UNIVERSITY FOR DEVELOPMENT STUDIES

EFFECTS OF SHEA BUTTER PROCESSING ON THE ENVIRONMENT IN TAMALE METROPOLIS

JIBREEL MOHAMMED BASIT

A DISSERTATION SUBMITTED TO THE DEPARTMENT OF COMMUNITY DEVELOPMENT, FACULTY OF PLANNING AND LAND MANAGEMENT, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ART (MA) DEGREE IN ENVIRONMENTAL SECURITY AND LIVELIHOOD CHANGE

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BY

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(UDS/MAE/0011/09)

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OCTOBER, 2010

DECLARATION

I declare that this piece of work is my original research work submitted as a dissertation towards my Master of Art Degree and that wherever sources have been quoted or used, full acknowledgements have been made. The work has not been presented in whole or in part for the award of a degree. Any shortcoming that may be found in this piece can only be laid at my door.

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ABSTRACT

Shea tree is an indigenous and exclusive asset in West and Central Africa and particularly wide spread in the Northern Savannah areas of Ghana. In these areas, whilst many praise shea butter for constituting an income source for women, others think the activity is detrimental to the environment because of its high use of both water and fuelwood. This study examined the effects of shea butter processing on the environment in Tamale Metropolis with three core objectives; to examine the differences that exist in resources used in shea butter processing methods in the Tamale Metropolis, to examine the effects of shea butter processing on the environment and to provide policy recommendations based on the findings of the research to improve upon the environmental situation in the Tamale Metropolis. Interviews, focus group discussions and field observation were used for the study.The finding is that the semi-mechanised method is more suitable in terms of resource maximisation than the traditional method. The study also revealed that fuelwood used in the study area contributes to deforestation in Yendi and West Mamprusi Districts of the Northern Region.It is recommended that efforts be made by Forestry Service Division for the enforcement of regulations on natural resource utilisation. Also, government should subsidise liquefied petroleum gas (LPG) and make it available to shea butter processors so as to minimise their over dependence on fuel wood as source of energy.

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DEDICATION

I dedicate this work to my son, Timtooni and my late parents, Alhassan Jibreel and Fatimata Jibreel.

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LIST OF ACRONYMS

CBE - Cocoa Butter Equivalent

CRIG - Cocoa Research Institute of Ghana

EPA - Environmental Protection Agency

FAOSTAT - Food and Agriculture Organization Statistical Database

GCE - General Certificate of Education

JSS - Junior Secondary School

LPG - Liquefied Petroleum Gas

MMDAs - Metropolitan Municipal and District Assemblies

MoFA - Ministry of Food and Agriculture

MT - Metric Tons

NBSSI - National Board for Small Scale Industries

NGOs - Non- Governmental Organizations

SARI - Savannah Agriculture Research Institute

SHS - Senior High School

SNV - Stichting Nederlandse Vrijwilligers

SPSS - Statistical Package for Social Sciences

UNIFEM - United Nations Development Fund for Women

UNDF - United Nations Development Fund

UNDP - United Nations Development Programme

UGK - Union des Groupement Kiswendsida

CHAPTER ONE

BACKGROUND TO THE STUDY

1.0 Introduction

The shea tree, Vitellaria paradoxa, has a history known and documented in the Western world and reference is sometimes made to the days of Mungo Park, the British explorer who first described the tree from his journeys in West Africa in the 18th century. The tree is considered a valuable asset in many parts of Africa where it can be found because of its high yielding edible oil for domestic use and products for cosmetic and pharmaceutical uses. It is important for the livelihoods of the rural population as it has been for over centuries (Lovett and Haq, 2000). Almost every part of the tree has its use, for example: the fruit is eaten and the leaves are used as fodder and serve as an ingredient for making alkaline and paint (Lovett and Haq, 2000). When the leaves are put in water, it forms a frothy opalescent liquid, which is used to bath a patient.

The shea tree grows well in 19 countries across the African continent, namely Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Ethiopia, Ghana, Guinea Bissau, Cote d'Ivoire, Mali, Niger, Nigeria, Senegal, Sierra Leone, Sudan, Togo, Uganda, Democratic Republic of the Congo and Guinea. Seven West African countries, Ghana, Burkina Faso, Benin, Cote d'Ivoire, Nigeria, Mali and Togo, produce about 500,000 tons of shea nuts, of which an estimated 270,000 tons are exported as raw nuts (Addaquay, 2004).

Ghana especially, is the leading exporter in the region, which produces about 55,000 tons of shea nut and exports about 40,000 tons per year (Addaquay, 2004). It is exported to France, Great Britain, the Netherlands, Denmark, North America and Japan (Elias and Carney, 2007). In these

countries it is processed in a wide range of food products including chocolate and it is also becoming more popular in the cosmetic industry (Schreckenberg, 2000).

In Ghana the shea tree occurs over almost the entire area of Northern Ghana, over 77,670 square kilometers with West Dagomba, South Mamprusi, West Gonja, Lawra, Tumu, Wa and Nanumba with East Gonja having the densest stands (CRIG, 2002). There is sparse shea tree cover found in Brong-Ahafo, Ashanti, and the Eastern and Volta regions of the country (CRIG, 2002).

The shea tree produces a lot of fruits which when ripen fall under their own weight and are gathered by women, children and some men from April to August of every year. The fruit pulp is nutritious and a very important source of calories, vitamins and minerals and an important source of food for many organisms including birds and bats. In northern Ghana, the fruits contribute to food security, particularly for the rural poor, especially since their ripening coincides with the lean season of food production. The fruit of the shea tree has a seed (nut) and in this seed is a kernel which is dried and stored for processing into shea butter.

In northern Ghana in general and the Tamale Metropolis in particular, many women process shea butter as their main source of income and in recognition of this a number of stakeholders including the Metropolitan, Municipal and District Assemblies, Non-Governmental Organisations, the National Board for Small Scale Industries and other private businesses have taken keen interest in the sector culminating in the provision of resources to support the industry. As part of efforts to support the economic empowerment of women in general and shea butter processors in particular, in 2008, the Japanese government provided a grant of 86,000 US dollars to two women shea butter processing groups in Walewale in the West Mamprusi District and Sagnarigu, a suburb of Tamale (Africa 2000 Network, 2009). The grant was to help establish

shea butter extraction centres in these two communities. Also in 2008, the United Nations Development Fund (UNDF) approved an amount of 246,000 US dollars for projects expansion for the women processing groups in these same communities (Africa 2000 Network, 2009).

Many other stakeholders have also contributed to the industry by way of provision of resources for skills training and research work. Many of these researches have focused on the contributions of the shea industry to the national or the local economy. In 2006, Stichting Nederlandse Vrijwilligers (SNV), West Africa conducted a study in the shea sub sector to analyze and understand the shea market chain in a holistic manner, including understanding all the actors, their relationships, motivation, opportunities and constraints to develop appropriate strategies to link the actors in a mutually rewarding manner (SNV, 2006).

1.1 Problem Statement

Shea is an indigenous and exclusive asset in West and Central Africa and is particularly abundant in the Northern savannah areas of Ghana. In this area shea butter production is a way of life for most women and is traditionally acknowledged as ‘women’s work’ by the local people as it is a key income source for them.

Processing of shea butter is a way of life for many women in Northern Ghana and the Tamale Metropolis in particular. While many of these women still use the traditional shea butter processing method they leant from their elders' years ago, others think the method involves lengthy, arduous processes requiring large quantities of fuelwood and water which are often carried from long distances. The large demad for labour, water and fuelwood by the traditional method of shea butter processing and a possible environmental effects from large and continues use of fuelwood have motivated many processors to acquire skills in alternative processing

method perceived to use less of these resources. This method is called semi-mechanised shea butter processing method.

Also, during shea butter processing different types of by-products are generated and are either further used or disposed off and these include waste brown water and waste black sludge. Aside the accumulations of both solid and liquid waste on the soil, other elements are also generated during the extraction process and these include heat and smoke. This study therefore examines the effects of sheabutter processing on the environment in Tamale Metropolis.

In line with this, the research aimed at finding answers to the following research questions:

a. What differences exist in resources used in shea butter processing methods in the Tamale Metropolis?
b. What are the effects of shea butter processing on the environment in the Tamale Metropolis?
c. What measures should be put in place to minimise and maximise the effects of shea butter processing on the environment in the Tamale Metropolis?

1.2 The Study Objectives

The main objective of the research was to examine the effects of shea butter processing on the environment in the Tamale Metropolis.

The specific objectives were to:

a. Examine the differences that exist in resources used in Shea butter processing methods in the Tamale Metropolis,
b. Examine the effects of Shea butter processing on the environment in the Tamale Metropolis and,

c. Provide policy recommendations based on the findings of the research to improve upon the environmental situation in the Tamale Metropolis.

1.3 Significance of the Study

Research on effects of shea butter processing on the environment is very significant on the backdrop of the numerous stakeholders who might have immeasurable interest in this topic and its outcome. They include shea butter processors and traders, researchers, government and students among others.

The shea industry is made up of many actors performing different roles including picking of shea nuts, processing of nuts into butter and the sale of both nuts and butter in both the domestic and international market. These actors need different forms of information to guide their activities. The study therefore hopes to provide this needed information especially in relation to the effects of their businesses on the environment.

Although literature on shea butter exists, for example, Addaquay (2004) on the shea butter Value Chain, Refining in West Africa and Akosah-Sarping (2003) on the demand for West Africa's shea butter in cosmetic industry, there is no substantial in-depth study on effects of shea butter processing on the environment in Tamale. It is therefore expected that the study will go a long way to add to the stock of knowledge on shea butter and its effects on the environment.

1.4 Scope of the Study

The study geographically covered five major shea butter processing communities located in the Tamale Metropolis and these are Katariga, Kanvilli, Sagnarigu, Vittin and Kumbuyilli. In terms of content, the study examined the differences that exist in resources used in shea butter processing in the study area, the contributions or benefits that accrue to the environment as a

result of shea butter processing and the harmful or negative effects that otherwise affect the environment as a result of shea butter processing.

1.5 Delimitation of the Study

The study was conducted in the Tamale Metropolis because of the large concentration of shea butter processors in the area and as a central point where the shea trade revolves. The Tamale Metropolis is located at the centre of the Northern Region sharing common boundaries with Savelugu/Nanton District to the north, Tolon/ Kumbungu District to the west, Central Gonja District to the south-west, East Gonja District to the south and Yendi District to the east.

1.6 Limitations of the Study

While the study has been successful in collecting and analysing data to address the research objectives, it is still limited in a number of ways. Generally, the factors that limited the research methodology can also be said to have affected the quality of the entire research. These include the limited financial and logistical resources available to the researcher for the study. As a result of these factors, the survey was limited to a total of 126 processors. A larger sample would have captured the views of more processors to increase the representation of shea butter processors in the study.

Also respondents were unwilling to participate and give out information because of the feeling that no financial reward will accompany the process. Again the study should have covered other key stakeholders like the Environmental Protection Agency (EPA), Savannah Agricultural Research Institute (SARI) and the Ministry of Food and Agriculture (MoFA) to make inputs related to the scientific aspect of the study.

1.7 Organisation of the Study

The study is made up of Five Chapters. The First Chapter is the introductory aspect; consisting of a general background to the study, the problem statement, significance of the study, broad and specific objectives and the scope of the study. The Second Chapter comprises literature review on the shea tree (*vitellaria paradoxa*), its characteristics and benefits, the shea butter production process of which the traditional, the semi mechanised and the full mechanised techniques of butter processing are looked at and both local and international uses of shea butter. Chapter Three entails Research Methods and Approaches used for the study. This included sampling units, methods of sampling, data collection and analysis. Chapter Four consists of data presentation and discussion. This is done in relation to the objectives of the entire study. Chapter Five provides a summary of the research findings, recommendations and conclusions.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter discusses previous literature relating to the shea tree (vitellaria paradoxa), its characteristics and benefits, the shea butter production process of which the traditional, the semi mechanised and the full mechanised techniques of butter processing were looked at. The chapter also focused on both local and international uses of shea butter and some of the quantities of shea traded in the shea industry.

2.1 The Shea Tree

Shea tree which is botanically known as Butyrospermum *parkii* or *Vitellaria paradoxa is* a common wild tree that grows extensively in the dry Savannah belt of West Africa, stretching from Senegal in the west to Sudan in the east. The shea tree is widely spread across parts of Africa, nearly 5,000km from Senegal to Uganda across the African Continent. The tree grows very well on a wide range of soils including highly degraded, arid, semi-arid and rocky soil. It usually grows to an average height of about 15 meters and girths of about 175 meters with profuse branches and a thick waxy and deeply fissured bark that makes it fire resistant. It grows naturally in the wild in the dry Savannah belt of West Africa from Senegal in the west to Sudan in the east and onto the foothills of the Ethiopian highlands.

The fruit of the shea tree is green, elliptical and about 5-8 cm long and 3-4 cm wide. Each fruit contains one large oval to slightly round, red brown to dark brown seed, which is usually referred to as the “shea nut”. The shell of this nut is shiny, smooth and fragile. This seed comprises about 50% of the weight of the fresh fruit and is the part used in shea butter production. Fruiting of the shea tree usually commences when the tree is about 15 years and beyond and often continues

with longevity of 200 to 300 years (Hall *et al.* 1996; Joker 2000). The fruit is harvested, depending upon the latitude, from May until September, which corresponds with the rainy season (Hall *et al.* 1996). The fruit yields do not become optimum until the tree is 25-40 years of age, although there have been some attempts to shorten this period by genetic improvements (Maydell, 1990) and grafting (Sanou *et al.* 2004), which have met with some success, resulting in major reductions in time to fruiting. The fruit is eaten by people from rural and urban areas, and is usually allowed to become slightly overripe to improve the sweet pear like taste (Booth & Wickens 1988; Sanou *et al.* 2004). People, as well as cattle, bats, birds, and a wide range of other animals reportedly disseminate the seeds (Hall *et al.* 1996).

Generally, *Vitellaria* reproduces naturally although it may be aided in its reproduction by being protected from fire or grazing by livestock if not traditionally planted (Hall *et al.* 1996; Boffa 1999; Kristensen & Lykke, 2003). Planted *Vitellaria* seedlings tend not to produce high quality nuts (Lovett & Haq, 2000).

2.2 Local Use of the Shea Tree

There are many uses of the shea tree. Oil from the kernel of the shea seed is a source of fat in many local diets and in some areas it is not used for that purpose (Booth & Wickens, 1988). The wood from the shea tree can be used as a high quality fuelwood and to make sturdy tools (Booth & Wickens, 1988; Boffa *et al.* 2000; Kristensen & Lykke, 2003). The oil and butter are used as a lotion for the skin and hair, although in many areas these traditional products are being replaced by commercially produced lotions. The tree is also valued medicinally for soothing arthritic pains, reducing swelling, treating skin problems and as an antiseptic for the treatment of wounds (Boffa, 1999). Butter from the shea tree can also be used as a waterproofing material for huts and walls (Booth & Wickens, 1988). Kristensen & Lykke (2003) interviewed over 200 people in

Burkina Faso, and asked them to rank the trees they knew according to uses and conservation value. The shea tree was the only tree to score high in all use categories: edible fruits, vegetable sauce, construction, firewood, medicine, commerce, field trees, and conservation priority. A 1994 study conducted in Mali by Gakou *et al.* found that the shea tree was highly valued for its oil and butter. In their study, which was conducted across six villages, people were asked what plants produce important non-timber forest products. The shea tree was one of the two species mentioned the most, more than 100 times during the interviews. The shea trees annually produce 15 to 20 kg of fruits, which when processed can yield 1.5 kg of shea butter (Spore, 2002).

2.3 **The International Uses of the Shea Tree**

The shea tree has become an important non-timber forest product on the international market. Products from the tree are exported in one of two ways. Either the nuts themselves after being roasted and are exported in bulk or the nuts are processed into shea butter within the country of origin like Ghana and then exported. Shea products were first recognized as an important export for West Africa during the Colonial period (Saul *et al.,* 2003). In the 1920's shea nut and butter exports increased as they began to be used in European chocolate, cosmetics and soaps industries. At one point in the 1970's, shea nuts and shea butter were the third largest export for Burkina Faso (Saul *et al.,* 2003). In the main producing countries of Nigeria, Mali, Burkina Faso, Ghana, Cote d'Ivoire, Benin, and Togo, about 650,000 tons of shea nuts are produced annually. Yet only about twenty percent of these nuts are processed and exported (FAOSTAT, 2004). In 2002, the FAO estimated that Ghana exported 4,969 metric tons (MT) of shea nuts at value of US$1,339,000, Benin 5,560MT for US$1,134,000, Burkina Faso 608MT for US$787,000, Nigeria 880MT for US$170,000, Togo 1,166MT for US$122,000, and Mali 7MT for US$9,000 (FAOSTAT, 2004). Some researchers believe that the volatility of price of shea nut and shea

butter makes it an unreliable export product (Carr *et al.*, 2000; Chalfin, 2004). Currently three firms dominate the majority of the shea nut trade: Karlshams: A Swedish firm, Aarhus Olie (Danish), and Loder Croklann (Malaysian owned) (Chalfin, 2004).

Shea nuts and the oil from them are valued on the international market primarily for use as a cocoa butter equivalent (CBE), a substitute or supplement for cocoa butter in the manufacturing of chocolate (Boffa *et al.*, 2000). Shea butter is usually cheaper than cocoa butter, and also adds durability to the chocolate making it less crumbly and more uniform (Chalfin, 2004).

Recently there has been debate in the chocolate sector over the levels of purity needed in chocolate to be able to call it chocolate (Lipp & AnIdam, 1998). Some countries, including the United States, France, and Belgium, do not allow any CBEs in chocolate production, while other countries such as Denmark, Sweden, Switzerland, Portugal, Ireland, Russia, and Japan allow up to 5 percent of the content, and some Eastern European countries allow up to 15 percent (Raise n.d.; Boffa 1999). Even though France and Belgium do not allow shea butter as a CBE, they do allow its use as a cocoa butter replacement (CBR) for cakes or other sweets not called chocolate (Hall *et al.*, 1996).

Furthermore, shea butter is being used increasingly in the cosmetic industry (Akosah-Sarping 2003; Chalfm, 2004). In cosmetics, shea is most often used as an ingredient in lotions, but it is also found in makeup, baby ointments, hair care products, and soaps. The Body Shop and Estee Lauder are two of the main international firms that sell a variety of shea products, although other companies such as Bare Essentials and Bed, Bath, and beyond also display shea-based products on their shelves (Chalfin, 2004). Most stores purchase the shea butter from factories in Europe and the United States. In contrast, L'Occitane, a French perfume company has opened cosmetic stores in the U.S. that provide a line specializing in products using butter bought directly from

local producer groups in Africa (Harsch, 2001). The Body Shop, through its Community Trade Programme has established partnerships to buy shea butter from community groups (Laird & Guillen, 2002).

Although some authors expressed the concern that the supply of shea nuts surpasses the current demand (Hall *et al.*, 1996) there is increasing interest in creating direct partnerships between African producers of shea butter and cosmetic companies (Boffa, 1999) as seen by the examples of L'Occitane and The Body Shop. This emphasis on village-processed shea butter not only provides a niche in the market for rural women in Africa, but also increases the economic return (Chalfin, 2004). Early in 2003, a conference was held in Washington D.C. with representatives from several shea butter producing countries. Hosted by the US Agency for International Development the participants came together to discuss the growing international demand for African produced shea butter in the cosmetics industry (Akosah-Sarpong, 2003). The cosmetics industry offers a niche to producers from African countries due to the growing demand for natural and organic beauty products (Akosah-Sarpong, 2003). In regards to this niche international organisations such as The UN Fund for Women (UNIFEM) are working to secure more of the profits for local communities by encouraging them through loans, a higher level of village level processing. UNIFEM helped to secure and manage a deal in Burkina Faso between the Union des Groupements Kiswendsida (UGK) and the French cosmetics firm L'Occitane. UGK is an organisation of over 100 women's groups who produce shea products, and in 2001 L'Occitane purchased over 60 tons of butter from them (Spore, 2002).

2.4 Production of Shea Butter

Shea is an indigenous and exclusive asset in West and Central Africa and particularly wide spread in the northern savannah areas of Ghana. In these areas, shea butter constitutes a key source of income for women and the production of this commodity has been acknowledged as 'women's work' by most people in the area. The contribution of shea butter to women ability to maintain their families and communities is enormous in northern Ghana.

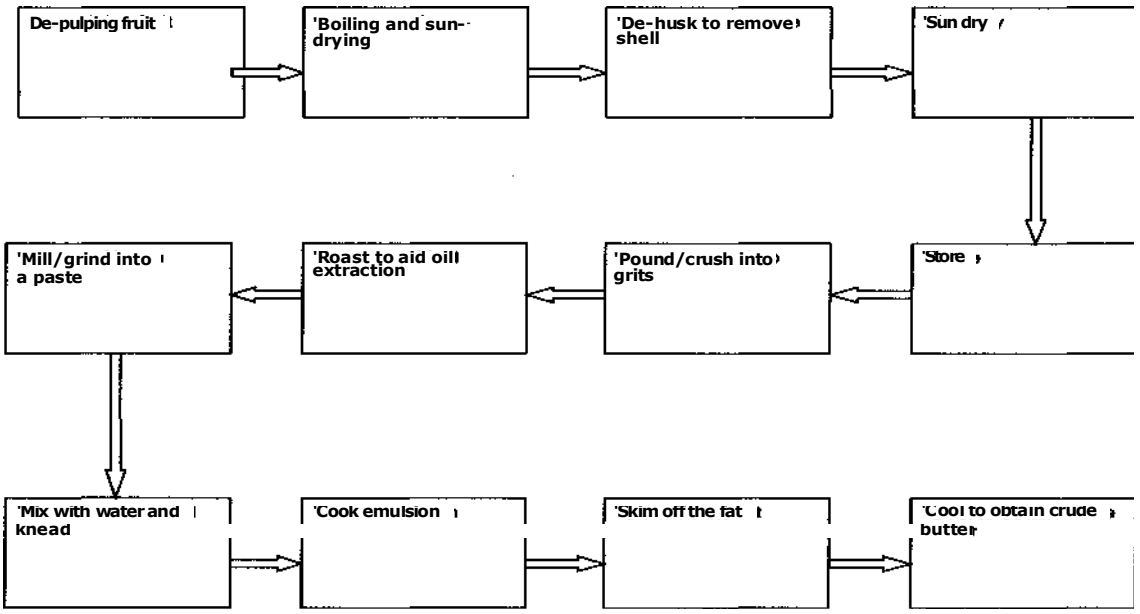
In 2006 the Stichting Nederlandse Vrijwilligers (SNV) conducted a study to analyze and understand the shea market value chain in a holistic manner, including understanding all the actors, their relationships, motivation, opportunities and constraints to develop appropriate strategies to link the actors in a mutually rewarding manner.The report indicates that more than 600,000 women in Northern Ghana depend on incomes from the sales of shea butter and other shea-related products as a means of their daily sustenance like supplementing the family food budget and meeting medical and educational expenses.

In addition to its economic importance, making shea butter is a way of life for women in Northern Ghana but majority of these women still process shea butter in the traditional ways they learned from their elders' generations ago. The traditional oil extraction technique of shea butter is time consuming, physically exhausting and requires large quantities of fuel wood and water resources that are often scarce in the regions especially the fuel wood where concerns are given by several stakeholders about the growing depletion of trees due to fuel wood production. It is estimated that the production of 1 kg of shea butter takes one person 20-30 hours and that 8.5-10.0 kg of wood fuel is needed to produce it (Niess, 1988).

Because of the number of production processes or stages involved, the traditional shea butter production technique is considered time consuming and physically exhausting. Addaquay (2004)

has described the following processes or stages for the production of shea butter using the traditional method in Figure 1 below.

Figure 1: Flow Diagram Showing Traditional Butter Production Stages



Source: Addaquay (2004)

From figure 1, shea kernels are obtained after de-pulping which is the removal of the fleshy mesocarp after initial fermentation of the fruit through boiling or burying. After de-pulping, the nuts are boiled and sun dried. Sun drying for 5-10 days reduces the moisture content to about 15-30%. After sun drying, the nuts are de-husked through a number of ways including trampling, pounding using a mortar and pestle and cracking between two stones. The de-husked nuts are also sun dried, stored, crushed into grits, roasted to aid oil extraction, milled or grind into paste, mixed with water and knead, cook emulsion, skim off the fats and cool to obtain shea butter. In Agroforestry Parkland Systems in Sub-Saharan Africa, Boffa (1999) also explains the traditional processing of shea butter similar to that of Adaquay. According to him after the shea

fruits are gathered they are buried in pits and allowed to ferment to facilitate the disintegration of the fleshly part of the fruit. The remaining nut is then boiled to remove any of the fruit pulp remaining (Hall *et al.*, 1996).The nuts are then either sun dried for 5-10 days or roasted over a fire or in a traditional oven for two to three days. Next, the nuts are dehulled either with a mortar and pestle, or by cracking them between two rocks. The dehulled kernels are dried further until the moisture content appears very low. The kernels are then pounded into a thick paste and the paste is mixed with hot water and kneaded until it reaches dough like consistency. The dough is then washed with cold water to separate out the liquid and solid fats. After separation, the solid fat (the shea butter) is washed again in cold water and shaped into individual units for sale. The total time required to process the shea butter, excluding the harvesting and drying times, is usually around 5-6 hours (Hall *et al.* 1996; Boffa 1999).

The concerns for the high labour requirement in the traditional method of shea butter production and the use of large amounts of water and fuelwood has led to the evolution of a second method of production at the village level in some areas. This method is semi mechanised with a nut crusher, an improved roaster, a kneader or a hydraulic screw press introduced to reduce the drudgery associated with the traditional manual process of shea butter production.

The semi mechanised method of shea butter processing makes a good use of a crusher taking the place of the mortar and pestle in breaking the kernel into tiny units for roasting. The crusher is normally powered by electricity, reducing the time and energy needed to break the kernel for roasting.

The semi mechanised method of shea butter processing has also introduced an improved technology for roasting the kernel after it has been broken into tiny pieces. The improved roaster

retians the heat in the compactment to roast the kernel at a reduced time, energy use(both fuel wood and human effort) and the processor exposure to the heat generated by the fire.

To further reduce time, energy and human effort, the semi mechanised method of processing has introduced another technology called a kneader to convert the milled kernel into an emulsion ready for cooking or heating. This technology has replaced the use of the hand in kneading.

The semi mechanised technology according to Addaquay (2004) has led to an improvement in shea butter extraction rate from 20 percent to 35 — 40 percent and production efficiency and product quality.

There are also fully mechanised industrial processing plants. These plants use machine pressers, chemical solvents, or a combination of the two, to extract the oil. Although there are a few of this technology in Africa, the vast majority of fully mechanised processing of shea butter occurs in Europe, Asia, and North America (Chalfin, 2004). Generally, the nuts are purchased in African markets through wholesalers and then exported to overseas processing plants. However, even the small amount of shea butter that is processed in Africa is usually refined further in overseas factories before being used in the international chocolate or cosmetic markets.

2.5 Shea Butter Industry

Many actors are involved in the shea industry. The main actors in the industry include shea nut pickers, shea butter processors and both shea nuts and butter traders. These actors trade shea in both local and the international markets. In Tamale market (Ghana, Northern Region) for example, three types of bulk traders are distinguished: 1) local traders 2) traders from the South of Ghana 3) traders who also trade abroad (Carette, 2009).

In recent years, shea butter has been used as a substitute for cocoa butter in the chocolate industry. It is especially useful due to its hardness at room temperature and enhancing the shine

for chocolate (Schreckenberg, 2004). In addition, the butter is considered as a valuable product for natural/luxury cosmetics in Northern countries and Japan such as skin creams, soaps, shampoos because of 'its hydrating, protecting and softening properties' (Schreckenberg, 2004: 92). Also the benefits of butter are UV protection, moisturizing, anti-eczema and anti-wrinkle (Lovett, 2004). The latest factor is especially appreciated by the US market as demand increases for cosmetic products (Lovett, 2004).

In fact, the demand of cosmetics has stimulated trade growth in the shea sub sector, increasing trade in West Africa from 200 tons in 1994 to 1,500 tons in 2003. Another estimate is that total African export increased from 200 tons in 1994 to over 2,000 tons in 2004 due to the growth of the cosmetics market (Lovett, 2004). For example, the Body Shop, one of largest cosmetic companies in the world that buys the shea butter from local women's groups has increased it's trading from 5 tons in 1994 to more than 100 tons in 2003 (Lovett, 2004).

Although the demand for shea butter has grown significantly, unlike cut flower industry, the shea butter sector has not yet developed. Nowadays, the sector faces the issue of ‘Quality and Quantity’ (Lovett, 2004). Due to immature markets, the chain has less linkage with supply chain network and a tendency to lack information. Even though some of the processors have some technology and skills to some extent, they often sell only to domestic markets since Northern markets require higher quality, which also require advanced technologies to process. Because of the above challenge, the local shea nuts workers sell the unprocessed nuts directly to middlemen for export (Carr and Chen, 2001) depriving them of a lot of returns from their efforts. In addition, shortage of information allows them less communication with supply chain actors and further distances them from the markets.

2.6 Uses of Shea By-Product

Shea nuts and shea butter have multiple uses. In a domestic setting, shea butter constitutes an important source of affordable cooking fat (Abbiw, 1990). It is also used as a base for medicinal and cosmetic ointments, such as pomade, hair cream, soap production and as an illuminant (Abbiw, 1990). Poor quality butter processed is not only applied to earthen walls but also to doors, windows, and even beehives as a waterproofmg agent. During shea butter processing, a residual meal which is one of the by-products is generated and used as an agent to repair and mend cracks in walls of mud huts, windows, doors and traditional beehives to protect them during the rainy season (Fluery, 1981). According to Wallance-Bruce, 1995, the sticky black residue, which remains after the clarification of the butter, is used for filling cracks in hut walls and as a substitute for kerosene when lighting firewood. In a traditional setting, shea butter of poor quality is also used as an illuminant (or fuel, in lamps or as candles).

The by-products especially the waste brown water is sometimes mix with soil material for plastering of buildings. The sticky black residue which is used as fuel for lightening is an equally good material for the extraction of alkaline. This is normally achieved through the ashes that are left after burning. Shea butter is also sometimes mixed with different types of alkaline to make soap.

It is obvious from the evidences on the economic importance of Shea butter deduced so far, that when this sub sector is given a special consideration, the economy of Ghana and certainly the entire country will receive a major boost of unimaginable proportions from both domestic and international uses of shea butter. This will also provide practical, market-based incentives for the sustainable management and conservation of the shea resources. Perhaps the greatest potential in this respect lies in the commercial development of shea products from naturally occurring

species with ready market value. The industry not only provides food, raw materials, income to the rural poor of Ghana and Tamale in particular, it also provides employment for the growth of the nation.

Also, while the economic benefits of the shea tree and butter are undoubtedly clear, there is the need for a protection of the tree and development of the industry against destruction and collapse. Ghana being one of the largest producers of shea in West Africa gives prospects for sustainable economic profit for the Ghanaians and the country as a whole on shea products which will remain uncertain if more strategies are not developed through continuous research to bring about technological progressiveness to boost the productivity of players in the industry. The establishment of the Cocoa Research Institute of Ghana (CRIG), a subsidiary research station of the CRIG in 1976 at Bole, Northern Ghana was not for nothing but to research into the ecology and biology of the shea tree with the aim of improving its yield and the industry in general.

In order for the development of shea products trade to result in tangible improvement in sustainable management of the shea resources in the country, partnership between rural producers, national policy makers, the private sector and international industry is inevitable and some portion of the benefits must be channelled in to better management of the industry.

In conclusion, it is very important to state that the shea industry which has contributed significantly in promoting poverty reduction in the Tamale Metropolis and Ghana at large has lots of prospects that require harnessing by industry players and government for a major boost of the Ghanaian economy.

CHAPTER THREE
METHODOLOGY

3.0 Introduction

This chapter presents information on the research study area and outlines the research approach adopted for the study, how the sample frame and sample sizes were determined, tools used for data gathering, the unit of enquiry and analyses as well as data sources. This section finally describes how field data was made suitable for presentation and analysis and the tools used for data presentation and analysis.

3.1 The Study Area

The Tamale Metropolis is the administrative capital of the Northern Region of Ghana. The Metropolis is located at the centre of the Northern Region. It shares common boundaries with Savelugu/Nanton District to the north, Tolon/Kumbungu District to the west, Central Gonja District to the south-west, East Gonja District to the south and Yendi District to the east as shown in figure 2 below. It occupies approximately 750 km sq. which is 13% of the total area of the Northern Region (Tamale Metropolitan Assembly Profile, 2006-2009).

Figure 2: A Schetch Map of Northern Region of Ghana showing Tamale Metropolis

Source: Ghana Districts dot com

3.1.1 Population size

The 2000 Population Census gave the population of the Tamale Metropolis as 293,881. This is made up of 146,979 males and 146,902 females (Ghana Statistical Service, 2000). This figure shows an increase of 75% over the 1984 population of 167,778 and represents a growth rate of 3.5%. This is far higher than the national and regional rates of 2.7% and 2.8% respectively. One possible factor for this big difference could be the boundary change of the Metropolis since 1984 (Ghana Statistical Service, 2000).

With an urban population of 67.1%, the Metropolis is the only district in the region which is predominantly urban. The population density of 318.6 persons per square kilometres for the Metropolis is about 12 times higher than the Regional average density of 25.9 persons per square kilometres. There exists vast difference between the densities of the urban and rural areas.

This is an indication of influx of people to Urban Tamale, and gives credence to the assertion that facilities and opportunities for modern employment are concentrated in few central places (Tamale Metropolitan Assembly Profile, 2006-2009).

The age structure of the population of a high fertility country such as Ghana is basically shaped by the effect of mortality. As it is the case with the Metropolis area, the structure of the population indicates a broad base that gradually tapers off with increasing age due to death. The fact that the population aged 9 -5 is slightly below that of 6 -12 years is an indication of this trend. The youthfulness of the population implies that we have the most important human resource potential that his tremendous potential will determine our strength and resilience in pursuing our social, economic and political development goals. On the other hand, the proportion of the elderly at 4.1 percent is rather far lower than the regional and national averages of 4.5 percent and 5.3 percent respectively, an indication of a comparably low life expectancy. In this regard pragmatic efforts would have to be made to make primary health care delivery more accessible and affordable to the aged (Tamale Metropolitan Assembly Profile, 2006-2009).

3.1.2 Ethnicity

Apart from the Metropolis where there is ethnic diversity, almost all people in the surrounding villages are Dagombas. Even in the Metropolis, the Dagombas constitute about 80% of the total population (Tamale Metropolitan Assembly Profile, 2006-2009).

3.1.3 Micro/district economy

The economy of the Tamale Metropolis is dominated by agriculture and commerce including services and small-scale industries. The economy until the 1980s was basically agricultural. During this period over 70% of all indigenous people in the Metropolis were farmers. During the period before the 1980s, production of primary commodities in the Metropolis was very high. This was as a result of government policies towards agriculture. The introduction of subsidies on agricultural inputs raised production of both domestic and industrial crops. Significant among these were rice, maize, sorghum, groundnuts and beans.

However the trend of growth started declining as a result of the removal of subsidies on agricultural inputs, rapid population growth, declining soil fertility and the gradual decrease in the land area as a result of the rapid expansion of Tamale. The high transportation cost and lack of storage facilities compel farmers to depend on middlemen for sale of the produce. Small-scale farmers are thus most affected. It further indicates that 60% of the people are engaged in agriculture in the Metropolis. The major crops cultivased include maize, rice, sorghum, millet, cowpea, groundnuts, soya bean, yam and cassava (Tamale Metropolitan Assembly Profile, 2006-2009).

3.1.4 Climate and vegetation

The Metropolis experiences one rainy season starting from April/May to September/October with a peak season in July/August. It experiences a mean annual rainfall of 1100mm within 95 days of intense rainfall. Staple crop farming is highly restricted by the short rainfall duration.

The dry season is usually from November to March. It is influenced by the dry North-Easterly (Harmattan) winds while the rainy season is influenced by the moist South Westerly winds. The mean day temperatures range from 33° C to 39° C while mean night temperature range from 20° C to 22° C. The mean annual day sunshine is approximately 7.5 hours.

The climatic conditions have to a greater extent influenced the vegetation of the area. The Metropolis lies within the Guinea Savanna belt of Northern Ghana. Apart from the preserved natural colonies of vegetation at fetish groves, forest reserves and community woodlots, the whole Metropolis exhibits tall grass interspersed with drought resistant trees such as nim, sheanut, dawadawa and mahogany. During the rains the Metropolis becomes green making the vegetation more luxuriant. In the dry season, however, water becomes scarce as a result of poor vegetation cover, serious run-off and evapo-transpiration and leaching. The grasses dry up and the accompanying bush fires destroy the soil nutrients and even expose the soils to serious erosion.

There is one major natural forest reserve in the Metropolis located at Sinsab-gi-gbini. Beside this, there are other man made plantations which include the Water Works Plantation, Kogni Fuel wood Plantation and Ministry of Food and Agriculture (MoFA) area Fuel wood Plantation (Tamale Metropolitan Assembly Profile, 2006-2009).

3.1.5 **Soil**

The Tamale Metropolis area is underlain by sandstone, mudstone and shale, which over time, have been weathered to different degrees. The main soil types that have resulted from the above natural phenomenon include sand, clay and laterite ochrosols. These soil types are inadequately protected resulting in serious erosion during the rains (Tamale Metropolitan Assembly Profile, 2006-2009).

3.2 Shea Butter Processing Methods

Shea butter processing constitutes a key source of income for many women in the Tamale Metropolis and the production of this commodity has been acknowledged as 'women's work by most people in the area. In addition to its economic importance, making shea butter is a way of life for women in the study area but some of the processors still process shea butter using the traditional methods they learnt from their elders. This method is time consuming, physically exhausting and requires large quantities of fuelwood and water which are often scarce. The challenges of the traditional method have resulted in the development of improved method of shea butter processing in Tamale Metropolis. This improved method of shea butter processing is considered less time consuming, physically in exhausting and requires less quantities of fuelwood as compared to the traditional method shown in Table 1 below.

Table 1: Comparison of the traditional and the improved methods of shea butter processing in Tamale

Traditional Shea Butter Processing Method			Improved Shea Butter Processing Method (Bridge Press)		
Processess	Time Taken/25kg	Resources Required	Processess	Time Taken/25kg	Resources Required
Shea Kernel			Shea Kernel		
Pounding	60 Minutes		Pounding	60 Minutes	
Roasting	60 Minutes	Fuelwood(0.5 head loads)			
Milling	60 Minutes		Milling	60 Minutes	
Kneading	180-240 Minutes	Water (0.25 head loads)	Mixing/Bagging	15 Minutes	Water (2.5 head loads)
Rinsing	60 Minutes	Water (2.75 head loads)			
Boiling	90 Minutes	Fuelwood(0.5 head loads)	Pressing	40 Minutes	
Total	8.5-9.5 hours	3 head loads of water and 1 head load of fuelwood		2 hours 55 minutes	2.5 head loads of water

1 headload= approximately 30kg

Source: Swetman et al, 1997

From the Table 1 above, the information shows that both methods need dried kernel to be pounded, but there is no need for roasting of pounded nuts before milling with the improved method, thereby saving time, fuelwood and labour. After milling there are no kneading or rinsing stages therefore saving time again. A small quantity of water is also added to the paste for the press, also saving another vital resource.

3.3 Research Design

This study was a detailed investigation into the activities of shea butter processors and how the processing is impacting on the environment. As a result, a descriptive survey of non experimental research design was used to conduct the study. To empirically grasp an in-depth understaning and some of the complexities pertaining to the activities of shea butter processing, this research design was used. This design helps in gaining deep understanding of events, processes and situations involving a specific case study area (Trochim, 2006).

3.4 Types of Data

Data from both primary and secondary sources were used, so as to facilitate an in-depth understanding of shea butter production and its effects of the environment in the study area for policy recommendations to be provided.

3.4.1 Secondary data

Secondary data can be defined as processed information that is readily available to be utilized. Secondary data requirements and sources for this study included: journals, articles, reports of Non Governmental Organisations and the internet.

3.4.2 Primary data

Primary data provided first hand information on the subject under study. For the purpose of this research, primary data were sought around the following issues; sources of shea kernel and methods used in processing shea butter. Others included both positive and negative effects of shea butter processing. The sources of this information were sampled processors and key stakeholders linked to some activities related to the processing.

3.5 Instruments Used

This section discusses the research instrument used in the study. These included Interview, Focus Group Discussion (FGD) and Field Observation.

3.5.1 Interview

Interviewing is a useful way of collecting qualitative data because the technique allows respondents to report on themselves, their views, their beliefs, practices, interactions and concerns (Freebody, 2003). Besides, most people are more willing to talk in an interview than the case would be if they were asked to write or fill out a questionnaire (Robson, 1993). The interview technique is associated with a number of advantages and these showed up in the interviews the researcher conducted. Interview creates the opportunity for interviewees to ask for clarification when they do not understand a question just as the interviewer can ask for elaborations on answers given by interviewees. Furthermore, there is the guarantee that all questions would be answered or, at least, attempted by the interviewee (once he/she can allow enough time for the interview) which ensures a high response rate. Moreover, it becomes possible to check on the reliability of a response by asking the same question differently and at different stages of the interview (Freebody, 2003).

The interview technique was employed to obtain data from the women processors and the other key stakeholders. Questions were asked in areas such as the demographic background of the respondents, other activities engaged in by the processors, methods used by processors and uses and disposal of shea by-product.

3.5.2 Focus group discussion

Five groups each made up of ten people were engaged in focus group discussions in all the communities covered for the study. The aim was to validate and attain different perspectives on some of the emerging issues from the interviews. These issues included; methods of processing, sources of energy and water and health of processors. The method gave the participants an opportunity to collectively air their views on the subjects presented before them for discussion.

3.5.3 Field observation

According to Yin (1982), observations are a form of evidence that do not depend on verbal behaviour, and the method enables the investigator to observe the phenomenon under study directly. The phenomenon under study, shea butter processing, is one which lends itself to direct observation. Thus, in addition to the interviews, the researcher also conducted field observation as part of the data collection exercise. This involved the observation of the various extraction processes, the site where shea by-products are disposed, homes which were plastered and painted with shea butter by-product and farms where shea by-product is used to fertilize crops. In conducting the field observation, photographs were taken of some of the activities including crop lands, waste disposal sites and the women under taking some of the activities of shea butter processing.

3.6 Unit of Analysis

The unit of analysis of this study was sheabutter processors in five selected communities of the Tamale Metropolis.

3.7 Sampling

Multi-stage sampling techniques were adopted to obtain information from respondents. Both probability and non probability sampling techniques were used to gather data for the study. All the five study communities have shea butter processing centres which were stratified into five homogeneous strata. After the stratification, sample proportion was used to allocate sample size to each stratum. By this total population of each processing centre was divided by the total population of the five centres and the fraction obtained multiplied by sample size to give the sample for each stratum. A systematic random sampling was used with a sample fraction of total population for the five centres over the sample size (185/126=1.5 approximately 2). With the sampling interval of 2, the list of members in each processing centre was drawn and the second element included for the study starting from the first element when counting. By picking the first respondent, the researcher used the lottery method where respondents were made to pick pieces of folded paper numbering one (1) to the total number of processors in each centre. The person who picked the paper labeled ‘became the starting point for the counting. This was done until the total allocated sample was achieved and each selected respondent was made to complete a questionnaire on the effects of shea butter processing on the environment.

Purposive sampling technique was also used to select respondents for focus group discussions and other two key stakeholders (Fuelwood producer and a technical person from the forestry services) for the interview.

3.8 Sample Frame

The secretaries of the five shea butter processing centres supported the researcher to identify one hundred and eighty five (185) shea butter processors and this formed the sample frame for the study.

3.9 Sample Size Determination and Distribution

A mathematical method was used to determine the sample size of 126 from the population of one hundred and eighty (185) shea butter processors at 5% level of precision and 95% confidence level. The sample size calculation and distribution are shown below:

The sample size formula is given by: **n=N/1+N (e) 2;** Where n= sample size; N= sample frame and e= level of precision. N=185, (e) = 0.05; therefore: n=185/1+185(0.05) 2 =126.45, approximated to 126.

Table 2: Sample Size Distribution

Selected Communities	Number of processors	Sample Fraction	Adjusted Proportion
Katariga	32	0.173	22
Kanvili	57	0.308	39
Sagnarigu	41	0.223	28
Vittin	37	0.2	25
Kumbuyili	18	0.097	12
Total	185		126

Source: Field Survey, 2010

3.10 Pre-Testing

Before the commencement of the real field data collection, the researcher performed a pre-test in Kasalgu. It is one of the sheabutter extraction communities with all the characteristics of the other five study communities. A sample size of twenty (20) interview schedule was administered to ten (20) processors using the simple random sampling

The exercise actually helped the researcher to eliminate ambiguous and irrelevant questions. It also helped him to ensure the effectiveness or suitability of the interview schedule in obtaining correct responses for the study.

3.11 Validity

It refers to the appropriateness, meaningfulness, correctness and usefulness of any inferences a researcher draws based on the data obtained through the use of an instrument. The essence of validity therefore is to find out the degree to which the data collection instrument measures what is supposed to measure .To ensure that the validity of the instruments are maximised ,two steps were taken. The survey instruments were shown to the researcher's supervisor for scrutiny and comments. Secondly, the instruments were pre-tested to ensure their validity and reliability.

3.12 Data Analysis

Both qualitative and quantitative techniques of data processing were used in the data analyses and presentation. Data obtained from the field was organized through data cleaning and processing; this involved data coding and editing before the data entry process. Analysis was undertaken to generate a descriptive picture of the data gathered on such themes as the

demographic characteristics of respondents, household activities, methods used in terms resources and the effects of shea butter processing on the environment in Tamale Metropolis.

Data obtained from the field was organized through data cleaning and processing; this involved data coding and editing before the data entry process. The Statistical Package for Social Sciences (SPSS) and excel sheets were used to present and analysed data. Descriptive statistics such as pie charts and frequency distribution tables were also used to present data for easy comprehension.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESULTS

4.0 Introduction

This chapter presents results of the analysis of data obtained from the field survey. According to Kerlinger (1993), analysis involves ordering and breaking down of data into consistent parts to obtain answers to the research questions.

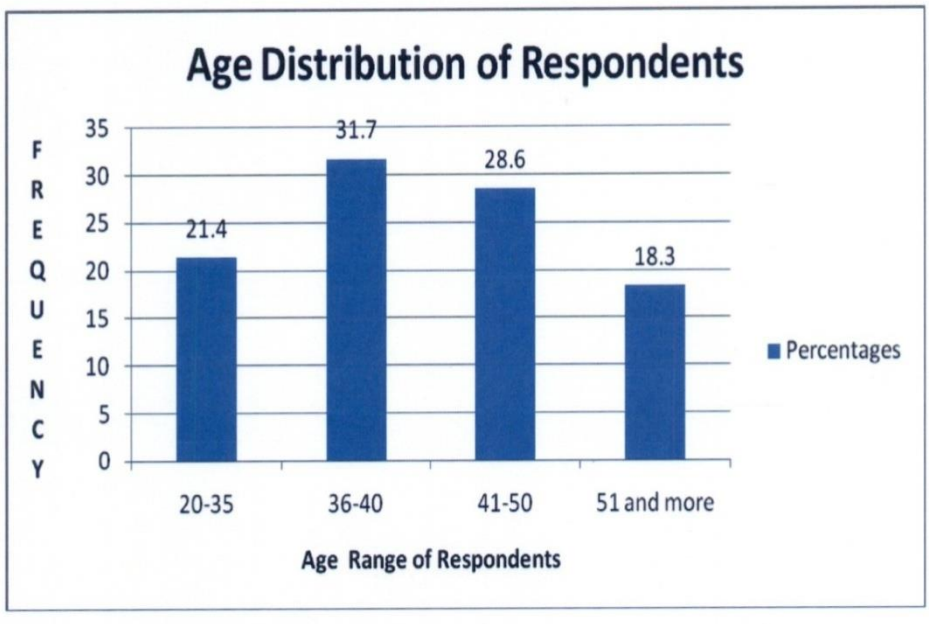
4.1 Demographic Characteristics of Respondents

The socio demographic characteristics discussed included age, education, marital status, household size and household activities of respondents.

4.1.1 Age of respondents

Age of respondents was considered significant to the study because a person's age can influence the kind of decisions and actions he or she can makes or take. The age of the respondents were sought in order to determine the main age group engaged in sheabutter processing and the results are illustrated in Figure 3 below.

Figure 3: Age Distribution of Respondents



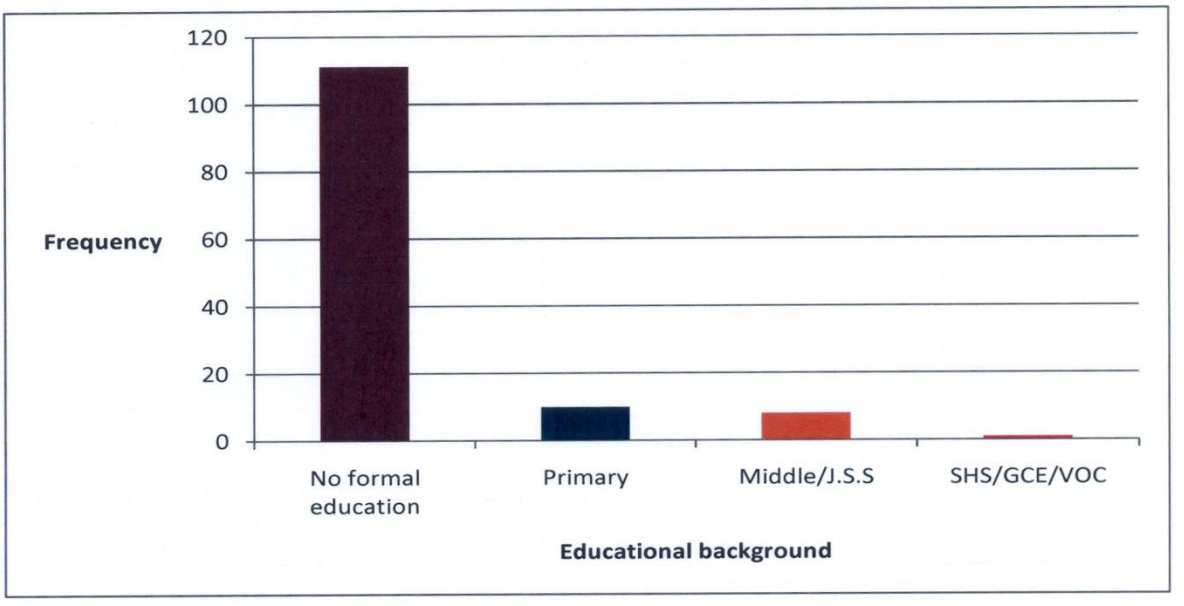
Source: Field Survey, 2010

From the field survey, the results revealed that 32% of the processors fall within the ages of 36-40, 29% falls within 41-50 years and the least being above 50 years. This shows that the shea butter processing activity is dominated by the active youth.

4.1.2 Educational levels

Education is also considered an important factor to the researcher because of the influence it can give on behaviour, attitude as well as understanding of issues such as acquisition of knowledge and skills for personal enhancement and development. For this reason educational background of respondents were sought as illustrated in Figure 4 below.

Figure 4: Education Background of Respondents



Source: Field Survey, 2010

On education, 84% of the respondents had no formal education, only 8% had primary education, 7% middle/JSS education and 1% SHS/GCE/VOC. This clearly shows that the communities are largely illiterate's and may not have enough baseline knowledge on the implications of their activity on the environment. More so, the status quo knowledge system being used by the women makes their work rudimentary and drudgery due to their low levels of education or scientific knowledge.

4.1.3 Marital status and household size

The survey revealed that 89% of the respondents were married, 9% were widows and 2% of them were divorced. Majority of them 47% were living in household size of 9 and more, 33% were living in household size of 7-8 and the least, 20% lived in household size of 1 and 2.These household sizes do not deviate much from the national average of about five (5).

4.2 Household Activities

Shea butter processing offers employment avenues for many women in the study area. Majority of the respondents 80% indicated they process shea butter as a full time job and do not engage in any other business activity because it is a major source of income for them. About 20% of them mentioned that even though they process shea butter as an income source, they also engaged in other activities including farming, petty trading, groundnut processing, dawadawa and rice processing. Shea butter processing is the major occupation and source of income for the women in the study area.

Majority of the respondents 68% were engaged in shea butter processing for ten (10) years and more. About 24% were engaged in shea butter processing for between five (5) and ten (10) years. About 5% were also engaged in the processing since childhood and 3% were engaged in the activity for less than five (5) years.

On the sources of raw material (Shea Kernel) for shea butter processing, 78% of the respondents indicated they buy already processed shea kernel from the market. About 16% of them also indicated they received nuts from shea butter buyers and process for them at a fee. About 6% indicated they pick shea fruits during the shea season and process them into kernel and on a regular basis buy kernel from the market for continuous processing.

mechanised system that could process shea butter. Analyses of field data on information obtained from the respondents are shown in Table 3 below.

Table 3: Processing Methods used at the study area

Processing Methods	Frequency	Percent (%)
Traditional	18	14
Semi-Mechanised	108	86
Total	126	100

Source: Field Survey, 2010

On the differences that exist in resources used in shea butter processing methods in the study area, results of field observation of shea butter processing revealed that the semi mechanised method which is widely used in the area, consumes less water, fuelwood and labour hours in the extraction process compared to the traditional method. During an extraction process of 25kg of shea kernel, processors used 1.9 headloads of water using the semi mechanised method as against 2.5 headloads to process the same quantity of kernel using the traditional method. A similar work by Swetman et al, (1997) indicates that in processing 25kg of shea kernel 2.5 headloads of water was used using the semi mechanised method as against 3.0 headloads using the traditional method. These results are highlighted in Table 1 above and 4(b) below and confirmed majority of the processors (85%) believe that the semi-mechanised method is more suitable in terms of resource maximisation than the traditional method.

The study further revealed that processors using the semi mechanised method need an average 3 hours 22 minutes to process 25kg of shea kernel and those using the traditional method need an

average of 8 hours 5 minutes to process the same quantity of kernel as shown in Table 4(a) below. The result means that the improved processing method offers reduction in processing time, water and fuelwood requirements and these savings will provide benefit to processors as they can engage in other activities and also conserve resources as also illustrated in table 4(b) below.

Table 4 (a): Comparison of time taken to process 25kg of shea kernel using traditional and semi mechanised methods of shea butter processing in Tamale Metropolis

Processes	Traditional	Improved Method
	Time Taken/25kg	Time Taken/25kg
Pounding	60 Minutes	2 Minutes
Roasting	50 Minutes	30 Minutes
Milling	25 Minutes	25 Minutes
Kneading	180-240 Minutes	45 Minutes
Rinsing	30 Minutes	20 Minutes
Boiling	80 Minutes	80 Minutes

Source: Field Survey, 2010

Table 4 (b): Comparison of resources used to process 25kg of shea kernel using traditional and semi mechanised methods of shea butter processing in Tamale Metropolis

Processes	Traditional	Improved Method
	Resources Required	Resources Required
Roasting	Fuelwood (0.4 head loads)	Fuelwood (0.3 headloads)
Kneading	Water (0.5 headloads)	Water (0.4 headloads)
Rinsing	Water (2.0 headloads)	Water (1.5 headloads)
Boiling	Fuelwood (0.5 headloads)	Fuelwood (0.5 headloads)

1 headload = approximately 30kg

Source: **Field Survey, 2010**

Majority of the respondents (86%) also mentioned that they use semi-mechanised method because it gives good and quality oil, uses less labour, less fuelwood and less water as compared to the manual or traditional method of processing. The method according to the respondents also generates less smoke, stress and higher volumes of butter. These results affirm Addaquay's (2004) argument that technological advancement that is from traditional to semi-mechanised processing has led to an improvement in extraction rate from 20%-35% and 40% production efficiency and product quality.

All the respondents indicated that the semi-mechanised method is less effective when there is electricity outage because the crusher and kneader use electricity. Other problems identified by the same respondents for the semi-mechanised method included the cost of electricity bills, cost of maintenance of both the crusher and the kneader and less quality oil if the operator of the kneader is inexperienced.

Eighteen (18) respondents representing 14% said it was rather the traditional method which gives good and quality oil and the use of which is less costly compared with the semi-mechanised method. They, however, also gave a number of problems associated with the method including; more time and labour needed to use the method, consumption of more fuel wood with its implication on deforestation, less volumes of butter is produced per day, generates more smoke and heat because of the different levels of roasting of crushed kernel, boiling of water for kneading and heating of oil. According to the respondents, they easily get tired and stressed using this method.

4.4 Negative Effects of Shea Butter Processing on the Environment

To examine the effects of shea butter processing on the environment, the study focused on the use of fuelwood, water, labour hours and the by-product that is generated during shea butter processing and is either disposed off or kept for use.

Large amount of wood extracted for fuelwood and charcoal in Ghana is yet another reason behind deforestation which can affect the country's ability to house a large Carbon Sink to absorb emissions and store large quantities of Carbon for extended periods of time. Fuelwood remains the sole source of domestic fuel for an overwhelming majority of Ghanaians and specifically Tamale. About 90% of households in Ghana rely on traditional biomass (fuelwood and charcoal) as the

primary fuel for domestic cooking and other productive activities (UNDP, 2006). Shea butter processing is one of the activities that use so much fuelwood in Tamale. From a survey of 126 processors 87% indicated they use fuelwood as the only source of energy for shea butter processing as shown in Table 5 below. About 13% also indicated they use gas to process shea butter.

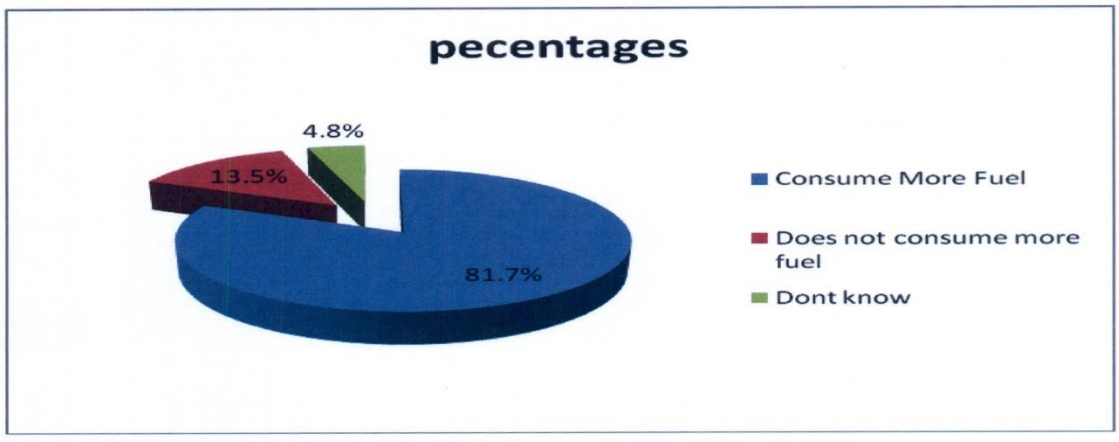
Table 5: Respondent Sources of Energy

Source of Energy	Frequency	Percent (%)
Fuel wood	110	87.3
Gas	16	12.7
Total	126	100

Source; Field Survey, 2010

The large use of fuelwood by shea butter processors which is supported by figure 5 below and appendix v does not only contribute to the degradation of the forest resources. It also denies Ghana an opportunity to maintain forest as an important component of adaptation strategies needed to address continuing changes in the natural resource base that sustains people livelihoods. It further denies the country the opportunity to house a large Carbon Sink to absorb emissions and store large quantities of Carbon for extended periods of time.

Figure 5: Shea Butter Processing Fuel wood Consumption



Source; Field Survey, 2010

From the survey, majority of the respondents (82%) indicated shea butter processing consumes a lot of fuelwood as shown in figure 5 above. In Table 5, the 87% of respondents, who indicated they use fuelwood to process shea butter, mentioned that they get their fuelwood from agents who bring them from outside the Metropolis. They were quick to mention the Yendi and West Mamprusi Districts as some of the areas their agents get fuelwood for them.

An interview with Afa Nasiru, a fuelwood supplier in the Metropolis confirmed that fuelwood could not be gotten from the Tamale Metropolis because of the depletion of almost all the tree resources and the few being protected by chiefs and land owners.

Another interview with an official of the Forestry Service Division in Tamale revealed that through rigorous policing and the use of threat of punishment, many people have over the years stayed away from excessive destroying of the forest reserves for commercial fuelwood activities.

The officer also mentioned that some people still gather fuelwood from the forest from dead trees.

The 87% of shea butter processors who use fuelwood in the extraction process added that they sometimes get dehydrated as a result of getting exposed to fire and this normally lead them to sicknesses such as headache and fever. They further revealed that their environments get polluted and indoor air quality reduced by smoke and roasted kernel as shown in appendix iii.

Water is taken for granted, wasted in many of our daily activities, and we even pay to drink it from little plastic bottles. It is very important and is associated with many of our daily activities including shea butter processing. Shea butter processing is an activity that cannot be done without water no matter the method of processing that is used. All shea butter processors covered by the study revealed they use pipe water to process their product as seen in Table 6 below.

Table 6: Respondents Source of Water for Processing Shea Butter

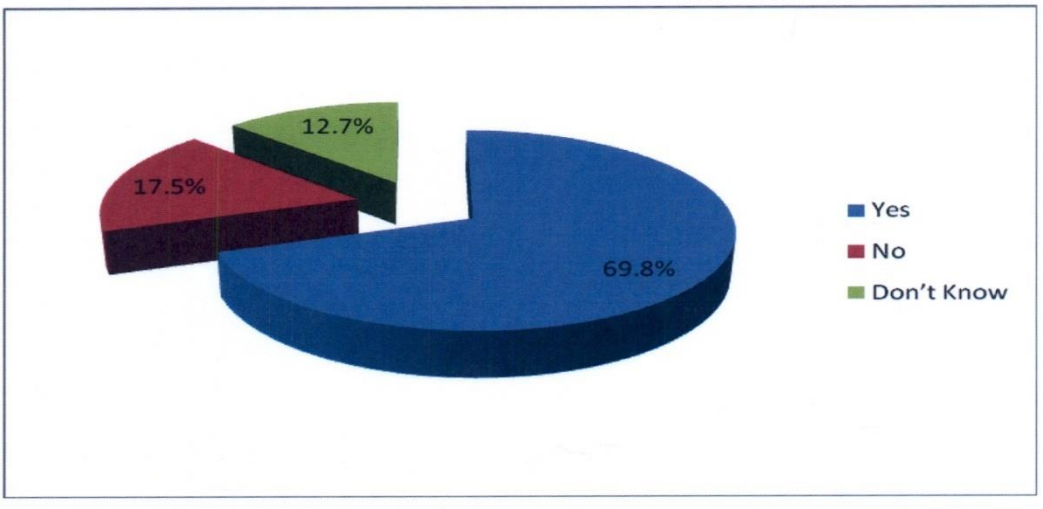
Source of Water	Frequency	Percent (%)
Pipe	126	100
Total	126	100

Source; Field Survey, 2010

Two methods are used by shea butter processors in the study area. The traditional and semi-mechanised method of shea butter processing as shown in Table 3. Both methods use water during the extraction process. Field observation in the study revealed that processors used 2.5 headloads of water to process 25kg of shea kernel, shown in Table 4(b), and in using the same quantity of kernel with the semi-mechanised method 1.9 headloads of water was used. This means that no matter the method used by processors water is consumed but with minimum

quantity when the semi-mechanised method is used. In figure 6 below the study further revealed that about 70% of the respondents think shea butter processing consumes more water. About 18% of the respondents also indicated shea butter processing does not consume more water and 12% were uncertain about the consumption of water by shea butter processing.

Figure 6: Perception of the Use of Water for Shea Butter Processing



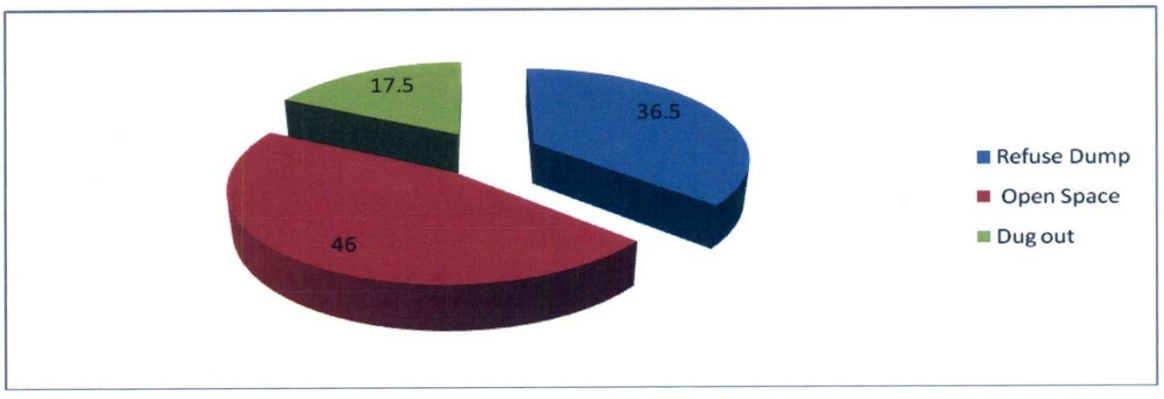
Source; Field Survey, 2010

Shea butter processing also results in the generation of two types of by-products; waste brown water and waste black sludge. The waste brown water is normally disposed off and the waste black sludge is dried in the compound for further use.

The study revealed that 46% of the processors disposed off the waste brown water in open spaces. About 37% disposed off this by-product in refuse dumps and about 18% of the respondents do their disposals in dug outs as shown in figure 7 below and appendix i. Respondents who indicated they disposed off the waste brown water in open spaces added that, continuous disposal of the waste at the same location prevents plants from germinating because

of the oil content in the waste. That it also kills existing plants and changes the soil colour, texture and structure.

Figure 7: Disposal of shea by-product



Source; Field Survey, 2010

4.5 Positive Contributions of Shea Butter Processing on the Environment

Waste black sludge and waste deep brown water were the agreed by-products that come out during shea butter processing. From the field observation it was revealed that, when the fat is creamed during kneading, water is added and stirred to facilitate the separation of fatty cream from unwanted materials. The cream is scooped and washed. The water used in stirring and washing the cream becomes deep brown. When the creamy fat is boiled, a thick black substance (sludge) settles at the bottom. All the respondents indicated that these two by-products have both positive and negative effects on the environment. That is, with the positive effects of shea butter by-products on the environment, 68% of the respondents indicated that they used it as a source of energy during processing and other household cooking. This, according to the respondents, helps them in terms of the cost they incur in procuring both Kerosine and Fuelwood for lightning and

other activities. According to Wallance-Bruce (1995), the sticky black residue, which remains after the clarification of the butter, is use as a substitute for kerosene when lighting firewood.

They revealed that the waste black sludge does not only minimise the rate at which they buy fuelwood but also good for the environment as less of it is depleted for fuelwood. About 18% of the respondents also indicated they preserve the 'waste brown water' in dug out as shown in appendix i for the use by their husbands in the preparation of compost manure for their crops shown in appendix vi. They mentioned that due to the high cost of chemical fertilizer, their husbands take advantage of the by-product to minimise the cost burden of input fertilizer. About 6% of the respondents mentioned they use the waste black sludge to mend their buildings and the waste brown water to paint them as shown in appendix vii. During shea butter processing, a residual meal which is one of the by-products is generated and use as an agent to repair and mend cracks in walls of mud huts, windows, doors and traditional beehives to protect them from rain (Fluery, 1981). Field data on uses of shea butter by-products is shown in Table 7 below.

Table 7: Uses of Shea butter by-products

Uses Of By-Product	**Frequency**	**Percent (%)**
Source of energy for processing and other household use	86	68.3
Organic Manure	22	17.5
Painting and mend walls	8	6.3
Binding agent for plastering	4	3.1
Feed for small ruminants	6	4.8
Total	**126**	**100**

Source: Field Survey, 2010

From the findings, there is a realization that not only does shea butter by-product support processors and their families' in terms of alternative energy source, fertilizer, cement and paint but also reduced pressure on the environment as rate of depletion is minimised by the use of the by-product.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

The study set out to examine the effects of sheabutter processing on the environment in the Tamale Metropolis, and was guided by three objectives which were: to examine the differences that exist in resources used in shea butter processing methods in the study area, to examine the effects of shea butter processing on the environment in Tamale Metropolis and to provide policy recommendations based on the findings of the research to improve upon the environmental situation in the Tamale Metropolis.

The study revealed that majority of shea butter processors in the study area use the semi-mechanised method of shea butter processing. The reason is that, the method is more suitable in terms of resource maximisation as compared to the traditional method of processing which is also known in the area.

The study also revealed that Shea butter processing consumes a lot of water and competes seriously with the domestic use of water at a time when water is being rationed at the study area. It was gathered that both methods known and used in shea butter processing in the study area consumes water, the traditional or manual processing method consumes more as compared with the semi-mechanised or automated method.

Majority of shea butter processors in the study area use fuelwood for shea butter processing and other domestic activities. This resource is a major energy source for the processors even though they supplement it with the by-product and with the two methods used, the traditional or manual

method consumes more fuelwood than the semi-mechanised or automated method because of the type of cooking stoves used and the different levels of burning. The study further revealed that fuelwood used in the study area contributes to the deforestation in Yendi and West Mamprusi Districts of the Northern Region and deny Ghana the opportunity to house a large Carbon Sink to absorb emissions and store large quantities of Carbon for extended periods of time thereby reducing the effects of climate change.

The findings also revealed that even though shea butter processing has some negative impacts on the environment, it also presents a lot of benefits for the people in the study area. Aside the income they derive from the activity, they make good use of the by-product which results from the processing. It serves as an energy source for processing shea butter and other domestic activities. It is used in the preparation of compost manure for crops and to paint houses after it is used to mend crack in walls.

5.2 Conclusions

The study revealed that the semi-mechanised method of shea butter processing is preferred by majority of processors in the study area because of its resource maximisation and environmental friendliness.

The study also revealed that, shea butter processing has both positive and negative effects on the environment in the Tamale Metropolis. On the positive aspects, aside the income shea butter processors get from the activity, the by-product that come out of the processing is used for many things including as energy source for processing shea butter and other domestic activities, used in the preparation of compost manure for crops and also used to mend cracks in walls and paint buildings.

The negative aspect had to do with the large volumes of water used in processing shea butter which competes with other domestic uses of water. This draws a lot of criticisms and complains from people about the way shea butter processors use water in communities where people queue to fetch water from public stand pipes amid water rationing by the Ghana Water Company.

Shea butter processing also consumes a lot of fuelwood and encourages fuelwood producers to produce more to meet the demands of shea butter processors. Even though processors buy fuelwood from agents who bring this product from outside the study area, it still denies Ghana the opportunity to house large Carbon Sink to absorb emissions and store large quantities of Carbon for extended periods of time thereby reducing the effects of climate change.

5.3 Recommendations and Suggestions for Further Research

From the research findings the following policy recommendations are made for consideration and adoption in order to promote the activities of shea butter processing and also ameliorate the adverse effects of it on the environment in the Tamale Metropolis.

Shea butter processing is a livelihood source for majority of people in the study area, as such efforts should be made by government and stakeholders in the water sector for continuous and uninterrupted water supply to all parts of the Tamale Metropolis. Underground water could also be explored for boreholes to be sunk to supplement pipe borne water that is rationed to the people.

The Forestry Service Division should collaborate with the Environmental Protection Agency and the Ghana Police Service for the enforcement of regulations on natural resource utilization in the country. This will help in minimizing the destruction of the forest resources of the country.

Government should subsidise liquefied petroleum gas (LPG) and make it available to shea butter processors so as to minimise their over dependence on fuel wood as source of energy.

Government and the private sector should explore the possibility of developing the shea by-product (black sludge) into a good source of energy for both domestic and commercial use in the country.

Further laboratory research is recommended for determining how shea butter by-product could be maximised for agricultural use to help the peasant farmers.

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APPENDICES

Appendix i: A pit for shea butter by-product for compost preparation at Vittin

Appendix ii: Using shea butter by-product to prepare compost at Sagnarigu

Appendix iii: Boiling of oil at Katariga

Appendix iv: Focused group discussion session and manual kneading of paste in a group at Kanvilli

Appendix v. Fuelwood at a Shea Butter Processing Center, Gurugu

Appendix vi. A backyard garden at Sagnarigu with shea waste used in the preparation of compost

Appendix vii. Shea waste brown water used to paint a house at Kanvilli

UNIVERSITY FOR DEVELOPMENT STUDIES

CENTER FOR CONTINUING EDUCATION AND INTER-DISCIPLINARY RESEARCH (CCEIR)

INTERVIEW GUIDE ON:

Effects of Sheabutter Processing on the Environment in Tamale.

Introduction:

This is a study conducted by a graduate student of Center for Continuing Education and Inter-Disciplinary Research, University for Development Studies in fulfillment of his M.A. programme in Environmental Security and Livelihood Change.

I therefore appeal to you to answer the following questions as candidly as

possibly. Please be assured that your responses will be treated with utmost

confidentiality. Thank you in advance for your cooperation.

Name of interviewer ..... ……..

Community..... ……

Date……..

Instructions:

1. Where alternatives have been provided ring the code number only.

2. For other questions write your answer in the space provided.

SECTION A

SOCIO-DEMOGRAPHIC DATA

1. How old are you?.....

2. Educational Background

(a) No formal education

(b) Primary

(c) Middle/JHS

(d) SHS/GCE/VOC

3. Marital Status:

(a) Single

(b) Married

(c) Widowed

(e) Separated

(0) Divorced

(g) Others

4. What is the size of your household?

(a) 1-2

(b) 3-4

(c) 5-6

(d) 7-8

(e) 9 and above

SECTION B

HOUSEHOLD ACTIVITIES

5. Do you engage in shea butter processing as a full time job?

(a) Yes
(b) No

6. Apart from shea butter processing mention any other activity you do?

(a)……..

(b).....

(c)……

7. How long have you been engaged in the shea butter activity?

(a) Since childhood days

(b) Ten years and more

(c) Between five and ten years

(d) Less than five years

8. Where do you get you raw materials from (shea kernel)?

(a) Collect shea fruits from the wild and process into nuts

(b) Collect shea fruits for processing into nuts and buy more nuts and add

(c) Buy shea nuts from the market
(d) Others, specify……

SECTION C
SHEA BUTTER PROCESSING METHODS

9. Which of the following shea butter processing methods do you use?

(a) Traditional method (the use of simple tools in the entire process)

(b) Semi-Mechanised Methods

(c) Full- Mechanised Method

10. Which shea butter processing method uses less fuel wood, water and labour hours?

(a) Traditional method (the use of the hand in the entire process)

(b) Semi-Mechanised Methods

(c) Full- Mechanised Method

11. What other shea butter processing method do you know?

.....

.....

12. What problem do you encounter with the method you use?

.....

.....

.....

.....

SECTION D

HARMFUL EFFECTS OF SHEA BUTTER ON THE ENVIRONMENT

13. Is the scent/smell generated from shea butter processing good or bad for you?

(a) Yes

(b) No

14. Will you live in areas where they process shea butter?

(a) Yes

(b) No

15. Please provide explanation for choosing any of the options in (14) above

.....

.....

16. Do you feel sick for getting exposed to the scent/smell generated from shea butter processing?

(a) Yes

(b) No

17. Do you feel sick for processing shea butter?

(a) Yes

(b) No

18. If your answer is yes what do you think causes your sickness?

(a) Smoke

(b) Scent/Smell

(c) Heat/Fire

(d) Stress/Tiredness

19. Have you ever received complaints from people in your neighbourhood about the scent/smell generated from shea butter?

(a) Yes

(b) No

20. If yes what do they complain about?

(a) Heat
(b) Smoke
(c) Scent/Smell
(d) Others, mention.....

21. Where do you draw you water from?

(a) River
(b) Dam/Dugout
(c) Pipe borne water
(d) Stream

22. What volume of water do you use to process one bag of shea kernel (85kg)?
.....
.....

23. Do you pay for the water you use in both processing and domestic?

(a) Yes

(b) No

24. If yes how much and for what quantity?

.....
.....

25. Do you think you pay so much for water during shea butter processing?

(a) Yes

(b) No

26. Do you have enough water for your domestic use?

(a) Yes

(b) No

27. Where do you dispose off the by-products from shea butter processing?

(a) Rubbish dump
(b) Open area
(c) Backyard
(d) Dugout/Pit

28. What changes do you see after continuous disposal of the by-product on plants and the soil?

(a) Plants are killed
(b) Changes soil colour
(c) Cover top soil and prevent plants germination
(d) Other, mention……

29. Has the by-products from shea butter processing any use?

(a) Yes

(b) No

30. If your answer to 30 is yes what are the uses?

……

……

……

……

……

31. What source of energy do you use in the shea butter production process?

(a) Fuelwood
(b) Charcoal
(c) Gas
(d) Electricity

32. What quantity of fuel wood do you use and at what cost to process one bag of shea kernel?

.....

.....

33. Does shea butter processing consumes a lot of fuel wood?

(a) Yes

(b) No

34. Please provide explanation for any of the options choosing?

.....

.....

.....