable that there should never be conflict, but neither the survey nor validation workshops furnished evidence about conflict between men and women, husbands and wives, between co-wives or at the level of village authorities.

Modelling decision making about consumption and sale of highly seasonal products such as baobab, shea and néré requires more data than could be collected during the study, and of a kind that would be difficult to collect. Decisions to consume or sell are a function of: a) the balance of cash needs for immediate consumption needs; b) the availability of reserves (which often are hidden), stored by both men and women, and requirements to store for the future *soudure*; thus c) the availability of other food sources; and d) relative product prices. Seasonality profoundly affects each element.

Nevertheless, underlying decision making is the dominance of the male head of household in terms of ultimate livelihood strategies and asset ownership: notably land apportionment to wives, tree ownership and management. Knowledge of decision making patterns and responsibilities about other economic activities like local (on- and off-farm) employment, and migration is very limited. There was evidence of a growth of individualism in the South where natural resources are more abundant, access is less circumscribed by gender-based cultural norms and where the changing environment manifestly is opening up more commercial opportunities, particularly for women.

In contrast, and exceptionally, decision making on the management of and returns to shea enterprises was the women's prerogative. Shea is a particularly timely and nutritious foodstuff. While most households can count on a number of women and children, and even male participation in some activities, labour per se is not necessarily a constraint, but the arduous nature of the processing is a burden for women.

The connectivity of smallholders to markets

Market demand exists in all the surveyed areas, but access is limited by distance. Tree product utilization and marketing are predominantly assigned to women and girls, almost invariably by permission of the

male head of household. An exception is the exclusive male dominion over baobab harvesting and *néré* management, which illustrates the persistence of both practical and cultural factors alongside social and economic determination of entitlement parameters for land and trees more generally. Women are not expected to travel far from homes, and are constrained by household responsibilities. Thus the 'thinner' and more distant markets in the North tend to be served much more by the men and by local traders. In comparison, the South women face fewer constraints about means of travel and transport and personal engagement in markets. Marketed volumes depend on available household 'excess' supplies and a means of transport, and in the South are influenced also by proximity to Ghana and a notably more commercial, entrepreneurial ethos.

In the absence of formal associations, there is very little evidence of collective action in harvesting, processing and marketing of tree products. What collaboration does occur is between co-wives within a *concession*, the underlying basis being shared household management schedules. Time is 'shared' while the economic enterprise itself is still individualised. Decisions about sales (cf consumption), at least of baobab products, are frequently made through discussions held among the men involved and the women - (co-)wives and older daughters. The intention is to maximising prices subject to cash needs. Returns belong individually to the participants, but use of the returns is often negotiated within the household. Prior claims are for general household expenses.

Sellers said that they were familiarised with market prices through visits to market and sharing of information within households and within the community.

The functionality of markets

Product volumes and prices in local, regional and national markets are affected by seasonality, but adequate consumption market data could not be collected within the scope of this research. No statistical analysis of market integration was possible, but similar products can be observed in both regional markets and major markets. It is evident that markets and traders in the North, at 2-3 hours from Ouagadougou, were linked with the capital. In the South, there was reported to be a free flow of products north to Ouagadougou and south into Ghana. A wide range of tree products is available in Ouagadougou in season. The products are significant but are mainly regarded as condiments, and therefore not major food items. Shea is exceptional, having significant opportunities for oil and butter products in the Sahel region and for industrial purposes more widely.

Conclusions, implications and development opportunities

Considering the limitations of sampling, caution must be exercised in generalizing about the implications of the findings for the region. Diversity among households and between regions and species should be noted, and further work undertaken to understand more comprehensively the bases of differences, and how these differences are evolving in the wider socio-economy. Activities and opportunities in the North are generally constrained compared with the south due to two principal factors, being the harsher climatic conditions and greater physical and cultural remoteness from surrounding social and economic influences.

Utilization

Ownership of trees is linked to land and therefore is circumscribed, but is not a major obstacle to harvesting and utilization of tree products. Men have a dominant influence over management and utilization, especially in the North – but generally this is not a constraint to utilization by women.

Decision making about consumption, sale and exchange by compounds and households, and about income distribution, is usually consensual even if power in decision making is not equal between genders. No evidence was found of conflict in decision making about ownership, harvesting, processing,

marketing and use of returns. Culture influences the activities women can undertake, for example marketing in the North, but women's participation is major at most stages.

Species differences and regionality

There are significant regional differences, with fewer social constraints in the south, aided by greater product abundance, and easier access to more diverse (local, regional and international) markets. Each of the three tree species studied has significant nutritional and commercial potential, somewhat underexploited, and highly seasonal. Patterns of utilization vary between species. Considering the significance of the tree, there is a need to explore potential for multiplication and dissemination of néré.

Developmental implications

There is a greater need for development initiatives in the North, but the potential is limited by ecological and cultural constraints. There is a need for development and dissemination of planting and regeneration technologies, especially in the North, and for the promotion of assisted natural regeneration.

The shea sector stands out as a significant source of economic activity, with considerable potential for greater employment creation and income-earning opportunities, especially for women. But it involves arduous work: there is a potential for developing labour-saving household processing and conservation technologies for shea fruit to reduce the physical labour input. While this research did not focus on collaborative enterprise, evidence from informal sources and from the literature about cooperative organizations points to further potential for collective enterprise arrangements and larger scale processing technologies. Economies of scale are likely to exist in processing investments as well as marketing.

Greater public investment in tree research and in rural services and infrastructure such as energy and communications will facilitate the development of the tree foods sector and enhance its contribution to rural livelihoods.

Further research

A market price and volume monitoring exercise for tree and other food products throughout the year would help to provide data to enable more substantial analysis of market demand, particularly in respect of product seasonality and quality requirements. While it would be complex and sensitive, further work can be undertaken to understand the compound and household economics of household decision making and utilization. It is necessary also to elucidate the differences between tree species in respect of the natural sciences of growth, production and conservation – and the limitations to exploitation – and the socio-economic implications of access and utilization.

Bibliography

Amrouk, El M., Mudungwe, N., Muzvondiwa, E. and Poole, N.D. 2013. The Impact of Commodity Development Projects on Smallholders' Market Access in Developing Countries: Case Studies of FAO/CFC Projects. FAO press. <http://www.fao.org/docrep/017/aq290e/aq290e.pdf>.

Arias, P., Hallam, D., Krivonos, E. and Morrison, J. 2013. *Smallholder Integration in Changing Food Markets*. FAO press. <http://www.fao.org/docrep/018/i3292e/i3292e.pdf>.

Barrett, C.B. 2008. Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa. *Food Policy* 33 (4): 299–317.

Becker, G.S. 1976. Altruism, Egoism, and Genetic Fitness: Economics and Sociobiology. *Journal of Economic Literature* 14 (3): 817–26.

Beckett, F. 2013. Researching Within-Household Distribution: Overview, Developments, Debates and Methodological Challenges. *Journal of Marriage and Family* 75 (3): 582–97.

Belemvire, Adama; Hamada Sawadogo, and Moumini Savadogo. 2008. *Evaluation Des Impacts Biophysiques et Socioeconomiques Des Investissements Dans Les Actions de Gestion Des Ressources Naturelles Au Nord Du Plateau Central Du Burkina Faso*. Rapport de synthèse. CILSS.

Bouis, H. and Pena, C.L. 1997. Inequality in the Intrafamily Distribution of Food: The Dilemma of Defining Individual's 'Fair Share'. In *Intrahousehold Resource Allocation in Developing Countries: Models, Methods, and Policy*, 179–93. Baltimore and London: Johns Hopkins University Press.

Dueppen, S.A. 2008. *Reinventing Equality: The Archeology of Kirikongo, Burkina Faso*. Michigan: University of Michigan.

Delpuech, C. and Vandeplas, A. 2013. Revisiting the 'Cotton Problem' - a Comparative Analysis of Cotton Reforms in Sub-Saharan Africa. *World Development* 42: 209–21.

Duperrey, A.M. 1984. Les Gourounsi de La Haute-Volta. Conquête et Colonisation 1896-1933. *Studien Zur Kulturkunde Wiesbaden* 72: 1–280.

Engberg-Pedersen, L. 1995. Creating Local Democratic Politics from Above: The Gestion Des Terroirs Approach in Burkina Faso. *Drylands Programme Journal, IIED* 54.

Englebert, P. 1996. *Burkina Faso: Unsteady Statehood in West Africa*. [Nachdruck]. Westview Press.

Gittelsohn, J., and S. Mookherji. 1997. The Application of Anthropological Methods to the Study of Intrahousehold Resource Allocation. In *Intrahousehold Resource Allocation in Developing Countries: Models, Methods, and Policy*, 165–78. Baltimore and London: Johns hopkins University Press.

Grossbard, S. 2010. *Independent Individual Decision-Makers in Household Models and the New Home Economics*. Discussion Paper 5138. Bonn, Germany: IZA.

Grow Africa Secretariat. 2013. Investing in the Future of African Agriculture. 1st Annual Report on Private-sector Investment in Support of Country-led Transformations in African Agriculture 2012-2013. The African Union Commission with New Partnership for Africa's Development (NEPAD), World Economic Forum and Comprehensive African Agricultural Development Programme (CAADP). <http://growafrica.com/>.

Guyer, J. 1997. Endowments and Assets: The Anthropology of Wealth and the Economics of Intrahousehold Allocation. In *Intrahousehold Resource Allocation in Developing Countries: Models, Methods, and Policy*, 112–25. Baltimore and London: Johns Hopkins University Press.

Haddad, L., Hoddinott, J. and Alderman, H. 1997. *Intrahousehold Resource Allocation in Developing Countries: Models, Methods, and a Policy*. Baltimore and London: Johns Hopkins University Press.

Hammond, P.B. 1966. *Yatenga: Technology in the Culture of West African Kingdom*. New York: Free Press.

Kent, R., Bakaweri, C. and Poole, N.D. 2014. Facilitating Entry into Shea Processing: a Study of Two Interventions in Northern Ghana. *Food Chain* 4 (3): 209–24.

Nanama, S., and Frongillo, E.A. 2012. Altered Social Cohesion and Adverse Psychological Experiences with Chronic Food Insecurity in the Non-market Economy and Complex Households of Burkina Faso. *Social Science & Medicine* 74 (3): 444–51.

Poole, N.D., Chitundu, M. and Msoni, R. 2013. Commercialisation: a Meta-approach for Agricultural Development Among Smallholder Farmers in Africa? *Food Policy* 41 (August): 155–65.

Rohatynskyj, M. 1988. Women's Virtue and the Structure of the Mossi Zaka. *Canadian Journal of African Studies*, Current Research on African Women, 22 (3): 528–51.

Sidibe, A., Vellema, S., Dembele, F., Teme, B., Yossi, H., Traore, M. and Kuyper, T.W. 2014. Women, Shea and Finance: How Institutional Practices in a Malian Cooperative Create Development Impact. *International Journal of Agricultural Sustainability* 12 (3): 263–75.

Skinner, E. P. 1964. *The Mossi of the Upper Volta: The Political Development of the Sudanese People*. Stanford: Stanford University Press.

Tincani, L. S. 2012. Resilient Livelihoods: Adaptation, Food Security and Wild Foods in Rural Burkina Faso. London: School of Oriental and African Studies.

UNDP. 2013. *The Rise of the South: Human Progress in a Diverse World*. Human Development Report 2013. New York: United Nations Development Programme. <http://www.undp.org/content/dam/undp/library/corporate/HDR/2013GlobalHDR/English/HDR2013%20Summary%20English.pdf>.

Wiggins, S., and Keats, S. 2013. Leaping and Learning: Linking Smallholders to Markets in Africa. Agriculture for Impact. London: Imperial College and Overseas Development Institute.

Appendix

Figure A1. Level of education – Passoré (northern site)

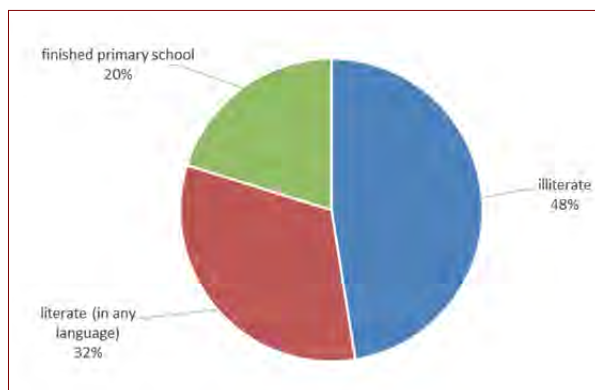


Figure A2. Level of education – Zoundwéogo/Nahouri (southern site)

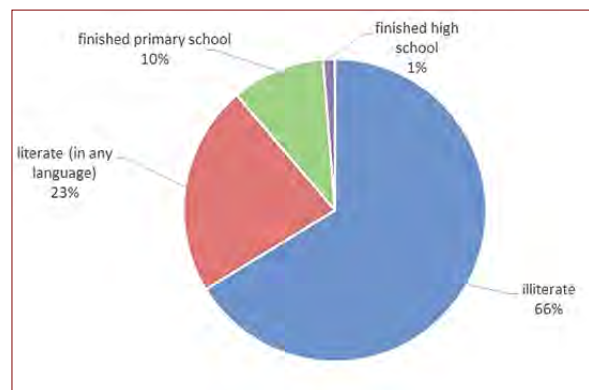


Figure A3. Household structure – Passoré (northern site)

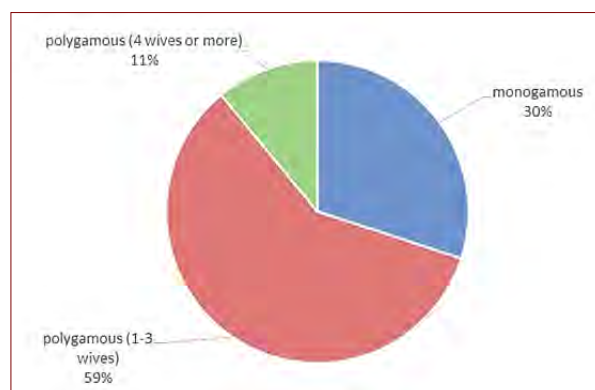


Figure A4. Household structure – Zoundwéogo/Nahouri (southern site)

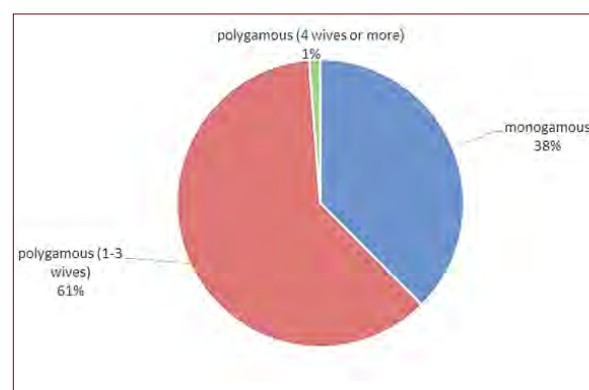


Figure A5. Compound structure – Passoré (northern site)

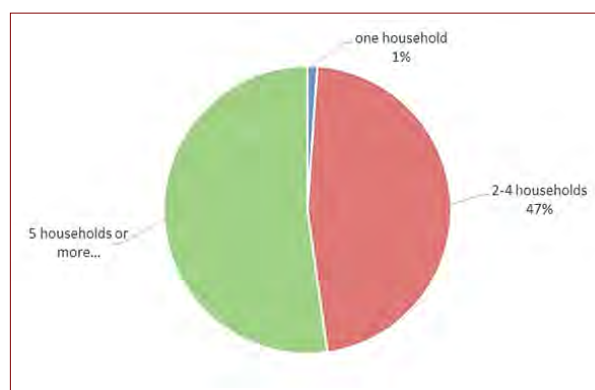


Figure A6. Compound structure – Zoundwéogo/Nahouri (southern site)

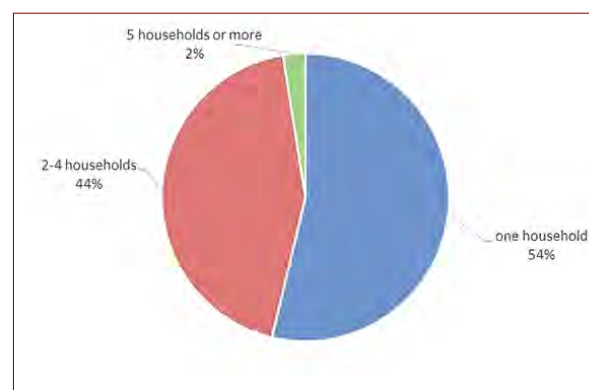


Figure A7. Access to goods and services- Passoré (northern site)

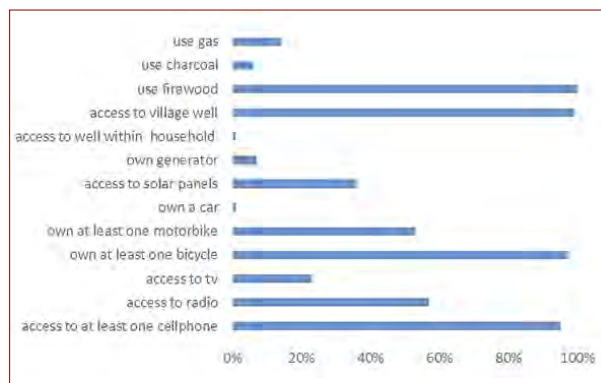


Figure A8. Access to goods and services - Zoundwéogo/Nahouri (southern site)

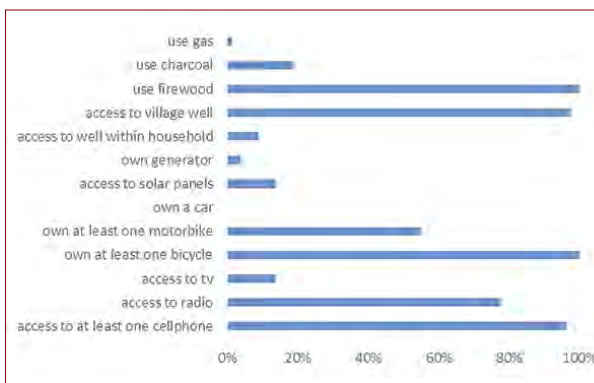


Figure A9. Agricultural land - Passoré (northern site)

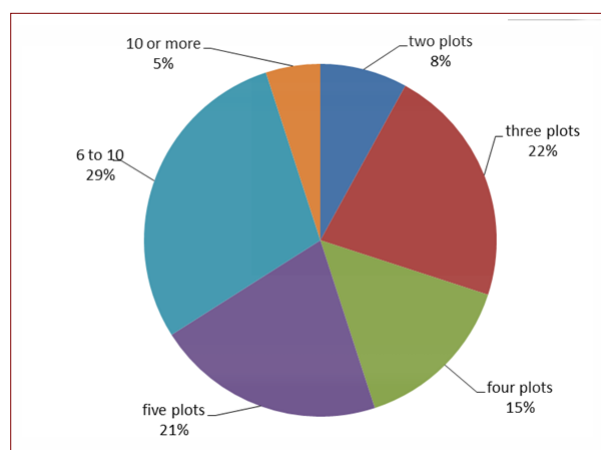


Figure A10. Agricultural land - Zoundwéogo/Nahouri (southern site)

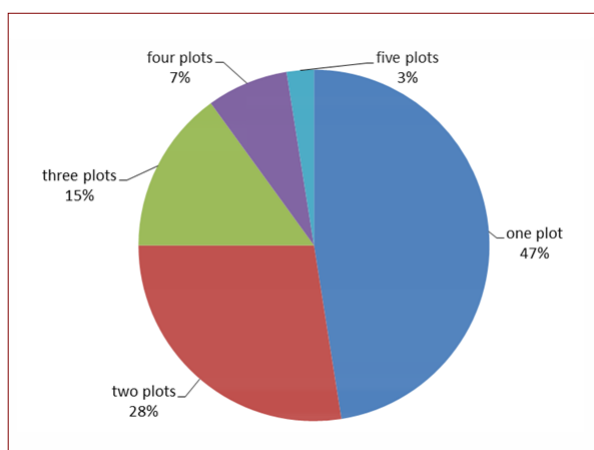


Figure A11. Livestock ownership - Passoré (northern site)

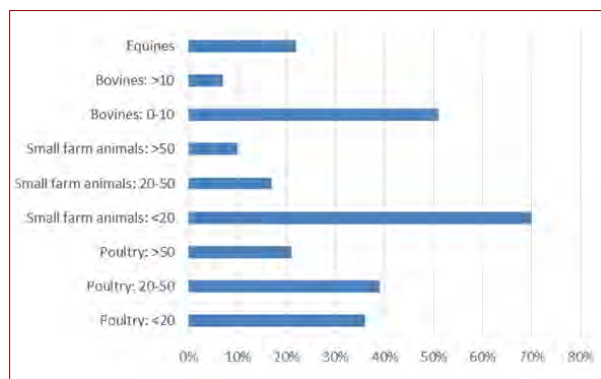


Figure A12. Livestock ownership - Zoundwéogo/Nahouri (southern site)

