NKUMBA UNIVERSITY

ASSESSMENT OF SHEA NUT TREE (*Vitellaria Paradoxa*) CONSERVATION AND ITS ECONOMIC VALUES: A CASE STUDY OF AJAN SUB COUNTY, ARUU NORTH COUNTY PADER DISTRICT

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Declaration

I, Okello Francis, hereby declare that this research project titled "**Assessment of shea nut tree (*Vitellaria Paradoxa*) conservation and its economic values in Ajan Sub-County- Pader District**" is my original work and to the best of my knowledge, it has not been submitted to any institution for any award.

Signature..... Date: 15/10/2026

Approval

This is to certify that this dissertation titled "**Assessment of shea nut tree (*Vitellaria Paradoxa*)" conservation and its economic values"** has been done under our supervision and is ready for sub-mission to the **School of Sciences** of Nkumba University for consideration.

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Dedication

I dedicate this dissertation to God the Almighty who makes all things possible, my sister Aol Beatrice Omaya, my wife Natukunda Sylivia and my children for financial and moral support and all the authors cited in this project for their inspiration that ensured that this dissertation was completed.

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Table of contents

Approval ..... **Error! Bookmark not defined.**
List of acronyms x
CHAPTER ONE: INTRODUCTION 1
1.0 Introduction 1
1.1 Background 1
1.3 Objectives 14
1.3.1 Main objective 14
1.3.2 Specific objectives 14
1.4 Research questions 15
1.5 Scope of the study 15
1.5.1 Content Scope 15
1.5.2 Geographical Scope 15
1.6 Justification of the study 15
1.7 Significance 16
CHAPTER TWO: LITERATURE REVIEW 19
2.0 Introduction 19
2.1 Major threats facing shea nut tree and how to overcome them 19
2.2 Conservation practices of shea nut tree 30
2.3 Economic benefits of shea nut tree products among households 35
2.3 Other benefits (nutritional, ecological, medicinal, cultural) 41
2.3.1 Nutritional benefits 41
2.3.2 Ecological benefits 43

2.3.3 Medicinal benefits 44
2.3.4 Cultural benefits 46
CHAPTER THREE: METHODOLOGY 48
3.0 Introduction 48
3.1 Study area 48
3.2 Research design 50
3.3 Study population 50
3.4 Sampling size 51
3.5 Sampling procedure 51
3.6 Data collection methods 52
3.6.1 Questionnaire Survey 52
3.6.2 Interview method 53
3.6.3 Direct Observation 53
3.6.4 Focused Group Discussion (FGD) 53
3.7 Data collection Instruments 54
3.7.1 Interview Guide 54
3.7.2 Questionnaire administration 55
3.7.3 Focus group discussion guide 55
3.7.4 Document review 56
3.8 Validity 56
3.9 Reliability 56
3.10 Data processing 56
3.10.1 Editing 57
3.10.2 Coding 57
3.10.3 Data Entry 57
3.10.4 Data Cleaning 57
3.10.5 Data analysis preparation 57
3.10.6 Qualitative data processing 58
3.11 Data analysis 58
3.12 Limitations of the Study 58
3.13 Ethical considerations 59
CHAPTER FOUR: ANALYSIS AND PRESENTATION OF RESULTS 61
4.0 Introduction 61
4.1 Response rate 61
4.2 Demographic Characteristics of the respondents 61
4.3 Presentation of results according to objectives 67

4.3.1 Evaluation of the major threats facing the shea nut tree in Ajan Sub-County. 67
Age group active in cutting shea nut trees 69
4.5 To examine the current conservation practices of Shea nut tree species in Ajan Sub-County. 72
4.5.1 Key players in conservation of shea nut trees 74
4.6 Assessment of the economic benefits derived from Shea nut tree products among households in Ajan Sub-County. 75
Economic benefits of shea nut tree to households 75
Comparison of income from shea products and other economic activities 80
4.6.2 Other benefits of shea nut tree 81
4.6.2.1Nutritional benefits 82
4.6.2.2 Ecological benefits of shea nut trees 82
4.6.2.3 Medicinal benefits of shea nut tree 84
4.6.2.4 Cultural benefits of shea nut trees 85
4.7 Collection of shea nuts 85
4.8 Contribution to Processing of shea nut butter oil 86
CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS 87
5.0 Discussions 87
5.1 Major threats facing the shea nut tree and how to overcome them in Ajan Sub-County. 87
5.2 Examination of the current conservation practices of the Shea nut tree in Ajan Sub County. 95
5.3 Assessment of the economic benefits derived from Shea nut tree products among households in Ajan Sub-County. 100
5.4 Conclusion 114
5.6 Recommendations 115
Appendix 1: List of references 117
Appendix 2: Research questionnaire used 124
Appendix 3: Observation checklist 128

List of tables

Table 3.1: Sample size……...……..51
Table 4.3.1: Major threats facing shea nut tree……..……..67
Table 4.2: Current shea nut tree conservation practices in Ajan Sub-County……...…72
Table 4.3: Income levels of households……..….76
Table 4.4: Income obtained from shea nut products in season…….……..…76
Table 4.5: Other economic activities as source of income to households…….77
Table 4.6: Economic benefits of shea nut tree to households……...…77
Table 4.7: How money obtained is spent by households in season…….74
Table 4.8: Benefits of shea nut to government…….…79
Table 4.9: Comparison of income from shea products and other economic activities…..…....80
Table 4.10: Ecological benefits of shea nut tree species……..….82

List of figures

Figure 1.1: Conceptual framework……...…….……18
Figure 3.1: Map of Pader in Uganda and Ajan in Aruu, Pader District……49
Figure 4.1: Response rate……..61
Figure 4.2: Gender characteristics……..…..62
Figure 4.3: Age characteristics of respondents……..63
Figure 4.4: Education characteristics of respondents…….……...64
Figure 4.5: Profession of respondents…….……..……65
Figure 4.6: Occupation of respondents…….……...…..66
Figure 4.7: Age groups active in cutting shea nut trees……...……...70
Figure 4.8: Other benefits of shea nut tree to households……..81
Figure 4.9: Medicinal benefits of shea nut tree……...……...84
Figure 4.10: Shea nut collectors……...……...85
Figure 4.11: Contributors to shea butter oil processing……....86

List of acronyms

ALCODE	Agency for Local Community Development
A'level	Advanced level of secondary education in Uganda
CBNRM	Community-based natural resource management
CSO	Civil Society Organizations
ESAFF	Eastern and Southern Africa Small-Scale Farmers Forum
FGD	Focus group discussions
M.A	Missionaries of Africa (White Fathers)
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
O'level	Ordinary level of secondary education in Uganda
RPP	Rippe Pi Paco
UBOS	Uganda Bureau of Statistics
UGX	Uganda Shillings Currency
UNDRR	United Nations Agency for the Coordination of Disaster Risk Reduction
UNDP	United Nations Development Programme
UPDF	Uganda People's Defense Force
USD	United States Dollars

Abstract

The study on the assessment of shea nut tree species (*Vitellaria Paradoxa*) conservation and its economic values was carried out in Ajan Sub County, Aruu North County of Pader District located in Northern Uganda. It aimed at evaluating the major threats facing shea nut tree and how to overcome them, examining the current conservation practices of shea nut trees and assessing the economic benefits derived from shea nut tree products among households in Ajan Sub County, Pader District.

The study employed a cross-sectional study design that used both quantitative and qualitative approaches of data collection. A total of 150 respondents participated in the study. The study used questionnaires, interview guide, observation guide, Focus Group Discussion and review of existing literature to collect data. The data collected was analysed using Statistical Package for Social Scientists (SPSS) software version 22.0 and descriptive statistical methods to address the three research objectives.

The study found out major threats facing shea nut trees to include over cutting of shea nut trees, negative effects of intended annual bush fires, weak conservation law enforcement, population increase, emerging land uses, pests and diseases, effects of climate change and negative attitude of people in conservation of shea nut trees. The conservation practices being implemented were mainly community sensitisation, enforcement of by-laws, community engagement, adoption of smart climate agriculture and use of cultural taboos. Economic benefits derived from shea nut tree products were among others increased household income, payment of school fees,

purchase of household items, improved standard of living as well as nutritional, ecological, medicinal and cultural benefits.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter covers the research project on an assessment of shea nut tree (*Vitellaria Paradoxa*) conservation and its economic values, background, statement of the problem, objectives of the study, outline of the research questions, justification and significance of the study.

1.1 Background

1.1.1 Historical Background

Sabre et al (2026), the Scientific name *Vitellaria Paradoxa* and formerly *Butyrospermum Paradoxa* come from the butter which is the most important part of the seed and mostly used for food. Its German name "Shea-butter" was subsequently used for the whole tree by the German botanist Heinrich Friedrich Link (1767-1851) in 1841. In 1927, a commercial pharmacist Karl Hugo Stahl from Schwelm (Germany) published a book about medicinal and aromatic substances from the tropics.

According to Wardell (2013), pre-colonial patterns of trade in West Africa included exchanges of shea in periodic local and regional markets. The collection, processing and marketing of shea products in such markets continues to be predominantly by women to both meet subsistence needs, and exchange of surpluses. Wardell (2013), further asserts that in the early part of the 20th century, the British colonial administration considered the possibilities of starting large-scale exports of shea kernels to Europe.

Wardell et al (2021), After Burkina Faso's independence, shea butter continued to be the key staple edible oil used by Burkinabe households although alternatives are now being placed in local markets. Wardell et al (2021), Shea (*Vitellaria Paradoxa* C.F. Gaertn.) is primarily managed as a food tree crop for African consumers but has been promoted as a wild and abundant crop which gives African women cash and empowerment. New international demand for edible Cocoa Butter Equivalents (CBEs) from the 1960s onwards led to the introduction of several state-led efforts to regulate and control the shea trade through stabilization funds and parastatal marketing boards. These were abandoned after 1984, when cocoa prices collapsed and shea markets were liberalized. Wardell et al (2021), further note that increasingly since 2003, several leading Trans-National

Corporations that manufacture CBEs are involved in sourcing shea kernels to meet the growing demands of the multi-billion-dollar confectionary and cosmetics industries. Burkina Faso and Ghana are two of the main exporting countries producing 60% - 75% of all international shea offtake. West, Central and East African women shea collectors and their associations have also managed, more recently, to meet the growing demand for 'hand-crafted' shea butter for the global personal care sector and new niches in the edible oil industry. Attempts to explain the radical transformation of shea supply chains in West Africa have focused on relatively recent events and actions detached from the broader historical context in which they are embedded.

According to Sabre et al (2026), shea (*Vitellaria Paradoxa* C.F. Gaertn.) is a flagship tree of the Sudanian-Sahelian savannas of Africa, used since the Neolithic for its nutritious fruits and multipurpose butter with food, cosmetic, and medicinal applications. Its natural distribution spans from Senegal to Sudan, including Chad, where it occurs in several provinces and local morphotypes, reflecting high intraspecific diversity.

According to Wardell and Niels (2013), historical evidence indicates a widespread and centuries old exchange of shea kernels and shea butter on a regional scale in West Africa, not only between producing and non-producing areas but also internally in producing areas due to seasonal variations in supply. In the early part of the 20th century, the British (and French) colonial administration considered the possibilities of starting large-scale exports of kernels to Europe. Multiple initiatives were not successful. After the Second World War new technological developments in the fats and oil industry demonstrated the value of shea butter in the production of so-called cocoa butter equivalents (CBEs), components used by the chocolate industry as a cheap alternative to 'real' cocoa butter made from cocoa beans predominantly after the 1990s. Wardell and Niels (2013), in some of the EU-countries the use of CBEs in chocolate production was restricted but recently its use has been legally endorsed and demand for shea butter is expected to increase, not only in the EU but also in terms of broader global trade.

Historical patterns of local, regional and international trade in West Africa pre-date the arrival of the Portuguese on the West African coast in the 15th century (Brooks 1993; Wilks 1961; 1971, 1982; Hopkins 1973). The ebbs and flows of the dominant commodities exchanged during the last five hundred years have been determined by a complex web of social, cultural, religious, economic

and ecological factors across the region (Fage 1969; Daaku 1970; Dumett and Johnson 1988; Webb 1995). These, in turn, were influenced by the larger framework of the world economy, progressive improvements in transport and communications technology, and the influences of fluctuating demand and commodity prices. It was, for example, the opening up of new maritime markets in West Africa after the Portuguese trading monopoly was overthrown in 1642 which resulted in the progressive decline in trans-Saharan trade in gold by the late 17th century. A multitude of short distance commercial networks and longer distance trading relationships have continually forged linkages between local, regional and global trade (Newbury 1972). Furthermore, long-distance trade was possible long before the advent of colonialism as common monetary units such as gold standards and cowries existed, and trade relays involved multiple exchanges and modes of transport – camels, donkeys and human porterage – in different ecological zones (Webb 1995). Elaborate decentralised networks of commercial alliances were maintained as trade routes changed and new loci of commercial centers emerged. Some scholars have highlighted the persistence of local and regional trade in, for example, salt (Sutton 1981), kola nuts (Lovejoy 1980; Abaka 2005), and shea nuts (Chalfin 2004a).

European trade was largely confined to the West African littoral until the early 20th century. It was nurtured, initially, by African middlemen and European firms who operated as personalized oligarchic semi-monopolies. Wardell and Niels (2013), a significant expansion in the export of bulk commodities from, and bulk imports to West Africa occurred during the 19th century (Davies 1976; Arhin 1980). This period – often characterised as the era of 'legitimate trade' after the abolition of slave trading (Mcsheffrey 1983) – was dominated by the growth of trade in palm oil and palm kernels in exchange for imported cloth, guns, gunpowder, iron, salt and rum (Brooks 1970; Chamberlain 1979). The transition to bulk exports was facilitated by falling prices for bulk steamship transport, the advent of the telegram, and growing demand for raw materials amongst the new industrial economies of Europe. This era did not involve any major economic, political or social disruptions in the region; external trade had already proved to be profitable and offered the most favourable sources of credit. The credit or trust 'system' expanded and as Newbury has noted *"*Cash sales ... also increased, but did not displace the advance of bulk stocks against supplies of kernels and oil, ivory, cotton and shea butter" (Newbury 1972, 93).

1.1.2 Conceptual Background

The conceptual background of the shea nut tree (*Vitellaria Paradoxa*) focuses on its dual role as a crucial ecological pillar of sub-Saharan savannas and a vital cash crop supporting millions of rural livelihoods. It is heavily researched for its socio-ecological, economic, and botanical value.

According to Sapotaceae (2009), *Vitellaria Paradoxa* is a small to medium-sized tree (min. 7) 10-15 (max. 25) m high; much branched, dense, spreading, round to hemispherical crown. In mature trees the bole is short, usually 3-4 m but exceptionally 8m, with a diameter ranging from 0.3 to 1 m, but most frequently 0.6 m. The bark conspicuously thick, corky, horizontally and longitudinally deeply fissured; protects older trees against bush fires. Slash pale pink, secreting white latex, as do broken twigs or petioles. Leaves in dense clusters, spirally arranged at the end of stout twigs. Juvenile leaves rust-red and pubescent, later coriaceous, glabrous and dark green, shining, 12-25 cm long and 4-7 cm wide, leaf margin wavy and bent. The flowers develop in the axils of scale leaves, at the extremities of dormant twigs, from buds formed 2 years previously. Inflorescence a dense fascicle 5-7.5 cm in diameter, at the end of a flowering twig, each usually containing 30-40 flowers, though 80-100 have been recorded. Individual flowers white or creamy-white, about 1.5 cm in diameter and subtended by scarious, brown, ovate or lanceolate bracteoles, which are abscised before flower opening. Fruit 5-8 cm long and 3-4 cm wide

For Djekota et al (2014), the semi-domesticated shea butter tree (*Vitellaria paradoxa* (C.F. Gaertner) syn. *Butyrospermum parkii* (Kotschy), *Butyrospermum Paradoxum* (C.F. Gaertner) Hepper, Family Sapotaceae) is wildly distributed in the Sudano-Sahalian region from Senegal to Uganda (Hall et al., 1996; Hemsley, 1968; Salle et al., 1991). Presently two subspecies have been identified. *V. paradoxa* subsp. *paradoxa* is found in West and Central Africa (Hall et al*.,* 1996; Salle et al., 1991; Sanou et al*.,* 2005; Fontaine et al*.,* 2004; Allal et al*.,* 2008; Nyarko et al*.,* 2012; Kelly et al*.,* 2004), while *V. paradoxa* subsp. *nilotica* is common in East Africa (Soudan, Ethiopia, Uganda and Republic Democratic of Congo) (Gwali et al., 2012; Okullo et al*.,* 2004; Byakagaba et al*.,* 2011; Okiror et al*.,* 2012). The tree shape is influenced by various environmental factors and they are well identified by farmers according to the folk classification. During the wet season, the tree produces fruits edible by both human and animals. The fruits contain 1 to 3 large solitary seeds, rich in fat and oil used in a variety of purposes such as cooking (Abbiw, 1990), medicinal,

hair and skin ointments and as a base for industrial manufacture of confectioneries (Cidell and Alberts, 2006). The oil is also used in traditional and social rituals such as marriages, funerals, coronations and rainmaking (Ferris et al., 2004; Gwali et al., 2012; Hall et al., 1996; Moore, 2008). The wood of the shea butter tree is used for charcoal, furniture and construction, and the latex for glue making (Lovett and Haq, 2000a). In addition, the trees are used in agroforestry systems that play an important role in the adaptation to climate change such as contribution to soil fertility (Rao et al., 2007). For these reasons, shea butter tree generates significant incomes for households.

The life cycle of *Vitellaria Paradoxa* is prolonged and characterized by two significant periods related to predation and the provision of forest fuel (Sabre, 2026). The species is considered endangered, and international conservation programs recognized by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) impose trade restrictions on its fruits and nuts. it is a slow growing tree with a long juvenile phase. It begins bearing fruits after 10-25 years and can produce nuts up to 200 – 300 years. From nearly 4300 years ago, the shea sector has supported livelihoods across sub-Saharan African through butter production (Lovett, 2004; Bello-Bravo et al. 2015). In 2003, it was estimated that more than two million people were involved in shea sector in SSA (Bup et al., 2014): women and children who are responsible for nut collection and oil extraction; merchants and middlemen in charge of bulking, transporting and retailing shea produce; and processors and exporters who undertake value addition and cross-border trade (CFC, 2002; Wardell & Fold, 2013; Bello-Bravo et al. 2015). Similar to other export-oriented products, the value of shea drastically changes along the chain and results in divergent profit margins among actorsan issue that continues to raise concern in the sector (Gereffi et al., 2001; Rousseau et al., 2015).

Sapotaceae (2009), The shea tree is a light-demanding species of open sites and parkland savannah; forming extensive pure stands in some areas but often also associated with other trees, such as Parkia biglobosa (nere). Avoids swampy areas, those liable to flooding for any length of time, moist heavy loam soils or watercourses. The extensive root system is essential for survival in the 5-7-month dry seasons of savannah climates. Can withstand quite severe fires.

1.1.3 Theoretical Background

This study was guided by the Sustainable Livelihoods Framework (SLF), developed by the UK Department for International Development (DFID, 1999). The framework explains how households utilize available natural, financial, human, physical, and social resources to improve their livelihoods while responding to environmental and economic challenges.

According to the Sustainable Livelihoods Framework, natural resources such as the shea nut tree constitute natural capital that supports household income, food security, employment, and overall well-being. Sustainable conservation of these resources enables communities to continue benefiting from them over the long term, while unsustainable exploitation leads to resource depletion, reduced household income, and environmental degradation. The framework further recognizes that institutions, policies, and community practices influence how natural resources are accessed, managed, and conserved.

The theory is relevant to this study because it provides a basis for examining how conservation practices influence the availability of shea nut trees, how households derive economic benefits from the species, and how various threats affect the sustainability of both the resource and local livelihoods in Ajan Sub-County, Pader District. The findings will contribute to understanding how effective conservation can enhance environmental sustainability while improving household economic welfare.

Lovett (2015), states that shea butter, also known as Karité butter, is a natural fat that is the primary product of shea nuts. It is widely used in various food and cosmetics applications. Shea nuts are produced by shea trees that almost exclusively grow in sub-Saharan Africa's 'shea belt', which ranges from Senegal in the west to Uganda in the east. Main producers are mostly located in West Africa; Ghana, Togo, Benin, Western Nigeria, Burkina Faso, Mali, and Côte d'Ivoire. Shea is also found in Central and East African countries like Chad, Central African Republic, South Sudan, Cameroon, Uganda, Ethiopia, Congo, and Eastern Nigeria. However, these regions are currently less developed for export (Lovett, 2015).

Furthermore Lovett (2015), asserts that in recent years, European consumers have become familiar with shea primarily through its depiction on cosmetic labels. However, only 10% of the total

volume of exported shea is used in cosmetics, while the food industry uses the remaining 90%. Shea comes in two main varieties: *Shea Nilotica* and *Shea Paradoxa*. Shea Nilotica, found in East Africa, is soft and creamy with a light texture, making it popular in cosmetics. It has a mild scent and is easy to spread on the skin. On the other hand, Shea Paradoxa, from West Africa, is harder and has a strong nutty aroma. This is the variety that is more commonly used by the food industry (Lovett, 2015).

Manne (2025) reports that (according to data from Tridge), the world's top 10 shea nut producers are all African countries, with West Africa dominating the list and that the data reveal that the shea tree grows naturally in the savanna belt stretching from Senegal to Uganda. Globally, the shea nut production kept rising. In 2021, the total production was 984.5 million tons, which rose to 1.07 billion tons in 2022 and 1.09 billion tons in 2023, respectively.

According to Baxter (2015), shea nuts and their derivative shea butter offer significant economic benefits to European countries, primarily through their use in cosmetics and food products. Europe's large confectionery and bakery industries drive demand for shea butter as a cocoa butter equivalent and as a plant-based fat alternative. This demand creates export opportunities for shea-producing countries, particularly in Africa, and fuels economic growth within Europe's food and cosmetics sectors.

Arla Foods (2024), notes that the European market has strong potential for shea butter in food products. Europe has a large confectionery and bakery industry, with increasing demand for plant-based oils and fats. This is reflected in the growing European imports of these ingredients. The most promising markets for shea butter are Denmark, Germany, France, the Netherlands, the United Kingdom, and Belgium (Arla Foods, 2024). Trends that further drive demand are that more people are choosing plant-based diets and that there are growing demands for alternatives to cocoa butter and aadditionally, companies are moving away from using palm oil, and ethical, sustainable sourcing is becoming more important. In recent years, European consumers have become familiar with shea primarily through its depiction on cosmetic labels (Arla Foods 2024). However, only 10% of the total volume of exported shea is used in cosmetics, while the food industry uses the remaining 90%. Arla Foods (2024), further states that the European countries that offer the best opportunities for shea butter for food stand out for their substantial demand and imports of

vegetable oils and fats, large processing and manufacturing industries, and interesting consumer market characteristics with the most interesting markets includeing Germany, France, the United Kingdom, the Netherlands, Belgium, and Denmark. Other interesting European markets include Italy and Spain. Italy stands out due to its robust chocolate manufacturing industry, which demands high-quality plant-based fats, including shea (Arla Foods,2024).

In 2023, China was the top importing country of Shea Butter, followed by France, Germany, United States, Netherlands, Ireland, Poland, Canada, Brazil, and United Kingdom. This ranking is based on available import data and may not include countries with missing records (Tridge, 2025)

United Nations Development Programme (2025), report shows that an estimated 16 million women across 21 African countries, from Senegal to South Sudan, depend on the shea tree for their livelihood. Furthermore, United Nations Development Programme (2025) states that In Ghana, women play a central role in every stage of the shea value chain, from harvesting the nuts in rural communities to processing and selling shea butter in local and international markets. Participation in the shea business empowers Ghanaian women economically, socially and entrepreneurially, offering opportunities for income generation, skills development and increased decision-making power within their families and communities.

Aoife (2020), states that shea tree has become a globalized commodity and international trade in shea makes a significant contribution to the revenue of the shea tree zone. In Ghana for instance Aoife mentions shea nuts had a value of USD 14 million in 2018. Saabwe (2018), states that Uganda's export in shea tree is valued at USD 1 million for an industry whose global market is expected to surpass USD 5.5billion by 2032. Chester (2017), mentions the uses of shea tree which include serving as food, used for construction, used for cosmetic purposes, source of energy, source of medicine and employment of millions of people. Apart from its economic value shea trees act as carbon sinks and play an integral role in maintaining biodiversity (Saabwe, 2022).

Shea tree (Vitellaria paradoxa) is a semi-domesticated species indigenous to sub-Saharan Africa's semi-arid and sub-humid savannas, growing in 21 countries. It occurs along a 500 km-wide zone ranging from Senegal to Uganda (Bonkoungou 1987, Hall et al 1996) across 21 countries, including Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire, Chad,

Ethiopia, Gambia, Ghana, Guinea, Guinea Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Togo, Uganda, and the Democratic Republic of the Congo. The recently growing demand for shea products for local and international markets is increasing its role as a nutritional and economic resource within its distribution area of West, Central and East Africa. Despite this increasing importance, shea tree densities in natural stands are declining as the remaining trees age, and natural regeneration remains low. This is due to various natural and human driven factors, including climate variability and change, increasing demographic pressure with the disappearance of fallows and uncontrolled tree cutting for fuel wood and charcoal as well as large-scale land investments in intensive mechanized agriculture (Ky-Dembele et al, 2021).

According to Lovett (2015), the shea butter has been traditionally used as a staple ingredient in cooking and a cosmetic product for skin moisturising throughout Africa. More recently, shea butter has become a significant export product worldwide in food and cosmetics. While the supply of shea has been able to meet the rising demand, this might change in the foreseeable future. The modernisation of agriculture has led farmers to cut down trees to allow for modern machinery in their fields, as there is more money to be made from crops than from shea nuts. Lands are also increasingly farmed all year round, affecting the regeneration and productivity of the shea trees. At the same time, efforts to add to the existing trees by planting new shea trees have been limited (Lovett ,2015).

Jamala et al (2023), assert that vitellaria paradoxa is an important economic tree that plays a vital role in support of rural livelihood in areas where its uses include food security, employment and poverty alleviation. Similarly, Lovett (2015), reports that in recent times European imports amounted to 470 thousand tonnes and €1,200 million in 2023. Between 2019 and 2023, European imports grew by 1.7% in volume and 12% in value per year on average and imports of plant-based oils, including shea butter, grew in value at a strong rate of 13% on average per year from 2019 to 2023. While the quantity of these oils grew slowly (2.2% for plant-based oils, including shea butter, and 0.3% for oil seeds and fruits), the increase in value shows that the average price paid for these oils has increased. This is partly explained by a significant shift in the processing of shea kernels into shea stearin within West Africa over the past two decades. Several large non-African companies have invested in setting up processing plants, such as Bunge, sometimes through joint ventures with a local partner. On a smaller scale, some African-owned processing plants, such as

Ghana Nuts, have been built. Together, these crushing and fractionation plants now process shea kernels and convert shea butter into, among other fractions, stearin, before exporting it. Shea stearin is priced significantly higher than shea butter Jamala et al, 2023).

Lakaraber (2025), explains that due to associated economic benefits of shea nut tree to households in Pader district, a community-based organisation Pader Shea Butter Cooperative was founded in 2010 with 90 members and has grown significantly empowering over 500 and 900 women by giving them access to economic opportunities and a strong sense of belonging. As a result, 10,000 kilograms of cold-pressed shea butter and 15,000 litres of hot-pressed shea oil are produced annually by the cooperative (Lakaraber, 2025).

In Uganda shea nut trees are found in the belt of Northern region in the areas of Teso, Lango, Karamoja, Acholi and West Nile. These are valued for their nutritious fruits and oil-rich seeds which are used to produce shea butter. In Pader the shea nut trees are vital for to the livelihood of people for providing food and income through their nuts and oil. However, excessive cutting for charcoal and fire wood has threatened the tree with extinction although efforts are underway to protect the trees including community-led initiatives and national strategy for sustainable use Lakaraber (2025).

However, there has been a rampant reduction in the shea tree population in recent years due to climate change effects, large-scale tree cutting for charcoal production, fire wood and agricultural practices in sub–Saharan Africa Lakaraber (2025).

According to a report by Arla Foods (2024), shea butter supply has struggled to keep up with rising demand, worsened by environmental problems like deforestation and the use of shea trees for firewood in Ghana. Arla Foods (2024) further reports that a two-month heat wave in Ghana in 2024 gave a good indication of climate change's effects on shea. As a consequence, it is expected to impact supply and will likely increase prices for shea in the coming years if not adequately addressed. These challenges highlight the need for sustainable farming, harvesting and supply practices. These can include shea tree protection and planting new trees. Investments and innovation are needed to secure a stable supply, which is important to European importers.

United Nations Development Programme (2025), report explains that according to the Global Shea Alliance, preserving and sustainably managing shea parklands is not only essential for supporting local communities that depend on shea resources for their livelihoods, but also crucial for mitigating climate change and conserving biodiversity. Shea parklands are rich in biodiversity and possess significant carbon sequestration potential. United Nations Development Programme (2025) further asserts that the West African region's approximately one billion shea trees as well as the surrounding parklands sequester around 1.5 million tons of carbon dioxide annually. Beyond their ecological importance, these parklands serve as valuable resources and symbols of tradition, spirituality and identity for Ghanaians, playing a vital role in the country's cultural heritage. Nowadays, these unique savanna landscapes face a multitude of threats, primarily driven by clearing for large-scale agriculture and deforestation resulting from the logging of shea trees for charcoal production. In addition to these challenges, they also contend with issues like soil degradation, vulnerability to climate change and water scarcity. Restoring degraded shea parklands and fostering sustainable land management practices are therefore key bot for ecological integrity and economic prosperity.

Northern Uganda is the commercial hub for this wood fuel, supplying neighboring nations like South Sudan and Kenya. Every year, Uganda loses 122,000 hectares of forest to deforestation on average (Okot, 2022).

Okot (2022), stipulates that a 2011 study by Makerere University indicates that there were 20 shea trees per hectare on fallow land but the number dropped to between 10 (young fallows) and 15 (old fallows) in 2017. Makerere University’s environment researcher, Byakagaba, says the drop could even be higher, given the scant data on how many shea trees have been felled since the research was conducted. He says the government lacks the resources to monitor the tree numbers (Okot, 2022).

Ocungi (2021), asserts that shea nut trees which are also known to make quality charcoal have come under a threat in the wake of a growing demand for charcoal as an alternative source of fuel. Environmentalist are worried that the alarming destruction of shea nut trees may see the trees extinct, regardless of the stringent policies put in place by both the central government and the district local governments. For instance, Ocungi (2021) says that in 2018, the government of

Uganda, through the Ministry of Water and Environment banned the cutting, transportation and sale of shea nut and Afzelia Africana tree logs and their products. The northern region of Uganda had witnessed a surge in the destruction of the tree species owing to the lucrative markets Afzelia Africana trees were fetching at the time. In the early 2000s, nine perennial tree species in the district were considered endangered and thus barred from being destroyed. Ocungi (2021) continues to mention the endangered tree species including tamarind, wild plum trees, mango trees, black plum, shea nut, Afzelia Africa, hard cedar mahogany, and sausage tree among others. But in Pader and Agago districts, which are blessed with the bulk population of shea nut trees in the Acholi Sub-region, such government directives haven't helped curtail the vice over the years. Instead, an all-time surge in the destruction of shea nut trees is being registered in the areas of Puranga, Lapul, Pajule, Angagura, Awere sub-counties in Pader district, Adilang and Wol Sub-counties in Agago district.

GIZ (2025), indicates that a study by Makerere University in 2017 recommended urgent protective actions to regenerate the dwindling population of the Shea trees. This after finding out that by 2008, for every 2.4 acres piece of land, there were only 20 stems of mature Shea trees growing without the young ones (saplings). In agroforestry, Shea performs well with 6 meters by 6-meter spacing giving 180 trees in an acre of land. It is such mature trees that are targets of the Charcoal traders today. What is more is that an industrial farming project was being set up within the shea parkland of Aswa river belt by the Government of Uganda in which the Uganda Prisons' Services is in charge of opening the 30,000 acres of land for growing of cereal grains such as Maize, Soybeans and Beans (GIZ, 2025).

1.2 Statement of the Problem

Udongo (2026), the shea nut (*Vitellaria Paradoxa-subspecies Nilotica*) is a key non-timber forest product (NTFP) occurring largely in off-reserve forests in many parts of Africa, including South Sudan. Shea nut trees grow abundantly in West Nile, Northern and Eastern Uganda. Shea Nut trees provide shade, their fruit is edible, and the nuts are used for oil and food. The tree takes 18 to 25 years to fruit in the wild and can live for a long time, between 200 and 300 years. Shea Butter is also called "Women's Gold" because extracting the butter from the nuts gives income to hundreds of thousands of rural African women. Shea Butter has been an inherent part of African women's way of life for centuries. Shea butter is now being used in the manufacturing of cosmetics,

confectionery and as a substitute for cocoa in the chocolate industry. Unfortunately, most of the trees are endangered because of charcoal burning since it produces the best charcoal. The charcoal burners and brick layers are ignorant of the sustainable income they can get from value addition of the Shea nuts into Shea butter.

Saabwe (2022), mentions that the shea tree which was once available in abundance in Northern Uganda now faces human and climate induced threats due to large scale cutting for charcoal production and firewood for economic purposes. On the other hand, Makumbi (2023), reports that although the government of Uganda in 2017 put a ban on trading in endangered shea tree, dealers still do the business in secrecy. Ebong (2023), argues that shea trees are under threat of extinction in Otuke district due to the rising demand for charcoal which is attributed to poverty, population increase and high demand for charcoal and firewood in cities across Uganda.

According to the National Environment Management Authority, Uganda, (2015) the Shea tree in Northern Uganda, is cherished by the people of the land. Its usefulness varies from cultural to medicinal and the nuts are said to have the best quality of Shea butter that can be used for cosmetics. After a two-decade long rebellion in the region in 2006, youths most of them unemployed resorted to cutting the tree because it produces the best charcoal. Best charcoal means more income. A study conducted by Makerere University, Uganda's top university showed that in 2008, fallow land in Northern Uganda had 20 Shea nut trees per 2.4 acre without any juveniles (saplings) but by 2017, their number had dropped to between 10-15 Shea nut trees. The Ugandan government considers the Shea nut tree as one of the 35 endangered tree species in the country (National Environment Management Authority, Uganda, 2015).

Udongo (2026), reports that locals in West Nile districts in Uganda have been cutting shea trees for charcoal making because of poverty and ignorance of the sustainable economic value of the shea nut tree. Udongo (2026), continues that the processed nuts produce 8 to 10 kg of butter. The price of 1 kg of raw Shea butter is 25,000 UGX wholesale and 35,000/-UGX retail. Therefore, from one mature tree one can get between 200000/- 350,000 UGX every season. Moreover, when that one tree is cut and made into charcoal, it only produces 6 bags which when sold at 25,000 UGX earns only 150,000 UGX. However, if they make soap and lotion/cream, they get more

money because 1 kg of butter makes 18 pieces of bath soap which when sold at 3000 UGX earn UGX54,000. That means if the butter from one tree is made into soap, they can earn up to 435,000UGX sustainably per mature tree per season.

In Pader district and Ajan Sub County in particular the shea tree species is facing threats of extinction due to over cutting for charcoal burning, agricultural conversion of forested area, brick making and due to poverty and lack of public awareness about economic, social-cultural values of the tree. Yet it has for a long-time supported livelihood of the local people especially women, if its use is not checked, shea nut tree species will disappear.

The rampant cutting of shea trees due to the associated economic benefits to the local communities in Ajan sub-County and Northern region has attracted government attention to stop cutting down of the shea trees. This has also attracted other stake holders including Acholi cultural institution, community leaders, civil society organisations and Pader Local Government to conserve the wonder shea nut tree. This intervention has not yielded much result and there is therefore need to do more to realize appropriate results in conserving the shea nut tree. The study therefore is intended to assess the economic values of shea nut tree species and its conservation in Ajan Sub-County.

1.3 Objectives

The ultimate goal of the study was to address the conservation and economic values of shea nut tree species in Ajan Subcounty, Aruu North in Pader District.

1.3.1 Main objective

To assess the conservation of shea nut tree species and its economic values in Ajan Sub-County, Pader District, Uganda.

1.3.2 Specific objectives

i. To evaluate the major threats facing the shea nut tree in Ajan Sub-County and how to overcome them.
ii. To examine the current conservation practices of the Shea nut tree in Ajan Sub-County.
iii. To assess the economic benefits derived from Shea nut tree products among households in Ajan Sub-County.

1.4 Research questions

The following questions guided the study.

(i) To what extent do major threats affect the shea nut tree in Ajan Sub-County?
(ii) What conservation practices are being implemented to conserve shea nut trees in Ajan Sub-County?
(iii) Which economic benefits do households in Ajan Sub-County derive from shea nut tree products?

1.5 Scope of the study

The research scope was categorized into two; content and geographical scope.

1.5.1 Content Scope

This was limited to; assessing the conservation of shea nut tree species, its economic value and threats facing shea nut tree in Ajan Sub County, Aruu North County Pader District

1.5.2 Geographical Scope

The study was conducted in Ajan Sub County which cover Lobut, Amilobo, Pakeyo and Tungtwon as a representative of the entire Pader District and Acholi Subregion in Northern Uganda.

1.6 Justification of the study

The shea nut tree (*Vitellaria Paradoxa*) is a vital indigenous resource with significant socio-economic, cultural, and ecological importance in Ajan Sub-county and across many parts of Northern Uganda. Despite its value, the species is increasingly under threat due to human activities, environmental degradation, and weak conservation practices.

This study evaluated the current intervention methods being used to conserve the shea nut tree. This includes examining the effectiveness of community sensitization programs, reforestation efforts, and any governmental or NGO-led initiatives. Assessing these interventions helped to determine best practices and identify gaps that needed to be addressed.

The research sought to assess the various benefits of the shea nut tree, which play a vital role in the livelihoods of the local communities. Shea butter, extracted from the nuts, serves as a major source of income, especially for women, and is used for food, cosmetics, and medicinal purposes.

Understanding these uses highlight the tree's economic significance and justify the need for its sustainable use.

The threats facing the shea nut tree species including deforestation, charcoal burning, over harvesting, and lack of community awareness posed a risk not only to biodiversity but also to the economic well-being of the people who depend on it. By identifying and documenting these threats, the study provided evidence necessary to inform local policy and guide community-based conservation efforts.

Ultimately, the findings of this research informed policymakers, conservationists, and local stakeholders on how to sustainably manage and protect the shea nut tree. The study contributed to the design of more effective conservation strategies, promote economic empowerment through sustainable shea-related enterprises, and ensure the preservation of a critical natural resource for future generations in Ajan and beyond.

1.7 Significance

The research on the conservation of shea nut tree species and its economic values in Ajan Sub County, Pader District, carried significant importance:

The findings of this study are significant to various stakeholders involved in environmental conservation, agriculture, and natural resource management in Uganda. The study provides useful information that can guide environmental and agricultural institutions, as well as local communities, in improving the production, management, and conservation of the shea nut tree (*Vitellaria Paradoxa*) for sustainable utilisation.

The study is also important in identifying gaps and challenges that may not have been adequately addressed by relevant stakeholders in the sustainable management and utilisation of shea nut trees in Uganda. The findings may help stakeholders recognise areas requiring further attention and develop appropriate strategies to strengthen conservation practices and promote the sustainable use of shea tree resources.

Furthermore, the study provides a useful reference for future researchers interested in environmental conservation, natural resource management, and the economic utilisation of shea

nut tree products. It contributes information that may support further investigations into the challenges associated with shea tree conservation, as well as improved methods of extracting, processing, and utilising shea products sustainably.

The findings are also significant to the Government of Uganda because they highlight the environmental and economic benefits associated with the shea nut tree. This information may inform the formulation, review, and implementation of policies and strategies aimed at conserving the species, promoting its sustainable utilisation, and enhancing its contribution to national development.

In addition, the study contributes to the existing body of knowledge on the conservation and economic value of the shea nut tree. It provides information that may stimulate further academic discussion and research on the species, particularly regarding its ecological importance, economic potential, and role in sustainable livelihoods.

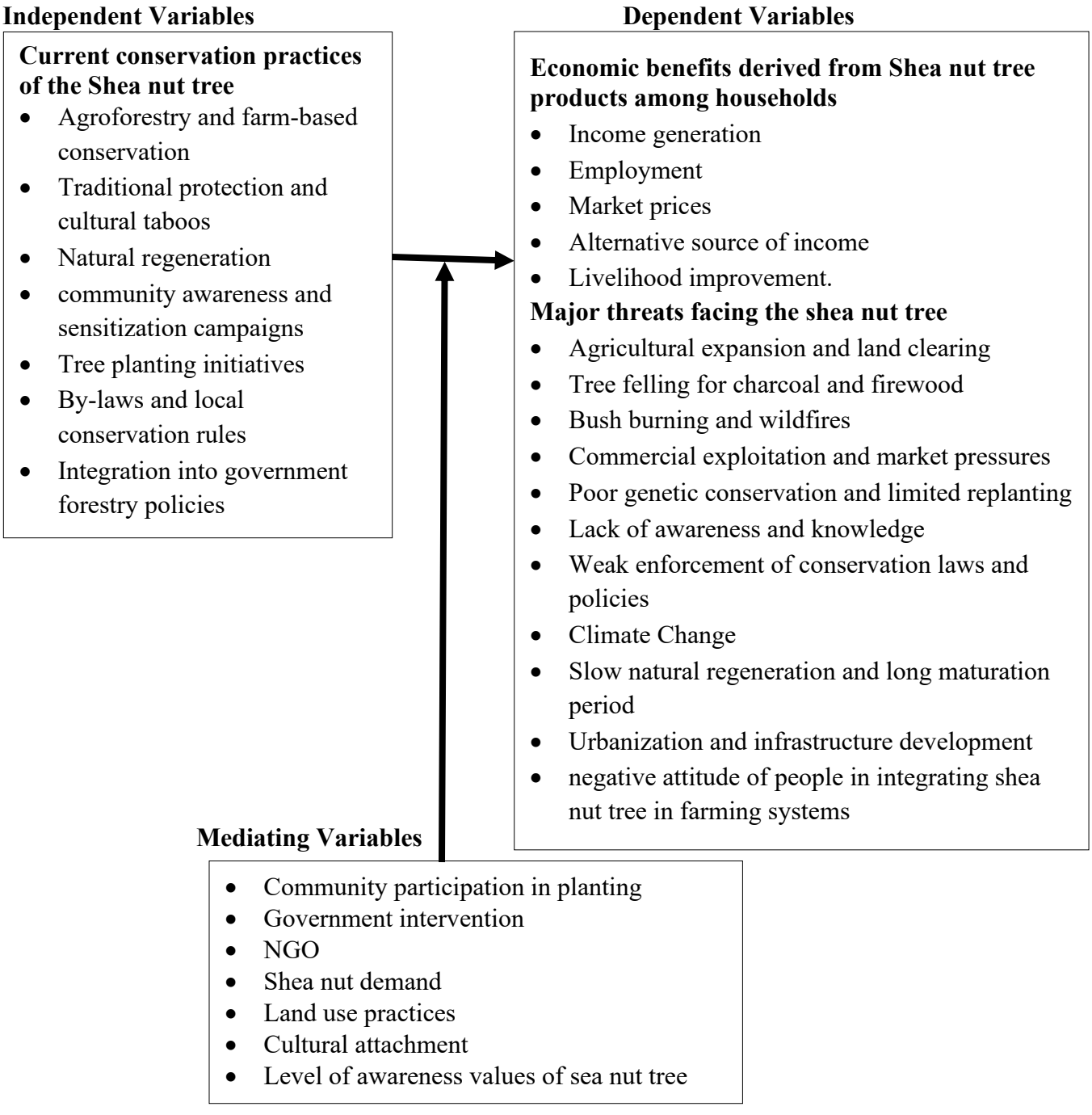
The study also contributes to the achievement of the United Nations Sustainable Development Goals (SDGs), particularly SDG 15 (Life on Land), through the promotion of terrestrial biodiversity conservation and sustainable natural resource management. It further relates to SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 8 (Decent Work and Economic Growth) by highlighting the potential of shea tree resources to support household incomes, food and nutritional security, and employment opportunities along the shea value chain.

At the national level, the study is relevant to Uganda's Fourth National Development Plan (NDP IV), covering the financial years 2025/26–2029/30. Its findings may support agricultural productivity, value addition, agro-industrialisation, private sector development, and employment creation through the sustainable production, processing, and commercialisation of shea nut products. By identifying opportunities for the economic utilisation of shea resources, the study may contribute to increased household incomes, improved rural livelihoods, and sustainable socio-economic transformation.

Finally, the study aligns with Uganda Vision 2040, which aspires to transform Uganda into a modern and prosperous country. By examining the conservation and economic value of the shea nut tree, the research highlights opportunities for sustainable natural resource utilisation, agricultural commercialisation, industrial development, value addition, and wealth creation. The

sustainable management and utilisation of shea tree products may promote entrepreneurship, generate employment, attract investment, and improve the livelihoods of rural communities. Consequently, the study demonstrates the potential contribution of shea nut tree conservation to environmental sustainability, economic transformation, and national development.

Figure 1.1: Conceptual framework



Source: Primary data, 2026

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter provides a comprehensive review of the existing literature regarding an assessment of shea nut tree (*Vitellaria Paradoxa*) conservation and its economic values. It identifies the crucial research gaps in current studies, establishing the justification for this research and placing the study within the current scholarly debate. The literature was generated from journal articles, Government agency reports, NGOs reports, published thesis, abstracts, textbooks, websites and internet. The literature has been organized in accordance with the specific objectives and themes of the study.

2.1 Major threats facing shea nut tree and how to overcome them

Shea butter supply has struggled to keep up with rising demand, worsened by environmental problems like deforestation and the use of shea trees for firewood. The 2024 shea crop is expected to be one of the most affected in recent years. A two-month heat wave in Ghana in 2024 gave a good indication of climate change's effects on shea. As a consequence, it is expected to impact supply and will likely increase prices for shea in the coming years if not adequately addressed (Ala Foods, 2024).

According to Larry (2021), across the African savanna belt from Senegal to Ethiopia, threats to shea trees (*Vitellaria Paradoxa*) the source of shea butter have become a regional environmental concern since at the local level, land struggles disrupt social ties that have historically determined access to natural resources like shea trees, forests, and arable land.

Larry (2021), argues that poor farmers across the African savanna belt from Senegal to Ethiopia urgently in need of cash are cutting shea trees resulting into the reduction of the fallow fields where shea trees regenerate thus with the proliferation of shea butter products on beauty aisles globally, the growing threat to shea trees remains little known. Pressures on land are changing long-standing practices that govern land-use. Shea trees reproduce naturally during fallows periods when no cropping occurs. As rural population increases, the fallow period decreases as more area is used for crops. Without young trees, the shea stands grow old and eventually produce less. Efforts to produce higher yields of grain and other crops encourage mechanization with tractors and oxen-drawn plows. However, with mechanized tillage, trees in the fields can be a nuisance and occupy space where government-promoted commercial crops like cotton could grow.

Mahmud (2021) argues that most mature shea nut trees in Ghana are very old and can no longer produce a lot of fruits. This coupled with effects of bush burning by traditional hunters of wild animals and increasing negative effects of climate change has forced women to join men in shea tree felling for charcoal and firewood which is a quicker source of income to meet immediate family needs. Consequently, it is estimated that more than 50% of the shea trees in the savannah ecological zone have been cut down for charcoal.

According to Garbra (2020), scarcity of shea hybrid is a major constraint to its establishment in an organized plantation as value chain actors are not aware of improved shea seedling or do not have access to it. This implies difficulties in shea tree domestication which could be linked to the fact that most shea value chain actors have limited extension contacts with respect to shea tree conservation.

Insecure tree tenure is a severe constraint to the conservation of shea tree due to pressure from shea fruit collectors as wild fruits. Insecure tree tenure is the main challenges of shea tree conservation in the rural settings as majority see it as a wild fruit with no permanent possessor. Farmers who have shea tree on the farm don't have total control over pickers of fruits and loggers. In addition, availability of land to plant tree crop remains a major problem among the rural dwellers (Garbra, 2020).

As stated by Venturin et al (2016), West Africa and the Sahel are considered climate change hotspots. With very high temperatures over West Africa are projected to raise by 3°C to 6°C by 2100, with unprecedented climate conditions occurring by the 2040s. The rainy season may occur later than usual, resulting in a wetter core. In the long-term heavy rainfall may become more frequent over West Africa and the Sahel during May and July. As a result, the suitability of certain terrestrial ecosystems and agro-climatic zones is expected to diminish, with significant impacts on vegetation and crops throughout Africa. Burkina Faso is already experiencing the impacts of recurrent droughts and floods. The country was hit by severe droughts in 2014 and 2011 that are estimated to have affected 4 million and 2.8 million people, respectively (EM-DAT, n.d.). In 2011, the country experienced reduced and delayed harvests (17% drop) owing to delayed rains and prolonged dry spells (FAO, 2011).

Dembele et al (2021), state that parklands across the Sahel-Savanna eco-zones are significantly threatened by extended land-use change. Millions of shea and other native trees are being cleared to make way for modernised farming, urbanisation, mining, and fuel wood extraction. In addition, Dembele et al (2021) reports that fallows, which are vital for wood fuel production and the natural regeneration of indigenous tree species of the savanna woodland system, are shrinking or disappearing, while at the same time, herbicide use is increasing. It is known that pesticides, coupled with habitat and fodder loss, reduce insect populations. Notably, honey/stingless bees are the main vectors for pollination, resulting in lower shea fruit yields and fewer resources available for migratory bird populations. The natural regeneration of shea trees is mostly impeded by disappearing fallows, new emerged seedling destruction during ploughing and excessive exploitation of the fruit (leaving only a few seeds to contribute to the soil seed bank for the regeneration), bushfire, and roaming livestock. Furthermore, the undiscriminating cutting down of shea trees for timber, firewood and charcoal threatens the sustainability of this species listed as vulnerable (https://www.iucnredlist.org/species/37083/10029534) and constrains the expansion of its value chain. The complete germination process is also challenging because the recalcitrant seeds lose their viability quickly. It takes a long time for the shoot to emerge, which is a major challenge for shea to be planted by farmers.

As shea parklands have arboriculture characteristics, the trees they harbor are regulated by national policies, which generally do not integrate the above-mentioned local and customary rights. Consequently, implementing the policy related to parkland tree tenure or usufruct is complicated as it does disincentives farmers from preserving and nurturing shea trees in their fields and more so for those who are not land owners, like the migrants (Dembele et al, 2021).

Research by Dembele et al (2021), shows that the shea tree has low resistance to diseases and pests. The causative organisms mostly attack the leaves, where they cause dark brown and grey spots. The identified pathogens are: Fusicladium butyrospermi Griff, Pestalozzia heterospora Griff and Mauble. From pests, Salebria spp. (Lepidoptera: Pyralidae) have also been identified, with infection rates of 49–80% for trees and 4–15% for fruit in Burkina Faso (Patrick Bustrel Choungo Nguekeng et al, 2021). The main common infestations are with the hemi parasitic plants (Loranthaceae), associated with three species of mistletoe parasites: Agelanthus dodoneifolius,

Tapinanthus globiferus, and Tapinanthu sophiodes. High infestation rates have been reported in the West African parklands of Burkina Faso (95%) and Nigeria (81%). Dembele et al (2021), in Northern Cote d'Ivoire, Dembele et al, (2021), report two parasitic species of Loranthaceae that have been identified, Tapinanthus bangwensis (Engl. and Krause) Danser, and A. dodoneifolius (DC.) PolhetWiens with infestation rates from 59.7% to 65.5%.

With climate change, these shea districts in Northern Uganda are currently experiencing prolonged droughts. This affects the survival of the young saplings /seedling because of limited water. Besides, flowering of the mature trees is interfered with changes in weather patterns. Consequently, the mature shea trees fail to produce fruits which in turn affect reproduction. With increase in population in the area, there is need for clearing of forest land for agriculture. Since most shea trees are found in the wild, they remain to be at risk of being cut down for establishment of land for agriculture and for settlement. Large herds of cattle are likely to affect survival of the young shea tree plants. The cattle step on the young plants threatens their survival (Okullo, 2016).

The Shea trees especially in the Shea belt of Abim, Otuke, Agago and Kitgum Districts have been subjected to severe incessant bushfires. Fire is probably the most serious threat to conservation of Shea trees. This is frequent in the dry season. In these communities, it is culturally normal to burn the grass in the dry season and this threatens survival of Shea trees. In fact, the intensities of fires are increased when cattle are found in the area, since cattle keeper clear the old grass to kill pests such ticks that feed on the animals and encourage sprouting of new forage material (Okullo, 2016).

Termites are wide spread in the districts and tend to attack the young shea tree saplings and seedlings. This is worse in the dry season when the trees have limited water for survival. This threatens regeneration of shea trees in the districts (Okullo, 2016).

The current land tenure system in the shea districts cannot allow shea tree plantation establishment. This is because of communally owned type of land where decisions on land are taken as a community not an individual. As a result, private individual interested in planting shea trees are discouraged by this type of system to establish shea forest plantations (Okullo, 2016).

The major reported constraints to conservation of shea trees were land shortage and insecure tree ownership and insecurity due to internal displacement. Shortages of planting materials and

inadequate advisory services on shea management were the other reported constraints to promoting conservation of shea trees in the major shea range districts in Uganda (Okullo, 2016).

According to Buyinza and Okullo (2014), reported threats to conservation of mature shea trees in Nakasongola were Charcoal burning and the present land tenure system. Other threats included bush fires, prolonged droughts, rapid human population growth and overstocking. The regeneration of shea seedlings was mainly threatened by prolonged dry spells, trampling by the large herds of cattle and termites.

A research by Buyinza and Okullo, (2014), revealed that extensive degradation of parklands occurs along livestock routes, watering points, hill tops and areas where charcoal burning is mainly practiced14,15. The combination of human population growth, traditional nomadic sentiments of overstocking and invasion by agricultural and ranching settlers has resulted into over utilisation and irreversible damage of Nakasongola parklands. The area under grassland in Nakasongola has declined from 78,100ha to just 40,182ha due to overstocking of livestock, regular bush fires and burning of charcoal16. Charcoal burning is the biggest threat to shea conservation in Nakasongola District.

The number of shea nut trees (*Vitellaria Paradoxa*) is declining rapidly throughout the African continent. This decline is caused by the interplay between increasing demographics, energy demand, limited affordable energy alternatives, poverty, urbanization and civil unrest. These factors, individually and collectively, fuel anthropogenic activities such as charcoal production, fuel wood harvesting, the expansion of agricultural farmlands and industrial development (IUCN 2014; ACCS (Advisory Consortium on Conflict Sensitivity) 2013), (Buyinza & Okullo (2014).

According to Buyinza and Okullo (2014), in Uganda, local governments are custodians of the country's natural resource base. It is necessary to review the existing institutional framework intended to uphold the conservation of natural resources at this level before we can examine the conservation status of the shea nut tree in Uganda. Reviewing the conservation status of the shea nut tree in the rest of the African shea belt is also useful to gain new insight for the strategic and holistic management of this invaluable resource. The information from this study is intended to contribute to the design of new approaches and retailoring of existing approaches used to conserve the shea nut tree at the local government level in Uganda. It is hoped that this study will be of practical use to local governments, policy makers and development partners currently working to

conserve the shea nut tree and other biodiversity components in Uganda (Buyinza & Okullo (2014).

According to the Independent newspaper (March 13, 2021), Weak laws are fueling extinction of endangered shea nut trees in Acholi land. Environmentalists are worried that the alarming destruction of shea nut trees may see the trees extinct, regardless of the stringent policies put in place by both the central government and the district local governments. For instance, in 2018 the government through the Ministry of Water and Environment banned the cutting, transportation and sale of shea nut and Afzelia Africana tree logs and their products.

Independent newspaper (March 13, 2021) further reports that the Northern region had witnessed a surge in the destruction of the tree species owing to the lucrative market Afzelia Africana trees were fetching at the time. In Pader and Agago districts which are blessed with the bulk population of shea nut trees in the Acholi sub-region, such government directives haven't helped curtail the vice over the years. Instead, an all-time surge in the destruction of shea nut trees is being registered in the areas of Puranga, Lapul, Pajule, Angagura, Awere sub-counties in Pader district and Adilang, Wol sub-counties in Agago district. In 2019, the Joint Acholi Sub-Regional Leaders-Forum drafted a charcoal policy for Acholi sub-region seeking to curb the cutting of endangered tree species and giving solutions for alternative sustainable charcoal production in the region. But nearly two years after drafting the bill titled "The Acholi Sustainable Charcoal Production and Marketing Bill, 2019," only Kitgum district local government council has passed the bill into law.

In a report of Inventory and Mapping of Shea Butter Trees in Abim, Agago, Kitgum and Otuke Districts carried out by National Environment Management Authority (NEMA), Uganda (2014), low number of regenerating and shea juveniles is be due to the fact that most of the fruits are collected for the production of shea oil or that anthropogenic activities might have also affected the regeneration process within these shea belt districts and that thick grass cover in the shea parklands is always a potential fire hazard that can wipe out the population of regeneration during the dry season.

According to research findings of Promoting Rural Development in Northern Uganda (PRUDEV) (2020)**, t**he most common threats to mature trees are charcoal burning, land tenure systems, human

population pressure and insecurity of the population while threats to seedlings/saplings are bush fires, drought, human population pressure, animal herds and termites. Due to the effects of climate change shea districts in northern Uganda are currently experiencing prolonged droughts. This affects the survival of the young saplings /seedling because of limited water. Besides, flowering of the mature trees is interfered with changes in weather patterns. Consequently, the mature shea trees fail to produce fruits which in turn affect reproduction.

Akpatsu (2024), asserts that as with many other fungi foliar diseases, the pestilential leaf spot causes infection and leads to various forms of losses in shea production and on most young disease-infected shea trees. The negative impact of the disease on yield could be due to the fact that leaf spot disease reduced the number of leaves, or the surface area of leaves, reducing the photosynthetic capacity of the related trees. In expense, this means that severely infected leaves contribute little to nothing to the overall chlorophyll production of the plant, which could translate to a poor contribution to the general development and production of the tree.

According to Abu (2025), the traditional shea butter production in Ghana and Burkina Faso is heavily reliant on fuelwood, which contributes significantly to deforestation and the subsequent loss of carbon sequestration (Jasaw et al., 2017). The environmental implications are far-reaching, affecting not only the local biodiversity but also contributing to climate change. The heavy dependence on fuelwood creates a trade-off with other essential ecosystem services provided by the Shea tree, such as the provision of non-timber forest products, erosion control, and the preservation of cultural values (Jasaw et al., 2017). The need for sustainable practices is urgent, requiring a shift towards improved stoves that use less fuelwood, sustainable harvesting practices, and the exploration of alternative energy sources, such as solar or biogas, to mitigate these environmental impacts.

Abu (2025), further argues that shea nut trees span over a wide range including production, processing and marketing. Shea trees are wild trees that naturally grow in producing areas. As a result, the life of these trees is exposed to destruction by human activities such as cutting down of the tress and bush fires. Planting of shea trees takes several years (minimum of 15 years) which discourages people in its production under controlled farms.

Research by Abu (2025), shows that deforestation becomes a bigger problem in Ghana which directly impacts the availability of shea nuts and butter. Bushfires, cutting of trees for firewood and destructive farming methods are all factors that affect the availability of shea nuts. Cutting down of the shea trees was discovered as one of the most pressing challenges facing all the respondents. The shea tress is often cut down to provide space for building of houses, roads construction, as materials for building houses and during land clearing for crop production. This reduces the supply of shea nuts for sale.

Atalla (2016), argues that throughout the shea belt of Africa, the shea nut tree continues to be exploited for charcoal production despite its 'vulnerable' status. Charcoal represents a significant portion of the domestic energy consumption in sub-Saharan Africa; as human population increases throughout the continent, demand for fuel is expected to soar placing an exceedingly greater burden upon tree resources preferred by the charcoal industry. In Uganda, charcoal and fuelwood account for 92% of the national energy demand.

Ojok (2024), reports that despite these advantages, Nilotica shea butter is not the preferred choice of the cosmetic industry, mainly due to three reasons. First, the supply of East African shea butter is limited because its trees are only found in Uganda and South Sudan, whereas paradoxa shea trees are abundant West and Central Africa. Secondly, conflicts in northern Uganda and South Sudan have hindered both government and private sector efforts to harness the benefits of the shea trees. Although the conflict in northern Uganda has subsided and investments are being made to develop the shea butter value chain, South Sudan remains unstable, and poor road and connectivity networks have impeded the industry's development. Thirdly, East African shea butter is more expensive as it requires refrigerated shipment due to its lower melting point.

Atalla (2016), argues that while Uganda has several broad policies which address biodiversity and conservation, there is no national policy which specifically addresses the conservation of the shea nut tree. Broadly defined policies can fail to draw adequate attention to, or simplify, or even overlook, key issues of concern. The shea nut tree was declared vulnerable to extinction in 1998 by IUCN. Uganda still lacks a national policy (17 years later), with clear strategic objectives and a plan for implementation, to steer conservation efforts for the shea nut tree. This absence of a national policy appears to indicate a lack of national commitment towards biodiversity conservation.

A National Market Study for Shea Products in Uganda Final Report by Promoting Rural Development in Northern Uganda (PRUDEV), (2020) reveal that the shea tree has a long tree regeneration and maturation. Shea trees grow mostly in the wild and produce their first fruits after 10–15 years, with full production not setting in before trees are nearly 30 years old. This therefore makes it difficult to avail reliable production data to project production trends that can inform investment in long run.

According to PRUDEV), (2020), there is indiscriminate burning of bushes and cutting of trees coupled with population in Northern Uganda which increases, insecurity, and expanding agricultural land clearing have led to woodland degradation in almost all districts where shea trees are found. Research on the domestication of the plant and development of improved cultivars for sustainable future performance is still limited (Promoting Rural Development in Northern Uganda).

In summary, although previous studies have documented the major threats facing shea nut trees, further research is needed to establish how these threats interact, why existing conservation measures have not adequately prevented tree decline, and which locally appropriate interventions can most effectively improve shea tree conservation in Ajan Sub County in Northern Uganda.

2.1.1 Overcoming threats facing shea nut trees

Vegetative propagation methods used for shea tree regeneration are cuttings, grafting, layering, and in vitro propagation are valuable techniques for reducing time to maturity, increasing yields, and producing planting materials at all time. Stem cuttings, when rooted in substrates such as rice hulls and treated with indole-3-butyric acid, show high rooting rates depending on maturity of the cutting source and hormone concentration. Grafting methods, such as slit grafting, achieve high success rates, especially with young seedlings, and shorten the juvenile period, making them cost-effective for maintaining superior shea traits (Affi, 2025).

Garbra (2020), suggests that shea hybrid with a reduced gestation period should be made available. Government and all the stakeholders in the shea value chain should collaborate with the Nigerian Institute for Oil-palm Research (NIFOR) in the area of mass production of improved shea seedlings at a very affordable rate to promote the planting of shea tree and curtail the reliance on

the natural regeneration. Furthermore Garbra (2020) mentions that campaign on regulatory harvest of shea tree for fuelwood and charcoal can ensure its conservation and enhance shea tree density since its development depends on natural regeneration.

Venturin et al (2016), argues that agro-forestry management practices, technological research and development, institutional and governance actions and financial support all have the potential to reduce the risks associated with climate change and to help adapt to new climatic conditions. In particular, natural regeneration of local trees and water harvesting are key in the fight against desertification.

Bylaws that prohibit the cutting of trees of economic value like shea should be strengthened and enforced and addressing issues of land ownership is very paramount and the conservation of the shea tree will only be safeguarded through caring for the existing wild ones or the establishment of shea tree plantation. Although commercialization of shea wood resources provides monetary benefits to the value chain actors control mechanisms need to be enforced on loggers to check wastage. Besides, government should promote and enforce shea tree planting. When the system is "take and replace" the conservation of shea tree is guaranteed (Garbra, 2020).

According to Affi (2025), farmers often integrate shea trees into parklands, which are characterized by scattered tree cover combined with crops such as millet, sorghum, and maize. These systems provide multiple benefits, including soil fertility improvement, microclimate regulation, and diversified sources of income as traditional pruning practices are often used to optimize tree health and fruit yield and farmers selectively prune branches to improve light penetration and reduce competition between branches, which promotes flowering and fruiting.

The assisted natural regeneration of shea trees through grafting and crown pruning as undertaken in Burkina can reduce the maturation cycle by 10 years and improve overall crop production performance for increased tree density and richness and, Rehabilitation of crusted and degraded soils is often done by farmers through the traditional water harvesting technique of zaï, or planting pits, which consists of manually digging holes in the soil to concentrate runoff water and organic matter increasing infiltration into the ground.

Venturin et al (2016) argues that Zaï has numerous advantages: not only does it respond to requirements for soil conservation, but also, it contributes to water conservation as it improves groundwater recharge and to the fight against erosion as it limits the volume of runoff. This practice allows the soil to reacquire its porosity and permeability and increase organic matter over time.

Farmers play an active role in the conservation of shea tree populations by selecting and protecting superior phenotypes based on traits such as fruit size and pulp taste in which scenario the selected trees are often left untouched during land clearing for agriculture, ensuring their survival and genetic diversity within the landscape. This participatory selection contributes to the preservation of locally adapted genetic material and the maintenance of trait diversity. This method not only supports conservation but also provides a basis for future domestication and breeding efforts (Affi, 2025).

Previous studies have identified several strategies for overcoming threats facing shea nut trees (*Vitellaria Paradoxa*), including vegetative propagation techniques such as grafting, stem cuttings, layering, and in vitro propagation; the development of improved shea seedlings; agroforestry practices; assisted natural regeneration; water-harvesting techniques such as zaï; enforcement of conservation bylaws; and community participation in tree selection and protection (Garbra, 2020; Venturin et al., 2016; Affi, 2025). These approaches have the potential to improve shea tree regeneration, shorten the period to maturity, increase productivity, and promote sustainable conservation.

However, there is limited location-specific evidence on the adoption, effectiveness, affordability, and long-term sustainability of these conservation strategies under the environmental, socioeconomic, and institutional conditions prevailing in Northern Uganda. Although studies have documented promising propagation and management techniques in other shea-producing countries, particularly Burkina Faso, it remains unclear to what extent these approaches can be successfully adapted and implemented in Uganda. Furthermore, insufficient attention appears to have been given to the factors influencing farmers' willingness and ability to adopt improved planting materials, vegetative propagation, agroforestry practices, and assisted natural regeneration.

Additionally, the relationship between conservation policies, enforcement of bylaws, land and tree tenure arrangements, access to financial resources, and community participation in sustainable shea tree management requires further investigation. The practical feasibility of combining improved propagation methods with traditional conservation practices to address threats such as bushfires, prolonged droughts, charcoal production, and agricultural land expansion also remains insufficiently established in the local context.

Therefore, the research gap lies in the need to assess the applicability and effectiveness of existing shea tree conservation strategies and identify the factors affecting their adoption and implementation in Northern Uganda. Addressing this gap would generate evidence to guide the development of locally appropriate, affordable, and sustainable interventions for improving shea tree regeneration, survival, productivity, and long-term conservation.

2.2 Conservation practices of shea nut tree

According to Ky-Dembele (2021),in West Africa the shea nut tree (*Vitellaria Paradoxa*) is conserved through a combination of traditional practices and modern interventions aimed at preserving this valuable resource. Traditional methods include protecting regenerating saplings during land clearance, valuing trees based on fruit sweetness and yield, and enforcing local by-laws against tree felling. Farmers often protect shea trees while clearing land for agriculture, pruning them, and integrating them into their farming systems. Local communities also have informal rules and customs that protect the trees and modern approaches involve government giving directives, awareness campaigns, research into sustainable management, increasingly enacting policies and supporting initiatives to enhance conservation efforts, including promoting sustainable harvesting and value addition (Ky-Dembele, 2021).

Jakpa et al (2018), assert that a study in that Shea Parklands in the West African savannah revealed that management practices such as weeding and creation of fire belts around farms and trees and pruning branches of trees proved successful in the conservation of shea nut tree species in the region. Jakpa et al (2018) further stress that success is further attributed to shea systems practices including shea agroforestry; shea trees intercropped with food crops; shea parklands on fallow lands with other trees but dominated by shea trees; shea parklands dominated by other tree species

and other forms of vegetation; shea home gardens such as backyard gardens, vegetable/crop gardens, and small pockets of shea trees within communities.

Abu (2025), mentions that the bottleneck in manual and traditional production of shea butter in Ghana and Burkina Faso underscores the necessity for targeted investments in appropriate technologies that are affordable, user-friendly, and capable of enhancing productivity without compromising the quality of the butter. Moreover, training and capacity-building programs should be established to help women and other producers adopt these technologies effectively.

Sonan (2025), reports that as the growing demand for charcoal and firewood hastens the decline of shea trees in Ghana, communities living on the fringes of the country's Mole National Park are planting fast-growing trees of other species as a buffer. The logic of the effort is for communities to instead cut down the fast-growing tree species for their energy needs, leaving the native shea species behind for sustainable harvesting of key commodities for trade, like shea nuts and butter. So far, the trees have many benefits over shea species, like growing faster and being more resistant to fires, but shea trees also produce more efficient charcoal. Sonan (2025) continues to report that around 300 community members in the towns of Mognori and Yazori are engaged in the effort by planting the seedlings of two species, the Gum Arabic tree (*Vachellia Nilotica*) and Paperback Thorn (*Vachellia Sieberiana*) (both formally known as acacia) and occasionally selling the firewood. The majority, about 60%, are women, who typically take dominant roles in the country's shea harvesting and trade. They have so far planted 53,434 seedlings on 158.11 hectares (390 acres) of land as part of a forest landscape restoration and sustainable wood energy project by the IUCN and A Rocha Ghana (Sonan,2025).

According to a report of National Environment Management Authority (NEMA) Uganda (2015), in order to protect the remaining shea butter trees, the National Environment Management Authority (NEMA) has since 2008 been involved in enforcement and awareness activities aimed at securing the trees. Lira and Otuke districts were the pilot districts where the enforcement and awareness were carried out in collaboration with the district and local authorities. The National Environment Management Authority (NEMA) Uganda (2015) continues to report that the enforcement and awareness activities aimed at securing shea nut trees in Lira and Otuke districts began with field inspections and consultations with the district leadership and technical staff in

April 2008 in which law enforcement officers including the police were trained on environmental laws to equip them with knowledge and understanding of environmental laws to enhance enforcement activities in December 2009, followed by awareness messages that ran on radio stations informing people of the benefits of shea trees to the local communities, the people of Uganda and the global community as well as the income that can be obtained from selling the products from sustainable use of shea butter trees.

NEMA (2014), states that the availability of by-laws against cutting of the Shea trees is a conservation move by the government of Uganda in which the government has listed the Shea tree as endangered, and through local government councils, its various bye-laws banning the cutting of Shea trees for charcoal have been passed. Although the enforcement of these bye-laws is still weak, it is welcomed by some local community members who reported that it reminds them of their old traditional sacred beliefs, which prohibit cutting Shea trees. The communities believe that the Shea tree is a divine gift and anyone who cuts it would be cursed. Accordingly, individuals and families in those places usually take initiatives to preserve Shea trees in their gardens; thereby preventing the unauthorized felling of the tree for charcoal. It is even easier for them do so where land is privately owned, than where it is owned communally (as is the case in most Shea districts in Uganda).

Okullo (2016), states that the Government of Uganda has listed the Shea tree as endangered, and through local government councils, its various bye-laws banning the cutting of Shea trees for charcoal have been passed. Although the enforcement of these bye-laws is still weak, it is welcomed by some local community members who reported that it reminds them of their old traditional sacred beliefs, which prohibit cutting Shea trees. The communities believe that the Shea tree is a divine gift and anyone who cuts it would be cursed. Accordingly, individuals and families in those places usually take initiatives to preserve Shea trees in their gardens; thereby preventing the unauthorized felling of the tree for charcoal. Okullo (2016) further reports that it is even easier for them do so where land is privately owned, than where it is owned communally (as is the case in most Shea districts). In such instances the communities have to convince their relatives to recognize the value of preserving the Shea tree. Okullo (2016) continues to report that in 2006, the President of Uganda issued a directive to protect the Shea tree from over exploitation. The

President also directed that a factory for Shea butter production be established in the region. In response partly to this directive, the National Environment Management Authority prepared a National Strategy on Shea tree aimed at promoting sustainable utilization of the Shea tree. Accordingly, the Uganda Exports' Promotion Board also included Shea butter to be promoted as a bio-trade product. Uganda National Bureau of Standards (UNBS), on the other hand, also, developed national standards for Shea butter and a certification scheme for small businesses, which Shea producers could benefit from (Okullo, 2016).

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To protect shea nut tree species, Okot (2022) reports that the government of Uganda imposed a ban on shea tree cutting in 2018 and for this experts say this is critical since the endangered shea trees play a big role on our planet since they help create an agroforestry landscape across sub-Sahara and act as a carbon sink, meaning that they absorb more CO2 from the atmosphere than they release and shea trees also provide vegetal cover that enables higher water infiltration and slows down forest degradation and desertification .

NEMA (2014), mentions good practices for improving fruit production of the shea trees**.** Farmers in shea belt of Uganda identified several interventions for improving the fruit production of *Shea tree*. These interventions included introduction of improved varieties of shea trees, provision of planting materials, enforcing existing bye-laws, practicing proper weed control, provision of pesticides for spraying and provision of better markets and control of flying squirrels respectively.

Pader Shea Butter and Agro Processing Cooperative Society Limited is one of the many Shea Cooperatives springing up in Northern Uganda in a bid to save the magical tree. The others are in Lango and West Nile sub regions. Robert Abak, the Resident District Commissioner of Adjumani district is a member of one such Cooperative. He says they have planted some Five acres of Shea Parkland in Otuke district in Lango Sub Region (Okema & Labeja, 2023).

According to The Independent (2025), the National Environmental Management Authority (NEMA) in 2023 estimated that districts in northern Uganda where shea nut trees are endemic have lost 40% of shea nut trees, with 30% of the trees in Adjumani, Madi Okollo, Otuke, Agago, Kitgum and Kaabong district lost in 20 years. As a result, the Global Environmental Facility (GEF) has approved $ 6.7 million (approximately 2.2 billion shillings) for a project of protecting shea nut trees in the Acholi and Lango sub-regions and supporting climate resilience initiatives by the people who depend on the endangered trees. The project aims to stabilize and sustain shea production through both large and small-scale interventions including: improving local policies and decision-making around land and natural resources; supporting agroforestry planning and training workshops; making the commercial shea value chain more inclusive to women and young people; restoring shea tree and monitoring tree-cover, and increasing communities' access to alternative financing for climate-resilient livelihoods (The Independent, 2025).

The Cooperator (2025), reports that conservation through innovation at Ngetta in Lira is being carried out. The innovation enables shea trees to start fruiting in as little as 10 years, half the time it takes for wild, non-grafted varieties, which can take up to 20 years to mature. To support adoption, Ngetta ZARDI has initiated a seedling production programme. The institute is currently raising 1,500 grafted seedlings, which will be available for sale to farmers in the Lango and Acholi sub-regions at Shs 4,000 each.

Atalla (2016), reports that the direct approaches, to be employed in the conservation of the shea nut tree in Uganda, are: regulatory approaches; sensitization; the use of economic incentives; and species regeneration and maintenance. Indirect approaches include the establishment of fuel woodlots and promotion of energy efficiency.

Atalla (2016), further assets that the use of traditional laws, rituals and cleansing appears closely alongside the use of formal laws in the districts. Species regeneration and maintenance are not favored by communities because of the shea nut tree's long juvenile period. Its potential for adoption is largely dependent upon how successfully it can be merged with other livelihood alternatives that have more readily/ quickly realized benefits, such as an apiary.

Previous studies have documented various approaches to the conservation of shea nut trees (*Vitellaria Paradoxa*) in Africa and Uganda, including traditional conservation practices, agroforestry, pruning, firebreak establishment, community sensitization, enforcement of

conservation bylaws, provision of improved planting materials, and the establishment of shea cooperatives (Ky-Dembele, 2021; Jakpa et al., 2018; NEMA, 2014; Okullo, 2016). Other initiatives have focused on alternative sources of fuelwood, improved shea varieties, value addition, and community-based restoration projects to reduce pressure on the remaining shea tree populations (Atalla, 2016; Sonan, 2025; The Independent, 2025). Recent developments, including the production of grafted shea seedlings by Ngetta Zonal Agricultural Research and Development Institute, also demonstrate efforts to shorten the maturity period and encourage shea tree cultivation. However, despite these conservation efforts, shea nut trees continue to decline in Northern Uganda, suggesting a gap between the introduction of conservation interventions and their effective implementation and adoption by local communities.

Additionally, while studies have identified promising interventions such as grafted seedlings, alternative fuelwood species, agroforestry, and economic incentives, their accessibility, affordability, sustainability, and adoption by rural households in the shea-producing districts of Northern Uganda remain insufficiently established. The extent to which government institutions, local governments, research organizations, cooperatives, and local communities coordinate their efforts to achieve sustainable conservation also requires further assessment.

Therefore, the research gap lies in the need to evaluate the effectiveness of existing shea nut tree conservation strategies, establish the factors influencing their implementation and adoption, and identify practical measures for improving conservation outcomes in Northern Uganda.

In summary, previous studies have identified conservation strategies and documented government and community initiatives, but further research is needed to determine how effective these measures are in practice, what constrains their adoption, and how they can be strengthened to ensure the sustainable conservation of shea nut trees in Northern Uganda.

2.3 Economic benefits of shea nut tree products among households

The shea value chain, including production, transformation and marketing, provides employment and business opportunities to communities, not only in the shea belt of Africa but also outside Africa. Shea constitutes an important tree crop for women and youth, the main shea collectors, bringing 12-32 % of household income with a mean gross income of USD 75 per woman. According to Global Shea Alliance, shea nut collection and processing into shea butter provides about 16 million women with income in the shea distribution countries (USAID 2016). These

amounts are substantial for households in the rural areas that shea is considered as "women green gold" in West Africa. Shea butter has become a dynamic industry because of its importance as a raw material for chocolate, cosmetic and pharmaceutical products. In addition to conventional butter, organic butter has also become of great interest for international industries, especially the luxury cosmetic companies (Dembele et al, 2021).

Dembele et al (2021), assert that entrepreneurship is growing at a promising pace in the shea sector in West Africa, especially in Ghana, Burkina Faso, and Mali. Many enterprises or mini-enterprises are established in all shea-producing countries to process shea nuts or make various products, including butter and cosmetics (soaps, moisturizers, lotions and lipsticks) and caterpillars, commercialized within local, regional and worldwide markets. Dembele et al (2021) further argues that the shea export trade is characterized by two main segments (cocoa butter equivalent and cosmetics) that offer contrasting income generation potential to producers. The largest (90%) export demand for shea is linked to the extraction of edible stearin used in the formulation of cocoa butter equivalents (CBE) for chocolate confectionery. The remaining 10% of exported shea goes into cosmetic and pharmaceutical markets. Here, shea is exported as butter and used as an ingredient in both luxury and mainstream cosmetic and personal care (e.g., moisturising creams, sun lotions, and soaps) and pharmaceutical (e.g., cholesterol-lowering and anti-arthritic remedies) products.

Choungoet al (2021), report that as a feedstock, the shea kernel is also traded internationally to meet industrial demands within the confectionery, cosmetic, and pharmaceutical industries (24,70,87). Shea butter is traditionally used to treat arthritis due to the presence of compounds with anti-inflammatory bioactivity. Choungoet al (2021) further point out that Shea butter contains triterpene and cinnamic alcohols and esters (74,88,89). The shea tree is recognized as a species that contributes to the economic growth and socio-economic development in South Saharan African (SSA) countries. As already mentioned, the shea tree is one of the most valuable fruit tree species utilized in agroforestry parkland across SSA (56,175). Many parts of SSA are suffering from hidden hunger, malnutrition, and food insecurity (176). From the fruit harvested from shea trees, 25% is used as a local source of food, and the remaining 75% is sold for cash in the local markets. The shea tree is recognized as a species that contributes to the economic growth and socio-economic development in SSA countries. The shea tree is one of the most valuable fruit tree

species utilized in agroforestry parkland across SSA (56,175). Many parts of SSA are suffering from hidden hunger, malnutrition, and food insecurity. From the fruit harvested from shea trees, 25% is used as a local source of food, and the remaining 75% is sold for cash in the local markets. It is estimated that as many as 16 million women, half of them in West Africa, are involved in shea related activities. The report of the Global Shea Alliance (GSA, 2020) provides data showing that 4 million women are involved in the export value chain, with 200 million USD generated as income every year in communities that produce shea tree products (Choungoet al, 2021).

According to Jeníček et al (2011), the uniqueness of shea in Northern Ghana is that it generates income specifically for women as it is traditionally seen as women' business. Most women either work individually near their homes or are organized into small business cooperatives in the industry which employs more than 900,000 women who are involved in all of its value chain processes.

Abu (2025), states that shea butter, extracted from the nuts of the *Vitellaria Paradoxa* tree, holds a crucial position in the global market, particularly within the cosmetics, pharmaceutical, and food industries. Shea butter processing is a vital economic activity in many African countries, particularly in Ghana and Burkina Faso, where it serves as an important source of income and livelihood for numerous households. The industry is mainly led by women (more than 80%) between the ages of 16 to 70, who are instrumental in the harvesting and production processes.

As stated by Abdu (2016), the shea nut industry provides a viable opportunity for government and development partners in their effort to reduce poverty among rural women in Northern Ghana. Abdu (2016), further states that the shea tree which grows well in northern Ghana has over the years supplemented the livelihood sources of rural women. For instance, women are engaged in the sale of the fresh shea fruits, processing and sale of the shea nuts, sale of charcoal made from the shea tree.

Ferris et al (2001), assert that shea fruit and oil provide an essential part of the diets for the people in the Shea belt. Trading in shea also provides an important source of income that is used by the rural households to purchase of food.

According to Tammy (2017), the Burkina Faso shea sector contributes to women's economic well-being with an average of CFA 530 000 (USD 892) per actor per year. But the average income is

skewed in that 33 percent of the women involved make less than CFA 100 000 (USD 171) per year, 50 percent earn less than CFA 200 000 (USD 342) per year and 25 percent earn more than CFA 480 000 (USD 821) per year. The four main categories of actors or market groups include: grassroots organizations, unions representing a number of groups in urban areas, traders, and processing industries. The actors who profit the most are those involved in all stages of shea butter production, who have an average annual income of CFA 686 136 (USD 1 174).

Garba (2011), reports that the Shea nut tree is an economic crop indigenous to the Guinea and Sudan savanna zones of Nigeria. Its role in food production, foreign exchange earnings, raw materials for industries, income and employment generation to millions of Nigerians most especially women and young people makes it a crucial asset for National Economic Development. It is obvious that apart from the nutritional and medicinal properties of Shea nut tree, the evidences on its economic and environmental importance to the economy of the nation are enormous. With adequate exploitation, the crop has the potentials to make significant contribution to the country's Gross Domestic Product (GDP). Nigeria is the leading producer of Shea nuts: 355,000MT was produced in 1999, 58% of the African production and 414,000MT in 2005. Mali and Burkina Faso are other leading producers as at 2005, with 85,000MT and 70,000MT respectively. African processed Shea butter exports have increased from 1200MT in 1998 to 3200MT in year 2000

According to Food and Agricultural Organisation of the United Nations Organisation report (2017), for centuries shea butter has been referred to as "women's gold" because of its rich golden colour and because it provides employment, medicinal benefits and nutrition for millions of women across Africa. The sector employs an estimated 3 million women across West Africa, generates between USD 90 million and USD 200 million a year from exports and promotes economic activity in communities, as recorded by the United States Agency for International Development in 2010.

Food and Agricultural Organisation of the United Nations Organisation report (2017) continues to report that despite these economic gains, it is not clear whether shea simply provides women with a source of income or whether it actually "empowers" them, as is often suggested. Is women's economic, social and political well-being improved by their involvement in the shea industry? The Burkina Faso shea sector contributes to women's economic well-being with an average of CFA 530 000 (USD 892) per actor per year. But the average income is skewed in that 33 percent of the

women involved make less than CFA 100,000 (USD 171) per year, 50 percent earn less than CFA 200 000 (USD 342) per year and 25 percent earn more than CFA 480 000 (USD 821) per year. In general women identified social rather than financial advantages deriving from membership of a shea group. In interviews, women claimed that the groups "opened their minds" to learning new skills and expressed appreciation of the opportunity to collaborate with other women. The groups acted as a social outlet for women, who could discuss issues that might be affecting them at home. Women felt that earning their own income was important in that they could pay for household items and that they felt more respected by others.

Tenderly referred to as *Yaa* among the Acholi people of Northern Uganda, every bit of the wonder tree is economically useful. The government agency, Uganda Bureau of Statistics (UBOS) estimates its world market demand to be USD 2.5 Billion (approximately 9.3 trillion Uganda Shillings as of 2023, with this demand projected to significantly grow to USD 5.2 Billion (approximately 19.4 trillion Uganda Shillings) by 2030 (Okema & Labeja, 2023).

According to Okot (2022), shea nut cakes, a residue that remains after Shea butter extraction is a good supplement for animals and poultry feeds. It is also used in making briquettes for cooking fuel. Its wood is traditionally used for making house posts and support poles, stakes and fencing, joinery, seats, household utensils, durable platters and bowls, pestles and mortars and other farm tool handles. Socially, the Shea trees hold divine position among the Acholi people of Northern Uganda. Its oil performs sacramental obligation in the confirmation of royalties. It is the final anointing given to chiefs as the indelible hallmark of permanent royalty.

Ojok (2024), mentions that shea butter has been an essential for Africans for centuries. From those who have used as a staple cooking fat, to ancient queens like Cleopatra, Sheba, and Nefertiti who incorporated it into their skincare routines. The unparalleled socioeconomic and health advantages of shea butter have propelled its ascension to become a key global commodity. Over the past twenty years, the global shea industry has witnessed extraordinary growth of over 600 per cent. Ojok (2024) stresses more that the current global market value is estimated at £2.36 billion, and projections suggest continued annual growth of 7 per cent until 2030. While Nigeria is the world's largest producer of shea butter, Ghana leads its exportation, shipping about 60,000 metric tons each year.

Previous studies have established that shea nut tree products contribute significantly to household livelihoods through income generation, employment creation, food and nutritional security, and the provision of raw materials for the food, cosmetic, and pharmaceutical industries (Dembele et al., 2021; Choungo et al., 2021; Abu, 2025). Research conducted in West Africa, particularly Ghana and Burkina Faso, has demonstrated that shea nut collection, processing, and marketing provide important economic opportunities for rural women and other value chain actors. Studies have also highlighted the contribution of shea-related enterprises to women's financial independence, social participation, skills development, and household welfare (FAO, 2017; Tammy, 2017). In Northern Uganda, studies by Okema and Labeja (2023) and Okot (2022) have documented the economic, social, cultural, and other uses of shea nut tree products among local communities.

However, there is limited empirical evidence on the actual contribution of shea nut tree products to household economic welfare in Northern Uganda, particularly regarding the extent to which income from shea products improves household livelihoods, expenditure patterns, food security, asset ownership, and poverty reduction. Although existing studies describe the economic importance of shea products and their potential in local and international markets, much of the documented evidence focuses on West African countries. Consequently, these findings may not adequately reflect the economic realities of households in Northern Uganda, where shea production, processing methods, market access, and value chain arrangements may differ.

Furthermore, the distribution of economic benefits among households involved in shea nut collection, processing, and marketing remains insufficiently understood. There is a need to establish whether households participating in different stages of the shea value chain obtain comparable benefits, which activities generate the highest returns, and what factors influence the income earned from shea products. The extent to which access to markets, processing technologies, cooperative membership, household characteristics, and other livelihood activities influence these benefits also requires further investigation.

Therefore, the research gap lies in the need to empirically assess the economic benefits of shea nut tree products among households in Northern Uganda and determine the extent to which these benefits contribute to household welfare and livelihood improvement. Addressing this gap would generate context-specific evidence to guide policymakers, development partners, and local

communities in developing interventions that enhance household incomes, strengthen shea-based enterprises, and promote the sustainable utilization of shea nut tree resources, welfare and livelihood improvement.

2.3 Other benefits (nutritional, ecological, medicinal, cultural)

2.3.1 Nutritional benefits

According to Dembele et al (2021), shea tree provides food and various ecosystem services. Locally, shea trees are valued for their fruit pulp (rich in vitamins and minerals), high-protein-rich caterpillars and the kernels. They provide shea butter, widely used as staple cooking oil, cosmetics, medicine and charcoal produced from their wood, the fruit pulp is an important local nutritional resource, widely eaten because it is rich in vitamins and minerals (ascorbic acid, iron and calcium) and constitutes a source of protein and carbohydrates, shea nut rich kernels provide edible oils and fats known as shea butter, used for cooking, cosmetic and medicinal application. Shea tree is an important source of honey, assuring a good supply of nectar and pollen. Another food product provided by the shea tree is the protein-rich caterpillar, Cirina butyrospermi, produced in many parts of the shea belt. These caterpillars, feeding on shea leaves, are a source of food with high protein (62.74%) and moderate lipid (14.34%) content (Dembele et al, 2021).

Choungo et al (2021), mention that the shea fruit consists of a sweet, moist pulp surrounding an oil-rich seed. Highly perishable when ripe, the fruit is consumed fresh soon after collection, providing calories and micronutrients during the annual ‘hungry season’ when stored foods are in short supply, and agricultural labor is at a premium, the pulp can be dried for storage; the pulp contains glucose, protein (0.8–4.4%), vitamins B and C, and minerals notably including calcium, iron, magnesium, and phosphorus and the kernels have rich oil called shea butter that is heavily used by local populations. It is the essential dietary lipid within the shea parkland; it provides a characteristic taste to traditional dishes.

Processed shea butter and oil have many uses from edible oils, soap, cosmetics, and medicinal purposes. Shea fruits are also an important source of protein, sugar, calcium, and potassium during the rainy season or “hungry season” when storages of grain are low and energy demand is high for planting crops (Naughton, 2016).

Vitellaria Paradoxa is a multi-purpose tree species distributed in a narrow band across sub-Saharan Africa. Shea trees provide shade for farmers, herders and their animals and the ripe mesocarp (fruit pulp) is a key source of energy during the preparation of fields in the rainy season when grain supplies from the previous season are low. Its leaves, stems, roots bark are used in various traditional medicine to treat a variety of diseases and injuries including stomach ache, headaches, fever, jaundice among others. The butter extracted from the fruit is used locally as food and as a cosmetic product for the skin and hair. The species is integrated into cropping and agroforestry systems as a nutritional and economic resource, which provides a range of environmental services. Integration of the species into land-use systems provides an essential source of livelihoods and income for local populations. The economic potential of the shea butter tree derives from its edible products, which also serve cosmetic and pharmaceutical applications (Choungo, 2021).

Ojok (2024), argues that shea butter is predominantly used in the food industry and nutrition sector. This accounts for 90 per cent of its consumption. The non-greasy and cholesterol-free fats in shea butter helps it to enhance the consistency of items it is added to. This makes it a highly sought-after ingredient in the confectionary industry, particularly as a cocoa butter equivalent or supplement in chocolate production. These characteristics favour *Paradoxa* shea butter from West Africa because of its high melting point and stearic acid concentration. Out of the 300,000 metric tons of shea butter exported by the four major exporting countries (Ghana, Nigeria, Mali, & Uganda, more than 90 per cent is West African *Paradoxa*.

Previous studies have documented the diverse nutritional, ecological, medicinal, and cultural benefits of the shea nut tree (*Vitellaria Paradoxa*) across sub-Saharan Africa. Studies by Dembele et al. (2021) and Choungo et al. (2021) highlight its contribution to nutrition through the consumption of shea fruit pulp, kernels, and protein-rich caterpillars, as well as its role in providing cooking oil and other food products. In summary there is nutritional gap of insufficient evidence on the contribution of shea fruit pulp, kernels, butter, and other associated products to household dietary diversity and food security in the study area.

2.3.2 Ecological benefits

Besides nutrition, shea also has great potential to mitigate the effects of climate change and therefore increase the climate resilience of value chain beneficiaries. This is evident in West Africa, where 99% of global shea exports originate, and the Intergovernmental Panel on Climate Change (IPCC) expects temperatures to rise by 3 to 6°C by 2100. Conversely, shea is relatively resilient to the changing climate and is beneficial to the overall resilience of the ecosystem and communities. This is through maintaining soil fertility (soil carbon) and biodiversity of flora and fauna, improving microclimate, improving water infiltration, and reducing wind and water erosion, and consequently mitigating climate change. Indeed, a recent study has demonstrated that shea has an enormous potential to mitigate climate change effects in West Africa, with an estimated production of 1.5 million tons of CO_2 every year. It is then assumed that every ton of shea kernel produced has a negative carbon footprint of 1.04 tons of CO_2. The carbon sequestered by shea trees above ground and in the soil leads to a whole range of ecosystem services, including protecting the land against degradation, regulating runoff and the micro-climate, and conserving biodiversity. Within the parklands, the associated annual crops growing under them are likewise less exposed to excessive temperatures while benefiting from the ecosystem impact of shea trees (Dembele et al, 2021).

Ecologically, shea trees contribute to carbon sequestration, soil fertility improvement, biodiversity conservation, water infiltration, erosion control, and microclimate regulation. Research by Muotono (2017), Abdu (2016), and Garba (2011) also documents the traditional medicinal uses of different tree parts in treating various ailments and their applications in cosmetics and pharmaceutical products. Furthermore, Kylian (2024) and Abdu (2016) emphasize the cultural significance of shea trees through traditional practices, women's participation in harvesting and processing, and the use of tree products in household activities and cultural traditions.

However, there is limited empirical evidence on the extent to which households in Northern Uganda benefit from the nutritional, ecological, medicinal, and cultural functions of shea nut trees and how these benefits contribute to household welfare and community livelihoods. Much of the existing literature focuses on the shea belt of West Africa, particularly Ghana, Burkina Faso, and Nigeria, meaning that the findings may not fully reflect the environmental conditions, cultural practices, traditional knowledge, and livelihood systems of communities in Northern Uganda.

Furthermore, although previous studies have described the multiple uses of shea trees, limited attention has been given to the relative importance of these benefits to local households, the frequency with which households utilize different tree products, and the extent to which these benefits reduce household expenditure, improve dietary diversity, support traditional healthcare, and strengthen cultural identity. The contribution of shea trees to local environmental resilience and the extent to which communities recognize and incorporate their ecological benefits into conservation practices also require further investigation. In addition, traditional medicinal knowledge and cultural practices associated with shea trees may differ across communities, creating a need for context-specific documentation.

Therefore, the research gap lies in the need to assess the nutritional, ecological, medicinal, and cultural benefits of shea nut trees among households in Northern Uganda and establish their contribution to household welfare, environmental sustainability, and the preservation of cultural heritage. Addressing this gap would provide locally relevant evidence to inform conservation strategies, promote sustainable utilization of shea tree resources, and strengthen recognition of their multiple benefits to rural communities.

2.3.3 Medicinal benefits

Choungo et al (2021), argues that in Northern Nigeria, roots are used as chewing sticks to clean teeth. Moreover, they are also used in traditional medicine to treat diarrhea and stomach pain, sometimes also for dysentery and gastro-intestinal pain. The bark is boiled in water for medicinal purposes. It is used to treat diabetes in some communities in Ghana. Furthermore, in some West African countries, including Senegal and Guinea, infusion of the bark crushed together with the bark of Ceiba pentandra and salt is used to treat worm infestations in livestock. In work carried out in Guinea Bissau, authors have reported that bark infusion could treat diarrhea, dysentery, gastric problems, and even leprosy.

In parkland systems, the shea butter tree provides high-quality, termite-resistant timber. The physical properties of the tree include moisture content (19.89% ± 6.67%) and density (1.22 ± 0.18 g/cm3). The tree also plays a vital role in climate change mitigation by improving soil and water conservation in parkland agroforestry systems, (Choungo et al, 2021).

The shea tree is considered one of the principal tree species primarily found in agroforestry parklands in sub-Saharan African countries, where the species occurs naturally and it constitutes a high percentage of standing biomass, contributes to reducing soil degradation, and possesses a significant carbon sequestration ability, which can be used for climate change mitigation strategies. The shea tree is the most common in Mali and has a relatively high density of 30–50 trees/ha. Growing shea trees in agroforestry plantations impact the microclimate positively. Due to trees shading effects, there is an essential effect on the soil moisture content, leading to higher crop yields. Some researchers have observed higher fruit yields in cultivated fields with shea trees compared with naturally fallow land (Choungo et al, 2021).

Research by Muotono (2017), shows that all parts of the shea nut tree have one or more uses. The leaves of the shea tree contain saponin which makes it lather in water and hence is used in washing. In northern Ghana the leaves are used in medicine for the treatment of stomach ache especially in children and the leaves are also used in a mixture with other leaves in a traditional mixture to produce a vapor which is used to bath persons for the treatment of fevers and headaches. The leaves when soaked in water turns to a soapy and frothy liquid which is used to bath the head of persons suffering from fever. İn cases of eye problems a leaf decoction can be used as treatment. The roots of the shea tree are used by locals in Northern Nigeria as chewing sticks for cleaning the teeth. The roots are also combined in mixture with the bark in traditional medicine for the treatment of jaundice, diarrhea and stomach pain. The root bark is boiled and pounded and used for treating chronic sores in horses. Muotono (2017), further argues that the bark of the shea tree is boiled and taken as a beverage claimed to cure diabetes in some communities in Ghana. In some West African countries including Senegal and Guinea, infusions of the bark which are crushed together with the bark of Ceiba pentandra and salted are used to treat worm infestations in livestock. In Guinea Bissau a range of sicknesses ranging from diarrhea and dysentery to gastric problems and even leprosy have been treated with bark infusions. In the Ivory Coast, child delivery is eased by the use of a bark decoction in baths during labour. This decoction is also believed to boost the flow of milk and hence is drunk by lactating mothers. A bark infusion is used as an eye wash against venom of the spitting cobra because it has the capacity to neutralize the venom. It is used as foot bath to extract jiggers in Ghana (Muotono, 2017).

Abdu (2016), states that shea has anti-microbial properties, which gives it a place in herbal medicine. It is also used in the pharmaceutical and cosmetic industries as an important raw material and/or a precursor for the manufacture of soaps, candles, and cosmetics.

Research by Abu (2025), shows that shea fruits are eaten as source of diet; the shea butter is used as cooking oil, manufacture of local soap, used as substitute for korosine in lightening and used in preparation of most herbal medicine (especially those that are prepared as cream); the bark of the shea tree is used as medicine for treatment of stomach ache; and dry shea trees used as firewood. These different uses reduce household financial requirements thus suggesting that the shea nut industry can reduce poverty among rural people.

According to Garba (2011), shea butter also protects the skin by stimulating production of structural proteins by specialized skin cells. It also has anti-microbial properties, which gives it a place in herbal medicine. It is also used in the pharmaceutical and cosmetic industries as an important raw material and/or a precursor for the manufacture of soaps, candles, and cosmetics. Shea butter is used as a sedative or anodyne for the treatment of sprains, dislocations and the relief of minor aches and pains. Other important uses include its use as an anti-microbial agent for promotion of rapid healing of wounds, and as a lubricant for donkey carts.

From previous research I is observed that there is inadequate documentation of local medicinal uses of shea tree products, the extent of their utilization, and their role in household healthcare practices.

Therefore, the research gap lies in the need to assess t medicinal, and cultural benefits of shea nut trees among households in Northern Uganda and establish their contribution to household welfare, environmental sustainability, and the preservation of cultural heritage. Addressing this gap would provide locally relevant evidence to inform conservation strategies, promote sustainable utilization of shea tree resources, and strengthen recognition of their multiple benefits to rural communities.

2.3.4 Cultural benefits

According to Kylian (2024), the African Karite Tree, also known as the shea tree, stands as a symbol of resilience and nourishment across the African savanna. From its roots to its fruit, the karite tree offers a wealth of benefits, deeply intertwined with the lives and traditions of communities across the continent. Kylian (2024), argues that shea nut tree is not just a source of

sustenance; it's a symbol of resilience, community, and cultural heritage, passed down through generations. Its significance is woven into the very fabric of life in these regions. Traditionally, the harvesting and processing of shea nuts is primarily done by women, empowering them economically and socially. This age-old practice strengthens community bonds and reinforces the karite tree's place as a cornerstone of African culture (Kylian, 2024).

Abdu (2016), argues that the residue from shea after extracting the butter is an excellent fuel and can also be mixed with mud for plastering traditional mud houses, while wood from shea tree is used for stools, hoes, pestles and mortar.

Previous research portrays limited understanding of how shea trees contribute to cultural identity, customary practices, indigenous knowledge, and intergenerational knowledge transfer among communities in Northern Uganda. Therefore, although previous studies have established that shea nut trees provide multiple benefits beyond income generation, further research is needed to determine the nature, extent, and significance of these benefits among households in Northern Uganda. This would help demonstrate the broader value of shea trees and support conservation approaches that recognize their nutritional, environmental, medicinal, and cultural importance.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter outlines the description of the area of study, research design and methodology used to evaluate an assessment of shea nut tree (*vitellaria Paradoxa)* conservation and its economic values in Ajan Sub-County and target population. It presents the research approach, sampling techniques, data collection methods, data collection instruments and analysis procedures, ethical consideration, the validity and reliability and limitations of the study. The chapter entails a researcher's approach to the research to ensure reliable and valid results to provide empirical evidence on the direct and indirect conservation practices and economic contributions of shea nut trees to local livelihoods.

3.1 Study area

The study was carried out in Ajan Sub-County of Aruu county Pader district. Ajan Sub County is composed of four parishes which are Paibwor, Goma, Pakeyo and Wipolo parishes. The study area is located in a region characterized by extensive shea tree populations and communities that rely heavily on agroforestry and non-timber forest products. Ajan lies approximately between 2.8°N – 3.0°N latitude and 33.1°E – 33.3°E longitude. The area is characterised by gently undulating plains with isolated hills and rocky outcrops. The soils are predominantly sandy loam soils suitable for crop cultivation, though some areas have laterite outcrops.

Pader District Profile (2022), Ajan climate is Tropical savannah climate with Bimodal pattern of rainfall with annual rainfall ranging from 1000mm to 1500mm, peaking between April–June and August–November and Average temperatures range from 18°C to 32°C. The natural vegetation consists of wooded savannah dominated by shea nut trees (Vitellaria paradoxa), combretum species, and grasses.

The altitude of the area is 1,020 meters (3350 feet) above sea level.

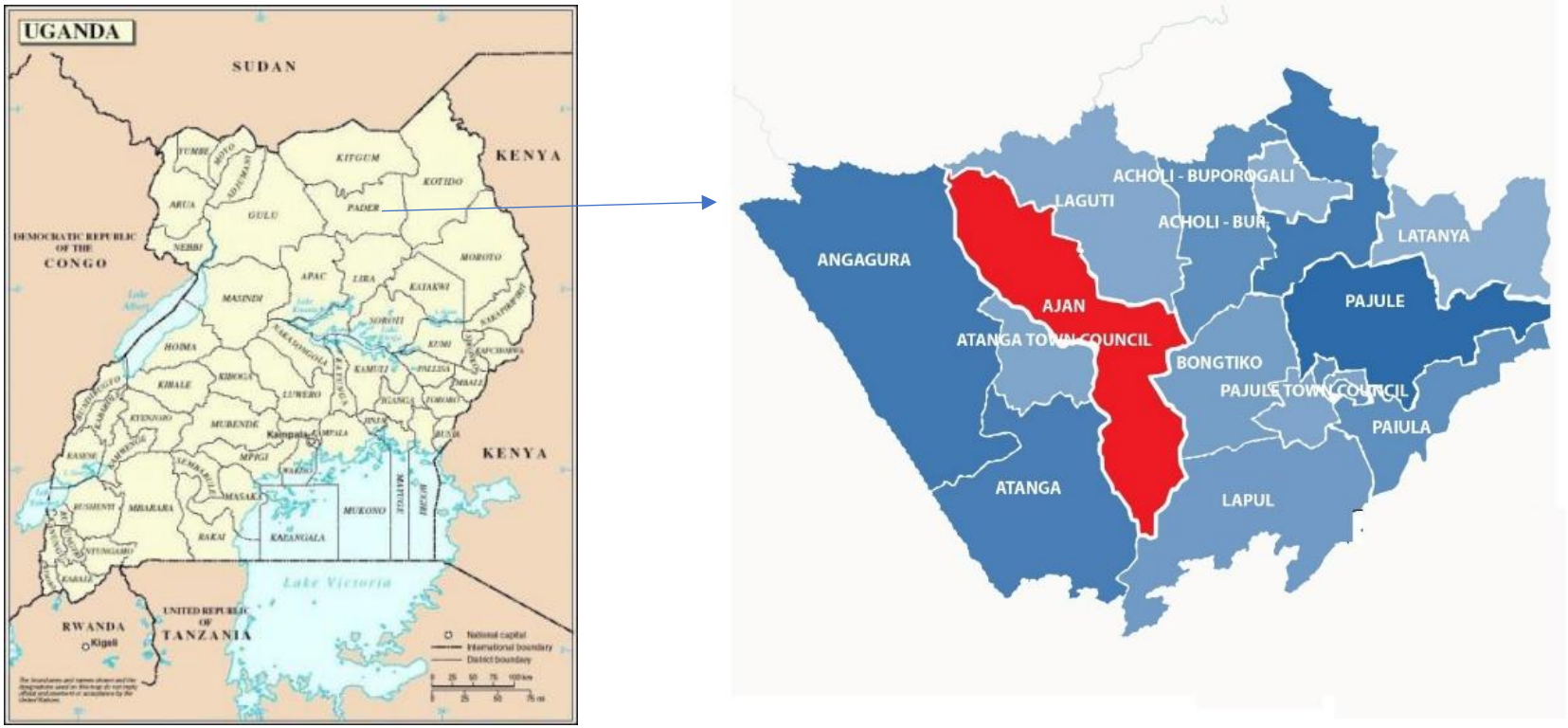


Figure 3.1 ***Map of Pader in Uganda and Map of Ajan in AruuNorth,***
Source: Pader District Profile (2022), *UBOS NPHC 2024*

According to National Population and housing census 2024 issued by UBOS, the population of Pader district is 240,159 with 114,088 males and 126,071 females.

Pader District Profile (2022), the predominant vegetation in the district is savanna grassland and woodlands. The common native tree species are sheared tree species, Butyrospermum, Paradoxium terminaliaspps, acacia spp, combretaspps, Milicaexclesa and bamboo amongst others. However, the human activities like bush burning, indiscriminate cutting of trees for charcoal production, timber and firewood is diminishing the vegetation cover within the District and Exotic Species are Pine, Eucalyptus, Gmelina and Grevilla species, Cedrellaodorato, and Tectona Grandis amongst others.

3.2 Research design

The study adopted a cross-sectional survey design that utilized qualitative and quantitative approaches for data collection. Cross sectional design is a kind of research method in which data are collected at a single point in time from a sample posing homogenous characteristics to represent a large population (Mugenda & Mugenda, 2003). Data was collected from 150 respondents across four parishes using structured questionnaire, focused group discussions and interviews.

A structured questionnaire which is a primary instrument was used to collect data. It facilitates standard collection of both qualitative and quantitative data.

3.3 Study population

The study population was composed of 150 individuals, including farmers, shea nut collectors (primarily rural women), shea butter processors, local shea nut traders, local councilors, Acholi Cultural Institution representatives, forestry officials and local government officials. This population selection ensured representation from key stakeholders involved in utilization of shea nut tree products and conservation, allowing for a comprehensive understanding of conservation of shea nut trees and the economic values to the community.

According to (UBOS, 2014), The National Population and housing census report of 2024 revealed there has been a population increase of 62159 people in Pader district and an annual growth rate of 5%.

3.4 Sampling size

A sample size of 150 respondents was deferred using Cochran's formula below.

Sample size = $Z^2 \times \frac{P(1-P)}{e^2}$

Where by

Z = score

e = margin of error

P = standard of deviation

The sample was computed as follows.

95% confidence level and a standard deviation of 0.5 and a confidence interval (margin of error) of + 8%.

$$n = \frac{(1.96)^2 \times 0.5(0.5)}{(0.08)^2}$$

$$n = \frac{(3.8416 \times 0.25)}{0.0064}$$

$$n = \frac{0.964}{0.0064}$$

$$n = 150$$

The study population of 150 respondents all small-scale farming households that had *Vitellaria Paradoxa* growing on their farms and around their home stead were distributed as follows in Table 3.1.

Table 3.1: Sample size

Respondents	Number
Shea nut processors	44
Shea nuts collectors	36
Key informants (Local leaders, Acholi cultural institution representatives)	33
Shea nut traders	22
Government officials	15
Total	150

Source: Primary data 2026

3.5 Sampling procedure

Before data collection commenced, the researcher introduced himself to the respondents and explained the purpose of the study before requesting their participation by completing the questionnaire. The respondents were informed that participation in the study was entirely voluntary and that only those willing to take part would complete the questionnaire. They were also assured

of their right to decline participation or withdraw from the study at any stage without facing any consequences.

3.6 Data collection methods

Both primary and secondary sources of data were used in this research. Primary data sources included data obtained from questionnaires, formal and non-formal interviews that were conducted. Secondary data sources included journals, briefs, textbooks, research report online, and reliable information from the internet, already written reports on the conservation of shea tree species, and newspapers, magazines.

For Primary data structured questionnaires were used to gather data on income, production volumes, market access, and labor use whereas key informant interviews were used to provide in-depth insights on traditional knowledge, land tenure, and economic history. Focus group discussions (FGDs) were used to explore collective experiences, gender roles, and sustainability practices.

For secondary data Government reports, NGO publications, and academic articles on conservation methods being applied to conserve shea nut trees species, economic values of shea nut trees and challenges facing shea nut tree species.

3.6.1 Questionnaire Survey

A questionnaire survey is a method of primary data collection where respondents were provided with a written list of questions which were answered by the respondent either by ticking or filling. This method was preferred because it was quick, cheap and reliable in data collection, collected responses with minimum errors and reduction of pressure as respondents were allowed to answer the questions at their convenient time (Burns, 2012). The method was applied to collect shea conservation, economic values and shea threats data from farmers, shea nut collectors and processors, traders and Local Government Officials to answer questions during their convenient time.

3.6.2 Interview method

Interviewing refers to a method of collecting data in which selected participants are asked questions face to face in order to obtain information on issue(s) of research interest and interview questions were in form of structured or unstructured form. The interview method was used to collect information from members of households, business men and women, cultural and community leaders asking them questions one by one and face to face which were in line with the study objectives. The interview constitutes a social situation between two persons, the psychological process involved requiring both individuals mutually respond though the social research purpose of the interview call for a varied response from the two parties concerned (Pandey, 2015). The interviews were conducted with key informants because these respondents had first hand and non-biased information. Interviews were also preferred because participants clarified all their doubts about research questions, and the researcher took each opportunity to explain his or her intention for better answers.

Interview method was applied to collect shea conservation, economic values and shea threats date that could not be obtained easily using interview and direct observation methods from farmers and key informants.

3.6.3 Direct Observation

Mikeal (2002) defines observation method as a method of data collection in which the situation of interest is watched and the relevant facts, actions and behaviors are recorded. Observation checklist was used to observe and record areas where deforestation took place, charcoal burning areas, heaps of firewood and charcoal form shea nut trees, residents selling shea butter oil along the roads and local markets, emerging land uses, farming systems and conservation methods with which a lot of valuable information about shea nut trees was collected. Direct observation was used to acquire nonverbal information from cultural leaders and elders that was important in justifying the controversial circumstances (Kothari, 2004). This method was used to verify the data collected through questionnaires and interviews (Kothari, 2004).

3.6.4 Focused Group Discussion (FGD)

A focus group discussion (FGD) is a qualitative research method that gathers a small, demographically defined group of people to discuss a specific topic in-depth, guided by a

moderator. FGDs aim to collect detailed information on attitudes, perceptions, and experiences by leveraging group interaction, which can reveal shared narratives, differences in viewpoints, and the meaning behind quantitative findings. Eeuwijk & Zuzanna (2017) define focus group discussion as a qualitative research method and data collection technique in which a selected group of people discusses a given topic or issue in-depth, facilitated by a professional, external moderator. This method serves to solicit participants' attitudes and perceptions, knowledge and experiences, and practices, shared in the course of interaction with different people. During the survey the method was used to collect shea tree conservation, economic values and shea threats data from 5 groups of 10 people considering gender (5 men and 5 women) that took 1 hour per session.

3.7 Data collection Instruments

Multiple data collection instruments were utilized, including structured questionnaires, interviews, observation, focus group discussion and a review of existing literature. This approach enabled the collection of both quantitative and qualitative data, providing a comprehensive understanding of the socio-economic importance of fishing in the community.

3.7.1 Interview Guide

An interview is process where the interviewer engages in a one-on-one conversation to gather detailed information from individuals using oral questions. The researcher administered interviews to the key informants with a help of an interview guide (appendix 2), reflecting the study objectives. With this instrument, the researcher engaged key respondents in oral questions. The interviews were used widely to supplement and extend the researchers' knowledge about individual (s) thoughts, feelings and behaviors (Watercamp, 2013). While interviewing, probing was applied in cases where respondents did not give adequate answers or where respondents got confused of the meanings.

Key informants include

- Local Council chairpersons and councilors in charge of environment at LC 1 levels
- Acholi Cultural Institution (Ker Kal kwaro) representatives
- Pader local government officials atAjan sub county level

3.7.2 Questionnaire administration

A questionnaire which was semi-structured in nature composed of both open and closed ended questions to capture primary data from the respective respondents.

Structured questionnaires were administered. This began with introduction of the researcher and explanation of the purpose of the study. The consent of the respondents was sought before actual exercise began. A total 20 questions with subsections were used to collect data. The questions were divided in 4 sections; sections A, B, C and D.

Section A: Demographic information of respondents

- Age
- Sex
- Marital status
- Level of education
- Income level

Section B: the current conservation practices of the Shea nut tree in Ajan Sub-County.

Section C: the economic benefits derived from Shea nut tree products among households in Ajan Sub-County.

Section D: the major threats facing the shea nut tree in Ajan Sub-County.

Each interview lasted for about 20minutes

3.7.3 Focus group discussion guide

Focus group discussion was used to collect data from 5 groups of 10 people considering gender (5 men and 5 women) that took 1 hour per session. The discussions were guided by questions on conservations measures of shea tree species to find out local knowledge of conservation, the economic values of shea nut trees to the local population and threats affecting the sustainability of shea trees. The discussions were voluntary and names of participants from the five groups were withheld for confidentiality purposes. The common responses were grouped and reported in discussion of the findings. Quotations of statements made by selected participants from the five groups were recorded and reported directly in speech.

3.7.4 Document review

Secondary data was obtained from written literature of what other authors wrote about shea nut trees from different parts of west and eastern Africa where shea nut trees grow naturally.

3.8 Validity

Validity refers to "the degree to which the instrument measures what it is supposed to be measuring". To establish content validity of instruments, the researcher consulted experienced and skilled researchers including the supervisors. Validity of the questionnaires was determined by pre-testing the instruments to 10 respondents before actual data collection. Results from the field helped to identify gaps so as to make modifications to the instruments.

The reliability of the instruments was assessed using the test-retest procedure to ensure consistency of results. Additionally, content validity was ensured through careful examination of interview questions and questionnaire items to eliminate ambiguity and ensure relevance.

3.9 Reliability

Reliability relates to the precision and accuracy of the instrument. If used on a similar group of respondents in a similar context, the instrument should yield similar results (Cohen et al 2015). A number of measures were taken both during the field work and in the sub-sequent analysis and conclusion process in order to ensure the quality of this study. Before real collection of data, data instruments were pre-tested on 5-10 respondents to determine their reliability and these respondents were outside the real study sample. The reliability of the questionnaires was computed using the Cronbach's Alpha Coefficient and total Coefficient was 0.70 which showed that instruments were more reliable.

3.10 Data processing

After the survey, questionnaires were checked for completeness, accuracy, consistency and uniformity of data. The data (each of the variables or questions) was then coded using whole numbers stating from zero (0) and entered into Statistical Package for Social Scientists (SPSS) version 22, using the codes. After data collection, the following steps were undertaken to process the data.

3.10.1 Editing

All completed questionnaires and interview guides were checked for completeness, consistency, and accuracy in the field before leaving each village. Errors such as missing responses and unclear entries were corrected by revisiting respondents or clarifying notes taken.

3.10.2 Coding

Responses from structured questionnaires were coded numerically for ease of data entry and analysis. For example: 1 = Yes, 2 = No. For benefits of shea nut trees, different benefits were assigned specific codes (e.g. oil extraction = 1, income generation = 2, medicinal = 3, cultural = 4, firewood = 5).

1=strongly agree, 2=agree, 3 undecided, 4=disagree and 5=strongly disagree

3.10.3 Data Entry

The coded data were entered into Microsoft Excel to create a database for analysis. Double entry verification was done by re-entering 10% of questionnaires to check for entry errors.

3.10.4 Data Cleaning

The data set was checked for inconsistencies, missing values, and outliers. Where inconsistencies were found, questionnaire hard copies were cross-checked to correct the data.

3.10.5 Data analysis preparation

Cleaned data were organised according to research objectives for analysis:

i. To identify the major threats facing the shea nut tree in Ajan Sub-County.
ii. To examine the current conservation practices of the Shea nut tree in Ajan Sub-County.
iii. To assess the economic benefits derived from Shea nut tree products among households in Ajan Sub-County.

3.10.6 Qualitative data processing

Qualitative data from key informant interviews and focus group discussions were transcribed manually. Transcripts were reviewed, and key emerging themes were identified, coded, and categorized based on research objectives for thematic analysis.

3.11 Data analysis

Data collected were analysed using SPSS computer software and descriptive statistical methods for quantitative data and thematic analysis for qualitative data to address the three research objectives.

Data was analyzed using two principles of qualitative and quantitative data analysis. Quantitative data was analyzed by computing statistics such as percentages and frequency distribution. Before processing the responses, the completed questionnaires were edited for completeness and consistency while the incomplete ones were entirely eliminated. Data was then coded to enable the responses to be grouped into various categories. Quantitative data was analyzed using the Statistical Package of Social Science (SPSS) 22.0 version to generate both descriptive and inferential statistics that aided in the interpretation of findings. Frequency distribution was used to analyze continuous and nominal data at Univariate level. Inferential statistics were applied to generate and interpret any significant associations between dependent and independent variables at both bivariate and multivariate level. Qualitative data was analyzed in verbatim form based on study themes.

3.12 Limitations of the Study

The study encountered several limitations that affected the research process. However, appropriate measures were taken to address these challenges and facilitate the successful completion of the study.

Financial constraints: The study was affected by limited financial resources due to the high costs of stationery and transportation associated with extensive fieldwork and data collection. This

challenge was addressed by seeking financial assistance from family members to support the research activities.

Time constraints: The researcher faced time limitations because data collection, data processing and analysis, consultations with the supervisor, and preparation of the final research report had to be completed within a specified period. To overcome this challenge, additional guidance was obtained from a second supervisor, and supervisory meetings were rescheduled to ensure regular consultations during data analysis and report writing.

Limited cooperation from respondents: Some respondents were hesitant to participate in the study because they viewed the research with suspicion, while others expected allowances in exchange for their time and responses. This challenge was addressed by explaining the academic purpose of the study and assuring respondents that the information they provided would be treated with the utmost confidentiality.

Delays in questionnaire completion and return: The data collection and compilation processes were delayed because some respondents took longer than expected to complete and return the questionnaires. The researcher addressed this challenge by requesting respondents' cooperation, conducting regular follow-ups, and making prior appointments through telephone calls to facilitate timely completion and submission of the questionnaires.

3.13 Ethical considerations

This research adhered to ethical principles to ensure the dignity, rights, and welfare of all participants involved in the study.

Informed Consent was obtained before data collection. Respondents were approached and informed of the intended survey. An explanation of voluntary participation was given to them and was individually requested to participate at will without any condition before the actual survey was conducted.

Confidentiality and anonymity were assured to the respondents because some of them were reluctant to disclose some information. Where respondents hesitated to give information about the

study, they were assured of confidentiality and an explanation for the purpose of study that was purely academic and nothing else was given to them.

Respect for cultural norms was highly considered and it involved recognizing, understanding, and valuing the specific cultural context, values, and practices of the community participating in the survey to ensure ethical, accurate, and respectful research practices. This considered being sensitive to cultural differences in concepts like informed consent and autonomy, avoiding biases in data interpretation, and adapting methodologies to fit the cultural setting, which ultimately built trust, enhanced data quality, and ensured that research was beneficial to the community.

The study involved minimal risk to participants by beginning with conducting a risk assessment, identifying potential physical, psychological, social, and legal harms, and then implementing robust mitigation strategies like obtaining informed consent, ensuring confidentiality and anonymity, using the least risky methods.

Ethical clearance was obtained from Nkumba University School of Science. In addition, local administrative authorities in Ajan Sub-County were notified and provided approval for fieldwork.

The researcher upheld ethical considerations expected of him in the design, conduct, analysis and dissemination phases of the study. The researcher informed all the study's participants on the main purpose of the study and sought their consent prior to their participation in the study. The identity and respect of the participants was upheld.

CHAPTER FOUR: ANALYSIS AND PRESENTATION OF RESULTS

4.0 Introduction

This chapter presents the analysis of results obtained from questionnaires, interviews, and focus group discussions. Findings were presented in charts, tables, figures, and descriptive narratives according to each research objective.

4.1 Response rate

The study engaged 150 respondents with 56 males and 94 females. All the respondents mobilized participated in the study to attain full 100% response. The results in *figure 4*.1 show a response rate of 94 (63%) females and 56 (37%) males of the targeted sample. The response rate indicates high confidence in data representativeness as recommended by (Kothari, 2004) who argues that a response rate of 50% and above is considered adequate for reporting and analysis.

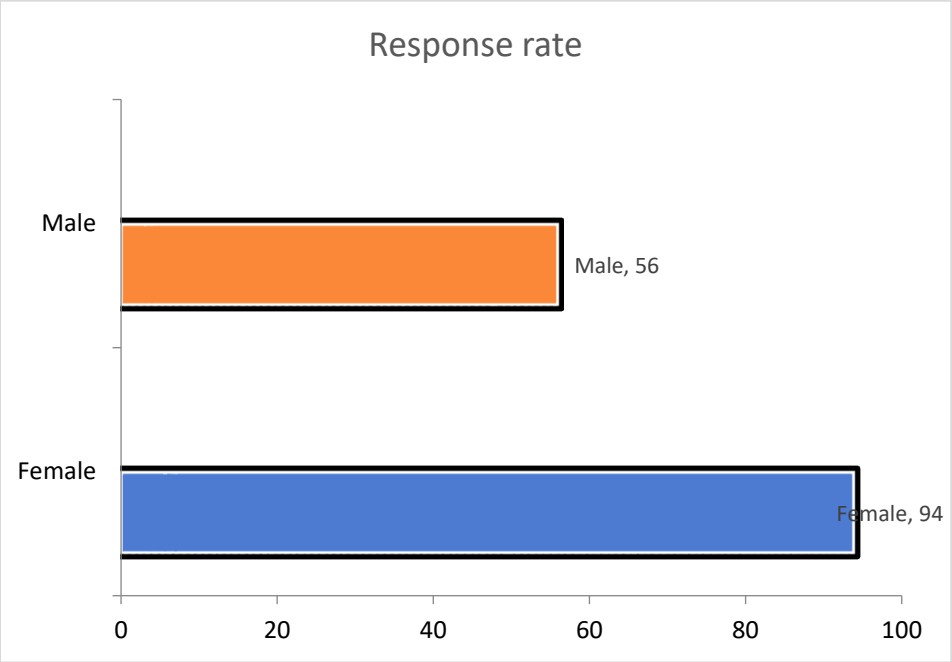


Figure 4.1: Response rate ***Source: Primary data, 2026***

4.2 Demographic Characteristics of the respondents

The demographic characteristics of the respondents included gender, age, educational attainment, occupation/profession and economic activities engaged in.

4.2.1 Gender of respondents

The gender characteristic of respondents given in *figure 4.2* shows (94) 63 % female and (56) 37% male who participated in the survey. There were more female respondents than the male ones because women were found to be the primary custodians of shea nut harvesting, processing, and trade as low-income peasant farmers because men consider shea nut collection as work of women and children. Livelihood of women in Ajan depend on shea nut trees, cultural norms, traditional gender role in customary land and tree tenure are responsible for the higher number of women than men in harvesting and processing shea nut butter since it is labour intensive fitting within women's seasonal agricultural and household work. The men on the other hand are the controllers of farmland in the study area with communal land tenure and they are majorly attracted to harvesting shea tree for charcoal burning and firewood for quicker money and poles for construction purposes.

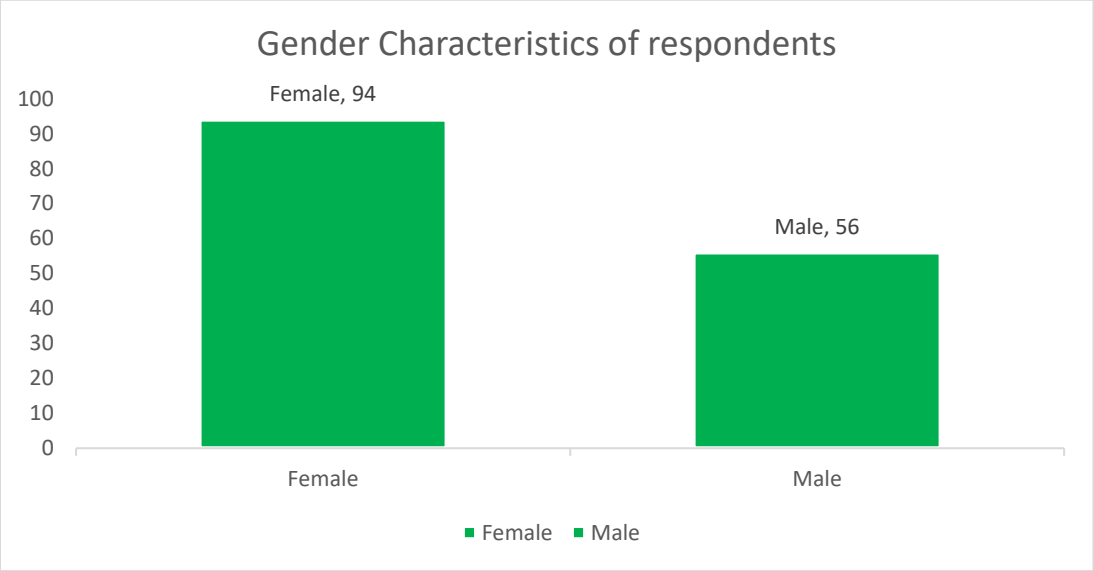


Figure 4.2: Gender characteristics ***Source: Primary data, 2026***

4.2.2 Age of respondents

According to results in *figure 4.3,* the age characteristics of the respondents comprised 9% between 20 and 25 years, 18% between 26 and 30 years, 22% between 31 and 35 years, 31% between 36 and 40 years and 20% for 41 years and above. This implies that participating respondents were of productive age bracket to influence access to resources such as land. ILO (2018), in its Convention

138 confirms this productive age group in its definition as “all persons aged 15 years and older” with the eldest to be 64 years in age. The productive age group of the respondents was found out to be active in harvesting shea nut trees for charcoal, firewood and poles for construction in addition to other uses such as pulp fruits, shea butter oil and medicinal purposes. The 20% of respondents in the study indicates that knowledge of shea tree conservation is largely concentrated among the elderly people, who rely a lot on indigenous practices. This suggests a potential gap in knowledge transfer to younger generations, which may threaten the sustainability of shea tree conservation and its economic benefits in the future.

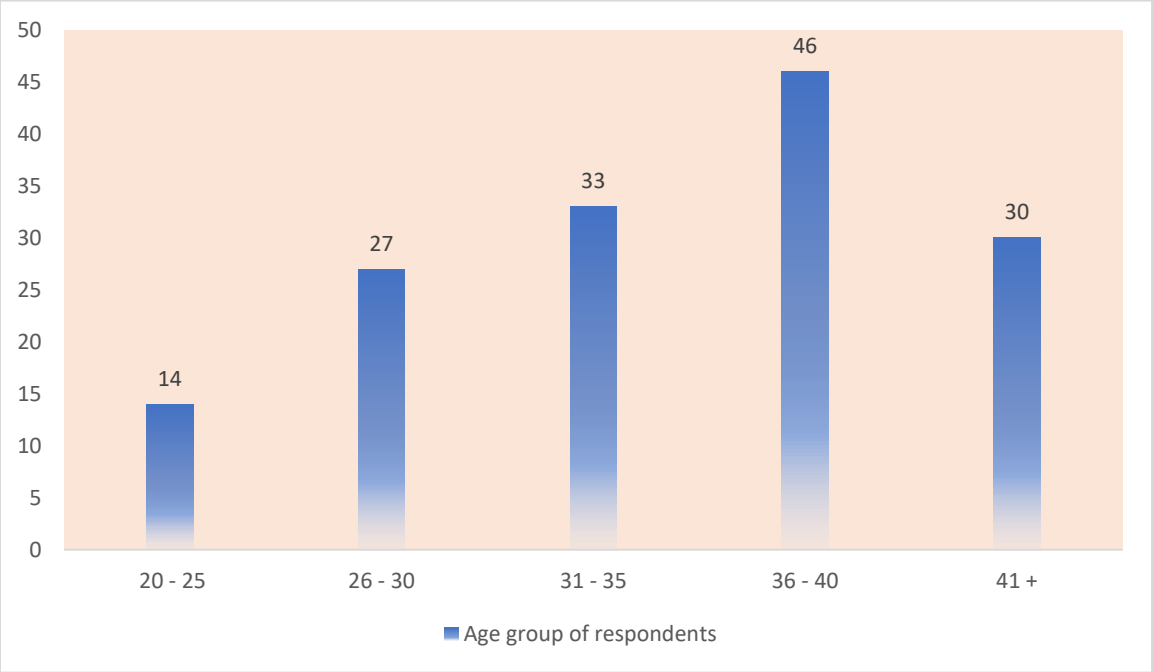


Figure 4.3: Age characteristics of respondents Source: Primary data, 2026

4.2.3 Education level of respondents

The results majority of respondents in *figure 4.4* show that 46 (31%) had completed primary level of education, followed by secondary level of education (O’level), 35 (23%), 23 (15%) attained advanced level of education (A’level), 20 (13%) attained certificate, 16 (11%) attained Diploma and 10 (7%) attained Bachelor’s degree. The variance in the education levels is attributed to poverty among the respondents and effects of prolonged civil war within the region. The education levels attained empower stakeholders in the shea value chain to perceive the economic potential

of shea trees, adopt improved and sustainable practices, add value through quality processing and branding, and conserve resources via awareness and coordinated community action. The high proportion of respondents with low levels of formal education suggests that shea tree conservation practices are largely based on traditional knowledge systems. While these practices support sustainability, limited formal education of the people in the community is likely to hinder the adoption of improved conservation techniques and value-addition processes, which contribute to affecting the full realization of the economic potential of shea resources.

Generally, the low level of education of the majority the respondents indicate that a larger population in Ajan have low level of education which means they have little knowledge why shea nut trees should be conserved and largely look at shea nut trees and the environment as their sources of livelihood.

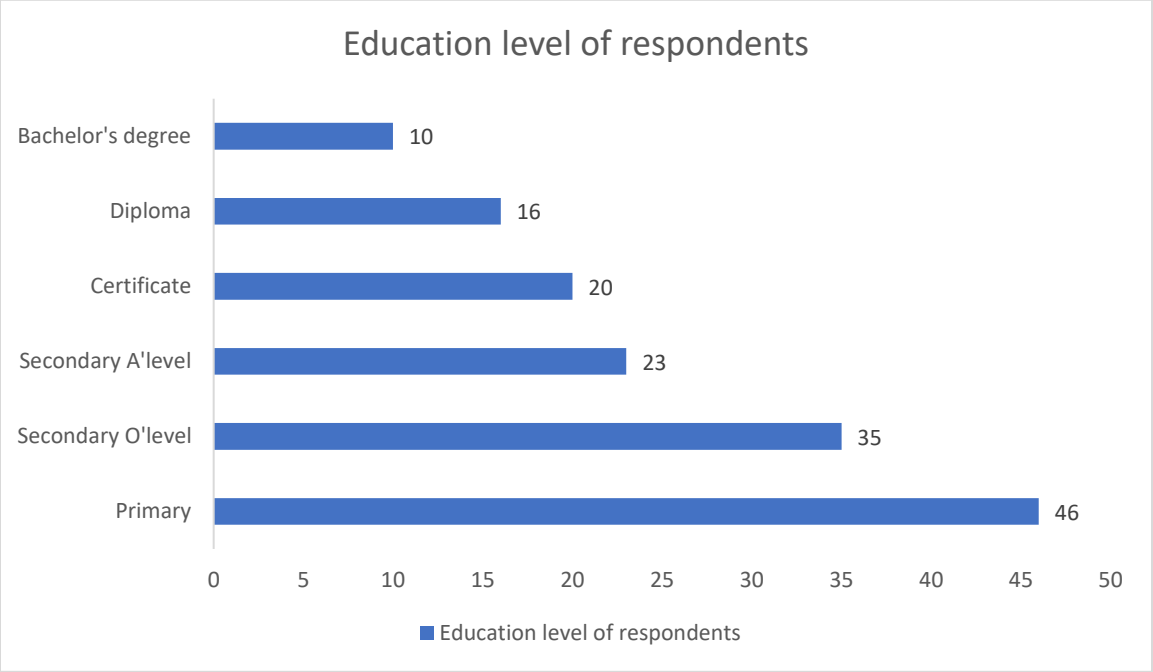


Figure 4.4: Education characteristics of respondents Source: Primary data, 2026

4.2.4 Profession of respondents

As indicated in *figure 4.5*, 63 (42%) of the respondents were found out to be engaged in farming, 8 (5.3%) in teaching and 17 (11.3%) were housewives. 8 (5.3) were government workers, 3(2%)

NGO workers, 45 (30%) were engaged in businesses and 6 (4%) were into transport (boda boda). This means that the community members in Ajan Sub-County are engaged in different employment activities. With the large number of farmers and shea processors among respondents the conservation of shea trees is revealed to strongly be linked to livelihood activities. The direct dependence of people in the study area on shea products for income serves as an incentive for conservation; however, competing agricultural demands may also pose a threat to sustained preservation.

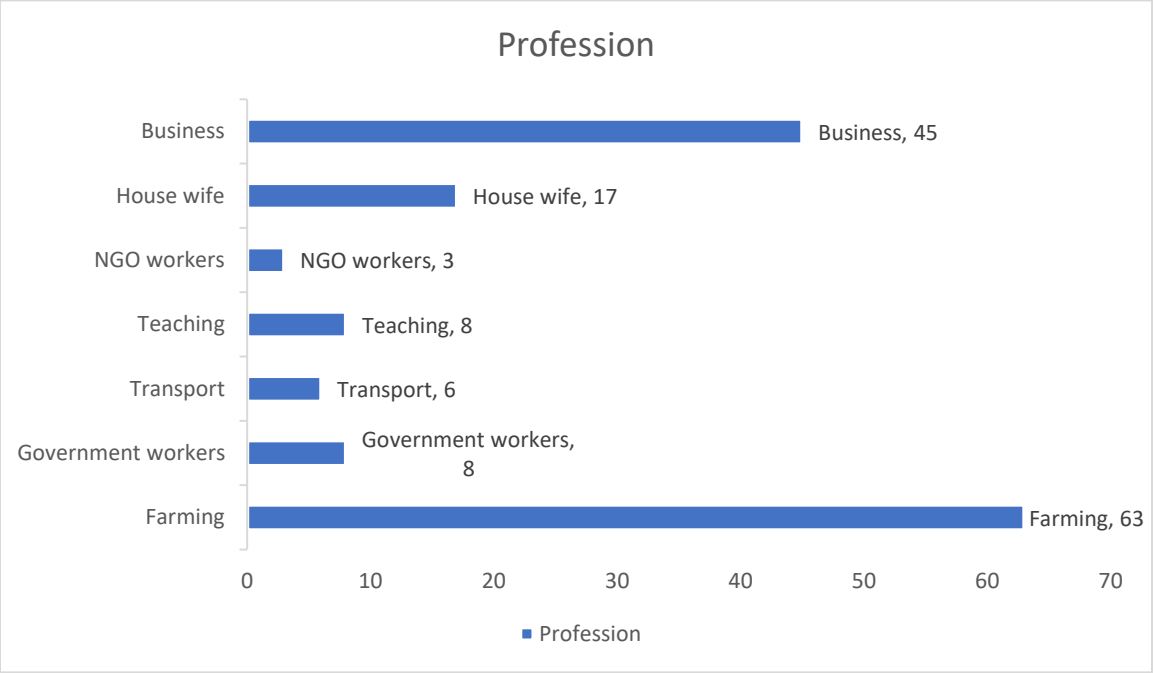


Figure 4.5: Profession of respondents ***Source: Primary data, 2026***

4.2.5 Employment (occupation) activities of respondents

Most of the respondents in *figure 4.6* were in sale of produce (35%) and charcoal/fuel wood (31%), while very few were in pottery (3%). This suggests reliance on natural resources by the residents for income. The majority of self-employed respondents especially women indicate that shea tree conservation is closely tied to livelihood activities, with many households depending on shea products for income. Whereas this dependence shows encouragement for preservation, the need for immediate financial returns may also contribute to unsustainable exploitation practices. In conclusion it is noted that women with low education dominate farming.

Occupation was found out to be the linchpin linking livelihoods, gender dynamics, and environmental sustainability in shea nut research. Women's occupations from collecting to processing shea nut butter anchor economic value and promote incentives for conservation. Meanwhile, introducing new occupational roles (like agroforestry or product development) not only empowers communities but strengthens the ecological resilience of shea landscapes. The larger proportion of respondents engaged in agriculture and shea-related occupations indicates that the conservation of shea trees is closely linked to livelihood activities. While this dependence promotes the protection of shea resources, the lack of occupational diversification is more likely to increase pressure on the trees, potentially affecting their long-term sustainability.

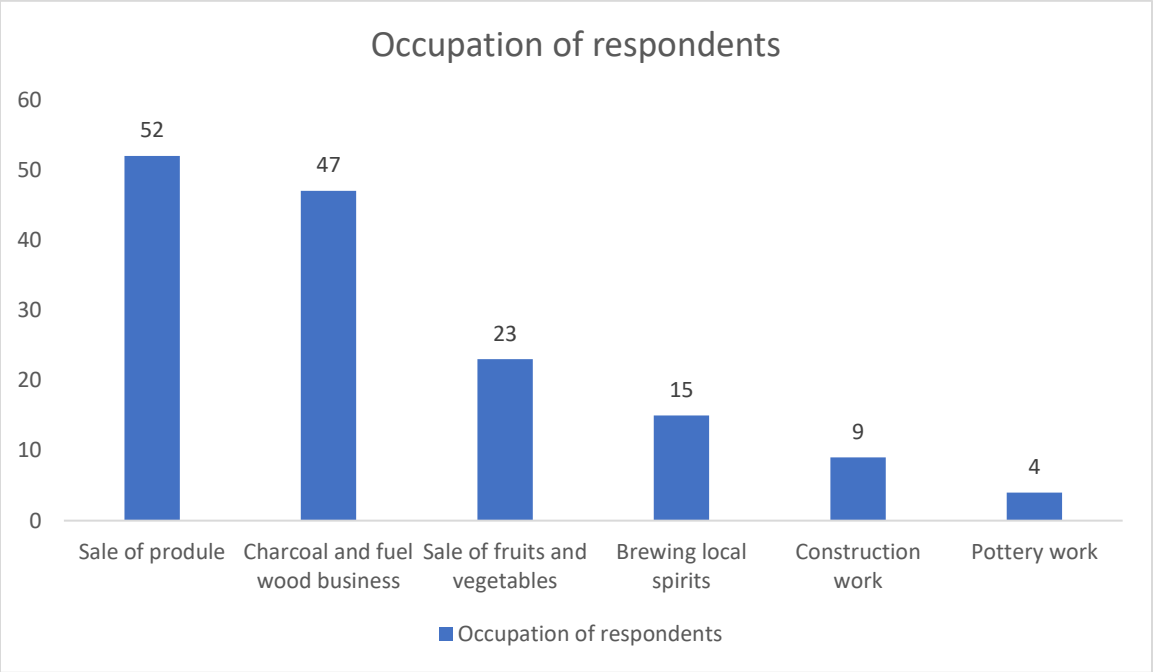


Figure 4.6: Employment activities ***Source: Primary data, 2026***

4.3 Presentation of results according to objectives

4.3.1 Evaluation of the major threats facing the shea nut tree in Ajan Sub-County.

Table 4.1: Major threats facing shea nut tree

	Strongly Agree	%	Agree	%	Undecided	%	Disagree	%	Strongly Disagree	%	X^2	P value
Over cutting	77	51	56	37	4	3	9	6	4	3	79.58	<0.001
Bush fires	77	51	50	33	4	3	10	7	9	6	66.83	<0.001
Weak law enforcement	64	43	41	27	7	5	28	18	10	7	38.37	<0.001
Population increase	60	40	37	25	3	2	30	20	20	13	34.82	<0.001
Emerging land uses	58	30	33	22	5	3	37	25	17	11	31.24	<0.001
Pests and diseases	52	35	30	20	7	5	38	25	23	15	22.07	<0.001
Effects of climate change	31	21	41	27	5	3	49	33	24	17	24.81	<0.001
Negative attitude of people	18	12	38	25	4	3	57	38	33	22	32.35	<0.001

Source: Primary data 2026

Total responses

$$N = 150$$

Expected value (X)

$$E = \frac{150}{5} = 30$$

Chi square test (x^2) value results and p-value

Over cutting with (x^2) value 79.58 and P-value <0.001 was very a significant threat

Bush fire with (x^2) value 66.83 and P-value <0.001 was very a significant threat

Weak law enforcement with (x^2) 38.37 and P-value <0.001 was a significant weakness

Population pressure with (x^2) value 34.82 and P-value of <0.001 indicated a significant drive of loss of shea nut trees

Emerging land use with (x^2) value 31.24 and P-value <0.001 was significant relationship

Pests and diseases with (x^2) value 22.07 and P-value <0.001was significant but weaker than human threats

Climate change with (x^2) value 24.81and P-value <0.001 was significant but secondary perception negative attitudes with (x^2) value 32.35and P-value <0.001 was significant but less than over cutting and fires

Conclusion: the biggest threats are human-driven (cutting, fires, weak law enforcement, land pressure) while natural threats are present but secondary.

Table 4.1 shows statistically significant differences (P<0.05), meaning the responses are not random. Shea nut trees are economically, ecologically and socially valuable but face serious human-driven threats.

The survey revealed that the major threats facing shea nut tree in Ajan include over cutting, bush fires, weak laws implementation, population increase, emerging land uses, pests and diseases, effects of climate change and negative attitude of people in Ajan (Table 4.2).

From the research finding, 51% of the respondents strongly agreed and only 3% strongly disagreed that there was over cutting of shea nut tree species in Ajan Sub County. This means there is high rate of deforestation posing a threat of extinction of shea nut tree species in the area.

The study found out that annual bush fire was a threat to the sustainability of shea nut tree species in Ajan Sub County. From the study respondents 51% strongly agreed that annual bush fire was reducing the existence of shea nut tree species and only 9% disagreed. This means that bush fire is a common practice recognized as a threat to extinction of shea nut tree and other organisms both fauna and flora.

The study revealed that there was weak law enforcement of promoting sustainable use of shea nut tree species in Ajan Sub County. This was represented by 43% of the respondents who strongly agreed and only 10% strongly disagreed. This means that there were existing laws to conserve shea nut tree but there was weak law enforcement in the community which is contributing to the indiscriminate cutting of the trees by farmers and community business community.

The survey found out that population increase population increase was posing pressure for more demand for land hence reducing forest covered by shea nut tree species in Ajan Sub County. This was represented by 40% of the respondents who strongly agreed that population pressure was a

threat to sustainability of shea nut tree species, 25% agreed and only 20% strongly disagreed meaning that population increase is exerting pressure on the land occupied with shea nut trees.

The research finding revealed that emerging land uses were posing threats to the conservation of shea nut tree in Ajan Sub County. 39% of the respondents strongly agreed to this issue and 11% strongly disagreed meaning that the new emerging lands uses were contributing to cutting down of shea nut trees to give room to economic activities and economic developments especially for commercial agriculture, road construction and settlements.

The lower rated threats found out that contribute to threats to conserving include;

Pests and diseases were reported by 35% of the respondents who strongly agreed and 25% disagreed to this threat. This means farmers are aware that pests and diseases are affecting the well-being of shea nut tree in Ajan Sub County.

The study found out that climate change effects were contributing to threats of conserving shea nut tree species in Ajan Sub County. For this, 21% of the respondents strongly agreed but 33% disagreed which means the effects are not very much felt by the community as affecting shea nut tree.

The survey revealed that negative attitude of the local community towards conservation of natural vegetation in the area of which shea nut tree species was posing a threat to its conservation. 12% of the respondents strongly agreed to this and 38% of the respondents disagreed meaning that the negative attitude of the people was contributing less to the treats of shea nut tree conservation.

Human activities of cutting trees, bush fires, weak law enforcement and land use are the biggest threats while natural factors of pests and diseases and climate change are perceived as secondary.

In conclusion the biggest threats are human-driven (cutting, fires, weak law enforcement, land pressure) while natural threats are present but secondary.

Age group active in cutting shea nut trees

The research finding found out that the most active and productive age group engaged in cutting shea nut trees for its different purposes were the youth in the age range of 20 and 35 and adults of 36 and 50. The adults of the age range of 51 and 56 were found to participate less in shea nut tree

cutting because of the values they attach to the trees, less participation in shea nut tree products businesses and their weak nature of the body for vigorous activities of tree cutting.

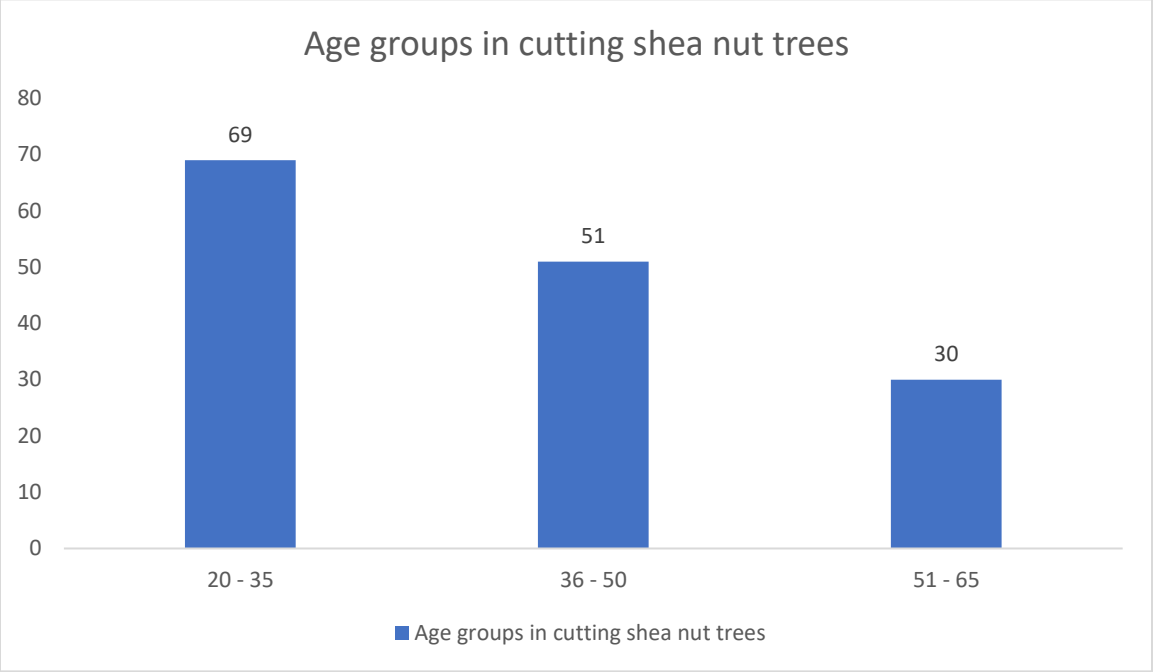


Figure 4.7: Age groups active in cutting shea nut trees Source: Primary data 2026

4.4 Results of FGD: Introduction

FGD was used to collect data on conservation practices, economic values, threats facing shea trees and how to overcome them. Five groups of participants of 5 male and 5 females from different L.C.1 zones in Ajan subcounty participated in discussion which lasted 10 minutes.

4.4.1 Threats facing shea tree

The discussion results revealed that population pressure and emerging land uses especially for commercial agriculture and subsistence farming were the major threats facing shea nut tree. A participant from Pakeyo LC1 zone of group 5 was quoted saying "the population of Ajan Sub County has increased over time especially after the Lords' Resistance War (LRA) with higher demand for more land for farming and settlement forcing the cutting down of trees. In addition, there is an in increase in the "Balalo" cattle keepers and commercial farmers who clear trees from the land they are operating in". This isa clear illustration that with high population growth and commercial farming of crops growing and animal rearing shea trees are at threats of extinction in

the area because the farmers value the land to carry out their activities without valuing shea trees on their land.

4.4.2 Overcoming the threats faced

Most of the participants reached a conclusion of their discussion that for the sustainability of shea trees in Ajan Subcounty there is need for combined effort of the local farmers, civil society organisations, Acholi Cultural institution, government agencies and environmentalists in the subcounty and district in general to enforce the national and bylaws on conserving vegetation and agreed agricultural practices in addition to planned and sustainable land uses. One of the participants in Tungtwon LC1 zone of group 2 mentioned that "if the laws and bylaws of conserving shea trees are not strictly implemented then within a period of 10 years, we shall not have shea trees in our community". This means that the members of the community in Ajan Subcounty are concerned about the fast rate of shea tree moving towards extinction because of the economic, social and ecological benefits associated with shea trees.

In conclusion the research finding revealed that participants emphasized the importance of shea trees for household income, particularly for women involved in nut collection and butter processing. However, over-cutting and bush fires were cited as major threats. Cultural taboos and community rules were noted as useful but insufficient without government support. Respondents suggested training in sustainable harvesting and access to better markets to encourage conservation.

4.4.3 Conservation practices being practiced

Key emerging conservation practices common to all the five groups include sensitisation, law against cutting shea trees and involving community in implementing conservation strategies of shea tree. A participant D in group 1 in Lobut LC1 Zone stated that "growing crops with shea trees is being practiced by the local farmers in our area as a way of preventing them from being cut when in the bush because people fear cutting trees from gardens". This means that agroforestry is a valuable shea tree conservation method being applied in the area of study.

4.4.4 Economic values

Nearly all participants in the 5 groups unanimously agreed that the major economic values of shea nut tree are income from charcoal and shea butter oil obtained after sale of those shea products. A

participant from Amilobo LC1 zone of group 3 reported saying "being farmers we wait for harvests of crops to sell to get money but we can get money quickly from sale of charcoal and shea butter oil". This means that shea tree is a quick source of income to harvesters of its products to mean the immediate family demands.

4.5 To examine the current conservation practices of Shea nut tree species in Ajan Sub-County.

The study found out the under mentioned conservation practices being applied to conserve shea nut trees in Ajan Sub-County as indicated in table 4.2.

Table 4.2: Current shea nut tree conservation practices in Ajan Sub-County

	Strongly Agree	%	Agree	%	Undecided	%	Disagree	%	Strongly Disagree	%	X^2	P value
Sensitisation	84	56	33	22	7	5	17	17	9	9	135.46	<0.001
By-laws	76	51	39	26	6	4	10	6	19	13	54.92	<0.001
Community Involvement	67	45	55	37	6	4	14	9	8	5	49.61	<0.001
Adoption of smart climate agriculture	40	27	27	18	13	9	35	23	35	23	56.02	<0.001
Cultural taboos/beliefs	30	20	28	19	8	5	44	29	40	27	11.19	<0.024

Source: Primary data 2026

Chi square test (x^2) value results and P-value

Sensitisation with (x^2) value 135.46 and P-vale < 0.001 was highly significant**.** Sensitisation has the strongest level of agreement among all variables, as evidenced by the very high value and the 56% "Strongly Agree" response.

The study found out that there were massive sentisation drives of conservation of shea nut trees by community, cultural, civil society organisations and government agents in the county which include values of the shea nut trees in society, planting, restoration and no cutting of the trees. This was represented by 84 respondents constituting 29%. 56% of the respondents strongly agreed that

it was taking place and only 9% strongly disagreed. This means that sensitisation of the community was taking place to conserve shea nut tree.

By-laws has (x^2) value 54.92 and P-value < 0.001 was highly significant. By-laws were strongly supported which means it contributes to conservation of shea nut trees in Ajan.
The survey revealed that enforcement of set by-laws on shea nut trees by the citizens, cultural institution and local government was carried out to conserve shea nut tree species in Ajan Sub-County in Pader District. 51% of the respondents strongly agreed they existed and only 10% disagreed. The study revealed that the by-laws were set by community and cultural leaders in collaboration with government agents in the district. This shows that there was a need realized conservation stakeholders by shea nut tree to conserve shea nut tree and use of by-law awareness among community members was observed.

Community involvement with (x^2) value 49.61 and P-value <0.001 was significant. This means that the community is engaged in conservation practices of shea nut trees in Ajan and it is not random.
Community involvement was found out by the study of being used to conserve the shea nut trees in the sub county. The community was collaborating with cultural institutions, civil society organisations and government agencies in the county to plan, implement, monitor and report tree felling in their areas, reporting of massive charcoal burning, confiscation of sacks of charcoal and heaps of shea nut tree logs for firewood and charcoal. 45% of the respondents strongly agreed but 5% strongly disagreed. This means that community participation in shea nut conservation was moderate among the community members.

Smart climate agriculture with (x^2) value 56.02 and P-value <0.001 was significant. This indicates that adoption of smart climate agriculture is real in Ajan and it is not carried out by chance.
The study found out that the local community in Ajan-Pader was adopting climate smart agriculture such as agroforestry in which crops were grown in gardens with shea nut trees together benefiting from shea nut trees in form of shades provided during weeding and harvesting season, fruits and addition of nutrients in the soil from decaying leaves of the shea nut trees. Shea nut trees are integral to climate-smart agriculture, offering both environmental and economic benefits. These trees are carbon sinks, sequestering CO_2, and their presence contributes to climate resilience by providing shade and modifying microclimates. They are also a valuable resource,

supporting livelihoods through the shea butter industry and promoting sustainable land management practices. A mixed reaction among the community members was observed with 27% who strongly agreed and 23% disagreed. This means that adoption of climate smart agriculture was being undertaken by some community members but with resistance from others.

Cultural beliefs with (x^2) value 11.19 and P-value <0.024 was significant at 5%. It is evident that it plays some role but with weaker effect in the conservation of shea nut trees in Ajan.
The study found out that the community was using cultural taboos/beliefs to conserve shea nut trees. The Acholi cultural belief attaches values to the shea nut tree as a secret tree that must not be cut because it is a source of food to the community. Opinions on cultural taboos was split with 20% of the respondents who strongly agreed and 29% agreed. This shows that cultural beliefs were less effective in the conservation of shea nut tree in the research area.

In conclusion it is evident that sensitisation, by-laws, community involvement, smart climate agriculture matter more than cultural taboos in conservation of shea nut trees.

4.5.1 Key players in conservation of shea nut trees

The study found out that there were several stakeholders involved in conservation drives to conserve shea nut trees.
The Acholi Cultural Institution (Ker KalKwaro pa Acholi) was found out to play a pivotal role of conserving the shea nut trees using the cultural taboos/beliefs in its conservation sensitisation campaigns spear headed by the Paramount Chief of Acholi chiefdom. The institution adopted the use of the Environment Act in the Constitution of Uganda 1995 translated in Acholi language issued in 2015 by The Uganda Law Reform Commission.

Pader Local Government in conserving shea nut trees was found out to use enforcement of by-laws, laws on environment and enforcement task force. At Angagura the UPDF has been deployed before Achwa bridge to intercept transportation of commercial sacks of charcoal and firewood to Gulu in a move to discourage dealers in charcoal and firewood from cutting shea nut trees and other indigenous trees.

Civil society organisations in Pader district were found out to be engaged in campaigns of conserving shea nut tree species and other indigenous tree species and environment in general.

One of the local organisations Rippe Pi Paco (RPP) led by Dr.Hon.Odonga Otto was found out to be committed in advocating for the stoppage of cutting of trees for charcoal and firewood transported to central Uganda and other parts of Uganda by illegal charcoal dealers coming from central Uganda cutting down trees in Acholi land. Another effort found out was “Roco Paco” campaign which advocated for a number of restorations of Acholi culture in which sustainable environmental management was promoted. This campaign was running in radio programs and other social media.

Community leaders including Local Council chairpersons with their cabinets were also key players found out in the conservation of shea nut trees in their areas of jurisdiction. The leaders in their areas of jurisdiction were jointly working with local community members in the enforcement of the by-laws set and government programs towards environmental conservation and sustainable development.

4.6 Assessment of the economic benefits derived from Shea nut tree products among households in Ajan Sub-County.

Economic benefits of shea nut tree to households

The study revealed that income levels varied among households dealing in shea nut tree products especially during the peak seasons. The highest income frequency recorded was 40 (27%) for income between 100,000 and 150,000 and the lowest was 2 (1%) as shown in Table 4.3. According to Table 4.3 detail, the average household had an income level ranging between 100,000 and 250,000.

Table 4.3: Income levels of households

Income level (UGX)	Frequency	%
50,000 – 100,000	26	17
100,000 – 150,000	40	27
150,000 – 200,000	28	19
200,000 – 250,000	18	12
250,000 – 300,000	11	7
300,000 – 350,000	9	6
350,000 - 400,000	7	5
400,000 – 450,000	6	4
450,000 – 500,000	3	2
500,000 above	2	1

Source: Primary data 2026

Income obtained from shea nut products

The study found out that income obtained from shea nut products by households in season vary with the product basing on the existing demand by the community as indicated in Table 4.4. The highest earning was recorded on energy (firewood, briquettes and charcoal) constituting 900,000 (46%) and followed by shea butter oil which amounted to 450,000 (23%). Cosmetics followed energy with income of 300,000 (15%) and fruit pulp with 250,000 (13%) and the least income obtained was from manure got from residues of shea butter extraction process with 50,000 (3%).

Table 4.4: Income obtained from shea nut products in season

Shea nut products	Income obtained (UGX)	%
Shea butter oil	450,000	23
Cosmetics	300,000	15
Energy (fuel wood, briquettes & charcoal)	900,000	46
Fruits pulp	250,000	13
Manure	50,000	3
Total	**1,950,000**	**100**

Source: Primary data, 2026

Other economic activities as source of income to households

The research found out that households did not rely on income from shea nut tree products alone but from other sources shown in Table 4.5 with varying amounts per household. Sale of surplus produce was the highest UGX 280,000 (24%) followed by brewing and sale of local waragi UGX 250,000 (21%). This was followed by casual laboring in farms 180,000 (15%) and construction work UGX 160,000 (14%). Sale of milk 130,000 (11%) was followed by sale of poultry UGX 100,000(8%) and the least was pottery 80,000 (7%).

Table 4.5: Other economic activities as source of income to households

Activity	Income per month (UGX)	%
Sale of surplus produce	280,000	24
Poultry	100,000	8
Sale of milk	130,000	11
Casual laboring	180,000	15
Local brews	250,000	21
Pottery	80,000	7
Construction work	160,000	14
Total	**1,180,000**	**100**

Source: Primary data 2026

Table 4.6: Economic benefits of shea nut tree to households

	Strongly Agree	%	Agree	%	Undecided	%	Disagree	%	Strongly Disagree	%	X^2	P value
Increased income	70	46	36	24	4	3	22	15	18	12	40.66	< 0.001
Payment of school fees	50	33	46	30	10	7	25	17	19	13	21.29	< 0.001
Purchase of house hold items	30	20	66	44	7	5	29	19	18	12	30.81	< 0.001
Improved standard of living	30	20	77	51	3	2	24	16	16	11	47.66	< 0.001

Source: Primary data 2026

Total responses

$$N = 150$$

Expected value (X)

$$E = \frac{150}{5} = 30$$

Chi square test (x^2) value results and p-value

Increased income with (x^2) value 40.66 and P-value < 0.001 was significant verifying that shea nut tree boosts income

School fees payment with (x^2) value 21.29 and P-value <0.001 was significant supporting that fact that shea nut tree supports education

Household items with (x^2) value 30.81 and P-value <0.001 was significant supporting the fact that shea nut tree contributes to daily needs

Standard of living (x^2) value 47.66 and P-value <0.001 was very significant. This proves that shea nut improves well-being

Conclusion: shea nut trees significantly improve household livelihoods in multiple ways

The study revealed that shea nut trees were associated with economic benefits to households in several ways indicated in Table 4.6.

Increased income: Strongly agreed by 46% of the respondents and strongly disagreed by only 12%. This means that income of households was increased as a result of dealing in shea nut tree products.

School fees payment: 33% of the respondents strongly agreed but many were neutral meaning that shea nuts contributed to financing education of children but not consistently throughout the year.

Purchase of household items: 44% of the respondents agreed and 12% strongly disagreed. This means that shea nut tree products income supports daily lives of community members.

Improved standard of living: 51% of the respondents agreed but 27% still disagreed. This suggested that shea nut tree is beneficial but not all households feel direct living standard improvement

Conclusively, shea trees provide significant economic benefits but impacts vary from one household to another. She therefore provides more income than the other alternative sources of income.

Table 4.7: How money obtained is spent by households in season

Items spent on	Amount (UGX)	%
Medical bills	20,000	5
School fees	100,000	25
Household kitchen items	20,000	5
Food items	50,000	12
Cultural activities	100,000	25
Cosmetics	25,000	6
Clothes	30,000	7
Farm inputs	20,000	5
Transport	40,000	10
Total	**405,000**	**100**

Source: Primary data, 2026

The research revealed that income obtained from shea products was spent by households for different purposes in season as shown in Table 4.7. Medical bills constituted (5%), school fees (25%), household items (5%), food items (12%), cultural activities like last funeral rites (25%), cosmetics (6%), clothes (7%), farm inputs (5%) and transport (10%). This meant that shea nut tree products are sources of income to the community to meet individual needs and wants for improving standards of living.

4.6.1 Benefits to government

The research finding showed that shea nut trees were valuable to the government through revenue collection from monthly collection of market dues in the local market (59%) and revenue from roadside (bus stop) dues (41%). The highest benefit recorded was from market dues (UGX 2,400,000) and the least from roadside vendors' dues (UGX 1,680,000).

Table 4.8: Monthly government revenue collection

Source of income	Mean (UGX)	Percentage (%)
Revenue from market dues	2,400,000	59
Revenue from roadside (bus stop) dues	1,680,000	41
Total	**4,080,000**	**100**

Source: Secondary data 2026

Comparison of income from shea products and other economic activities

Table 4.9: Comparison of income from shea nut products and from other economic activities

Economic activity	**Mean (UGX)**	**Std**	**Std error mean**	**t**	**Df**
Shea products	1,950,000	0.50	0.0577	7.96×10^{-17}	148
Other economic activities	1,180,000	0.50	0.0577		

Source: Primary data, 2026

Explanation of each column

Means: Shea (UGX 1,950,000) > Other activities (UGX 1,180,000). Difference = UGX 770,000.

Std (SD = 0.5): Both groups assumed to have equal spread (in millions).

Std Error Mean (SE = 0.0577): Measures precision of mean difference.

t-value (9.43): Large positive value → strong evidence of difference.

df (148): Degrees of freedom ($n_1 + n_2 - 2$, assuming 75 per group).

p-value (7.96×10^{-17}): Far smaller than 0.05 → result was statistically significant.

Formula used

$$t = \frac{\bar{X}_1 - \bar{X}_2}{SE}$$

Standard Error

$$SE = \sqrt{\frac{s^2}{n_1} + \frac{s^2}{n_2}}$$

Substituting values

$$t = \frac{1{,}950{,}000 - 1{,}180{,}000}{0.0577}$$

In conclusion, there was a highly significant difference between incomes. Respondents earned much more from Shea nut products than from other economic activities. This supported the economic importance of Shea in the study area.

There was a highly significant difference between incomes. Respondents earn much more from Shea nut products than from other economic activities. This supports the economic importance of Shea in the study area.

The comparison results in Table 4.9 showed that shea nut products bring in more income to the house holds thus indicating the need to conserve the shea nut tree.

Mean income of shea products UGX 1,950,000 and other economic activities UGX 1,180,000 showed that shea nut products generate higher income than other economic activities. This means that shea nut tree was of a strong economic importance to the community in Ajan Sub-County.

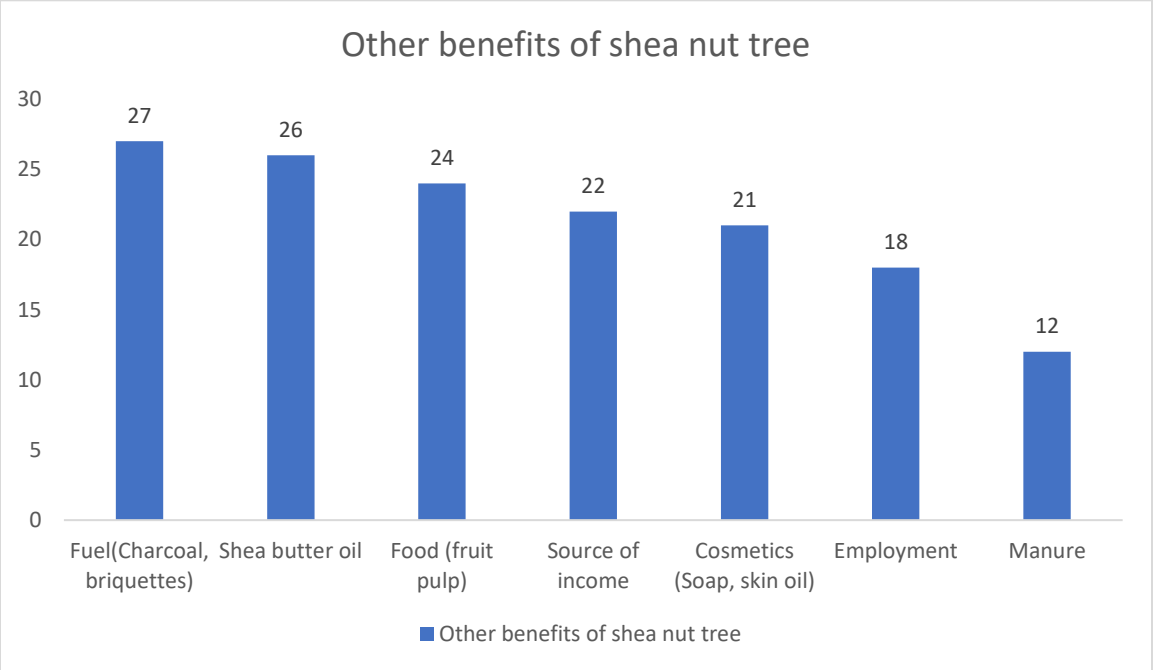
The comparison of income obtained from shea products and other economic activities during the research revealed that more income was obtained from shea nut tree products per month by households as compared to other economic activities.

4.6.2 Other benefits of shea nut tree

Other benefits of shea nut tree found out during the research include fuel 27 (18%), shea butter oil 26 (17%), fruit pulp 24 (16%), source of income 22 (15%), cosmetics 21 (14%), employment 18 (12%) and manure 12 (8%) as indicated in figure 4.8.

Shea nut trees were found out to be a source of energy for cooking in form of firewood, charcoal and briquettes. The shea nut trees fuel wood and charcoal were on high demand because of the high temperature and long-lasting heat produced during combustion which eases cooking by the users.

Figure 4.8: Other benefits of shea nut tree to households



Source: Primary data 2026

4.6.2.1Nutritional benefits

Shea nut trees were a source of food to people especially the fresh fruit pulps locally known as "*oduu yaa*" among the Acholi people which they collected and ate as a source of vitamin to both children and adults. From the fruit a locally sun-dried cake known as "poki" is made and eaten as snack and can be stored for longer time.

Shea nut trees are a source of the popular and traditionally cherished shea butter oil used for cooking and as appetizer to local dishes prepared from leguminous crops like pigeon peas, beans and cow peas.

4.6.2.2 Ecological benefits of shea nut trees

The research results revealed that shea nut trees were associated with a number of ecological benefits (Table 4.10).

Table 4.10: Ecological benefits of shea nut tree species

	Strongly Agree	%	Agree	%	Undecided	%	Disagree	%	Strongly Disagree	%	X^2	P value
Food to organisms	94	63	39	26	5	3	9	6	3	2	85.46	<0.001
Habitat	82	55	35	23	7	5	18	12	8	5	54.35	<0.001
Source of pollen grains	66	4	48	32	4	3	18	12	5	14	46.36	<0.001
Microclimate modification	33	22	37	25	6	4	38	25	36	24	18.36	<0.001
Soil nutrients addition	23	15	42	28	4	3	47	31	34	23	26.81	<0.001

Source: Primary data 2026

Total responses

$$N = 150$$

Expected value (X)

$$E = \frac{150}{5} = 30$$

Chi square test (x^2) value results and p-value

Food for organism of (x^2) value 85.46 and P-value <0.001 was strongly significant. This means food to organisms played a crucial ecological role.

Habitat of (x^2) value 54.35 and P-value <0.001 was significant. shea nut tree was habitat provider

Pollen grain source with (x^2) value 46.36 and P-value <0.001 was significant for playing pollination role

Microclimate with (x^2) value 18.36 and P-value <0.001 was significant but weaker recognition

Soil nutrients with (x^2) value 26.81 and P-value <0.001 was a significant contribution

In conclusion, shea nut trees are ecologically essential, especially for food and habitats

The research finding revealed a number of ecological uses of shea nut trees to the community as presented in Table 4.10.

Food to organisms**:** 63% of the respondents strongly agreed the shea nut trees was a source of food to organisms in the form of fruits, nectar, worms and caterpillars and only 2% strongly disagreed which means that shea nut trees played major ecological roles in the environment in the area.

Habitat: 55% of the respondents strongly agreed that shea nut trees were habitat to a number or organisms and 8% strongly disagreed. This shows the recognition of shea nut tree importance to biodiversity in the area.

Source of pollen grains: 44% of the respondents strongly agreed, 32% agreed that shea nut trees were a source of pollen grains and 9% strongly disagreed. This means that community members were aware of the importance of shea nut tree in supporting life pollinators especially to bees and birds that benefit from them.

Microclimate modification: A mix of responses with 22% of the respondents strongly agreed that shea nut trees contributed to microclimate modification versus 49% of the respondents who disagreed/strongly disagreed. This means that the respondents were less aware of the role of shea nut tree in microclimate modification and the role of vegetation in climate modification in general.

Soil nutrients addition: A mix of 43% of the respondents disagreed/strongly disagreed that shea nut trees contributed to soil nutrients addition versus 28% who agreed. This means the respondents were not aware of the role of shea nut tree in adding nutrients to the soil.

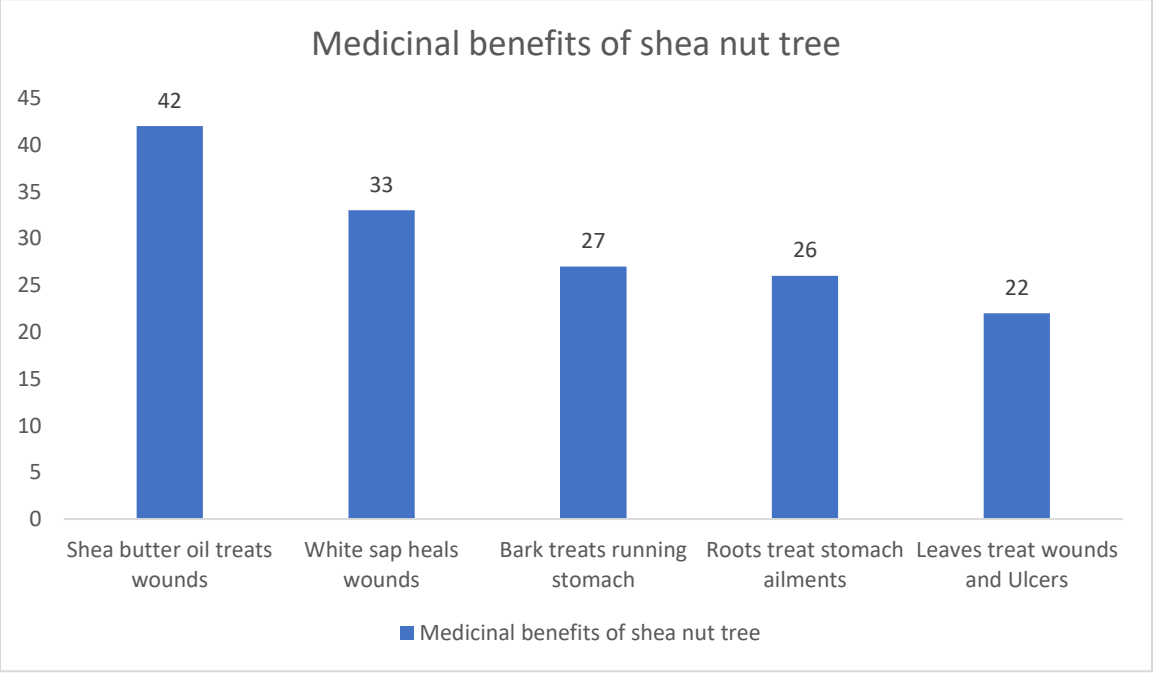
From the research findings it is observed that people in Ajan Sub County clearly valued shea nut tree for food, habitat and pollination but were less aware of climate and soil nutrient addition

contributions. The ecological role of shea nut tree was seen as food, habitat and source of pollen grains but undervalued in soil nutrient addition and microclimate climate modification roles. Shea nut trees were recognised as ecologically essential, especially for food and habitats. Shea nut trees served as habitat for birds, insects, bats and animals as represented by 94(32%). These birds and insects lived in the shea nut trees and reproduce in different parts of the trees like the leaves, branches and bark.

4.6.2.3 Medicinal benefits of shea nut tree

The study findings revealed that shea nut tree has a number of medicinal uses in the local settings. From figure 4.9 medicinal befits of shea nut tree found out indicated as shea butter oil used to treat open wounds as represented by 42 (28%) of the respondents, the white sap used to treat fresh open wounds reported by 33 (22%) of the respondents, the bark of the tree was reported to be used to treat running stomach 27(18%), the roots used to treat stomach ailments 26 (17%) and leaves used to treat wounds and Ulcers 22 (15%).

Figure 4.9: Medicinal benefits of shea nut tree



Source: Primary data 2026

4.6.2.4 Cultural benefits of shea nut trees

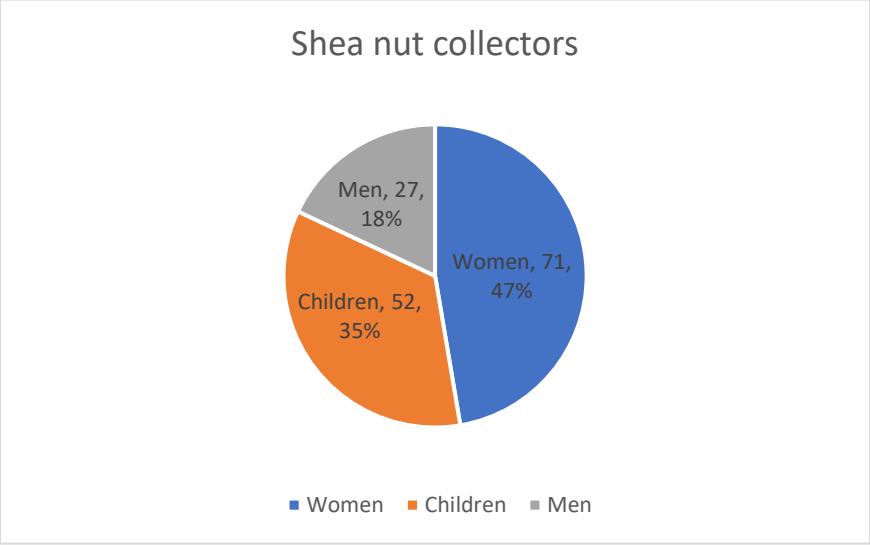
The research finding revealed that the shea nut butter was used for cooking and as an appetizer to local dishes of legumes especially pastes sauce from pigeon peas a popular cultural sauce known as “dek ngor lapena” among the Acholi people, without shea oil (moo yaa) poured on it is not valued culturally.

The study found out that the shea butter oil was culturally used during rituals of celebrating the birth of twins during which ceremony the shea butter oil is smeared on the twins or triplets and their parents to calm their hearts among the Acholi people. The Acholi people also use shea butter oil ‘moo yaa’ to smear it on traditional chiefs during initiation ceremony.

4.7 Collection of shea nuts

The research finding discovered that that collection of the shea nuts was majorly done by children who love it because of the readily available fruits that they ate and gave the nuts to their mothers. Children accounted for 35 % (52) from the findings and women 47% (71) who majorly collected the shea nuts for the nuts that they extracted shea butter oil from when dry and men contributed to 18% (27). It was discovered that men were less interested in the collection process because they considered it as work of women and children and demeaning to them to compete with the women and children when collecting shea fruits and nuts.

Figure 4.10: Shea nut collectors

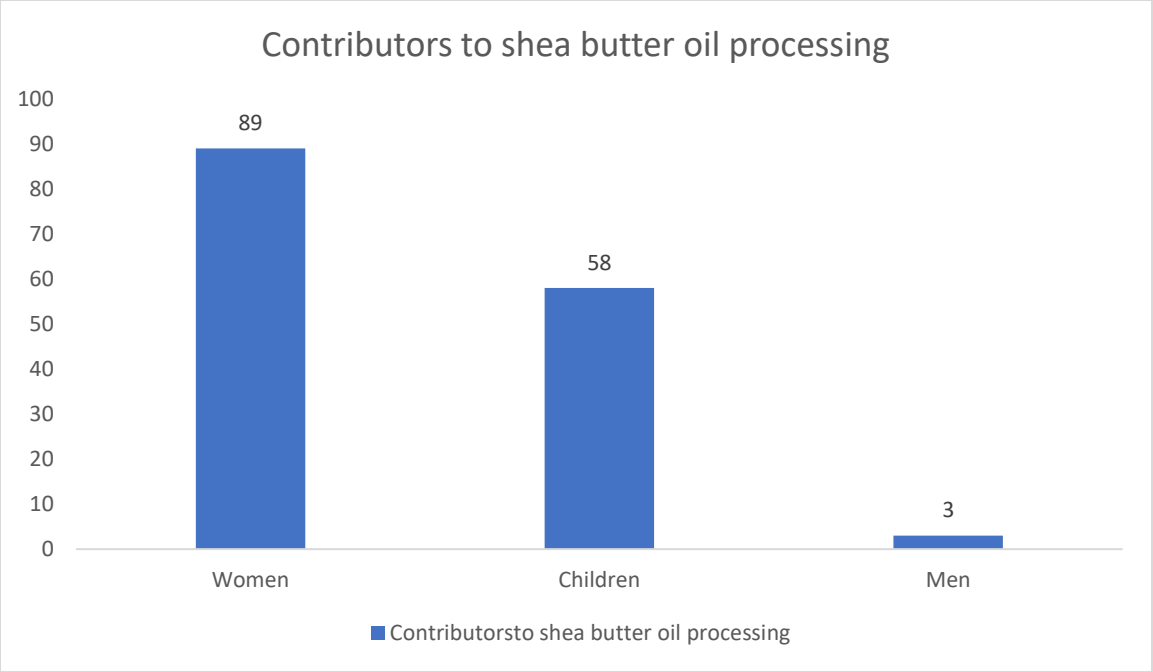


Source: Primary data 2026

4.8 Contribution to Processing of shea nut butter oil

The research finding shows that women were the major processors of shea nut butter oil represented by 59%. Children contributed 39% and men contributed least with 2%. The processes included shea nuts collection, sun drying, shelling, toasting, pounding, hand grinding on grinding stone, boiling the paste, separation of oil from paste and packing into containers like bottles. Children helped their mothers in collection, sun drying, shelling and pounding toasted nuts. This means men had little interest in processing shea butter oil but instead were more interested in firewood and charcoal that brought them quicker money.

Figure 4.11: Contributors to shea butter oil processing



Source: Primary data, 2026

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0 Discussions

This chapter synthesizes the main findings of this research, addressing the primary research aim of an assessment of shea nut tree (V*itellaria Paradoxa*) conservation and its economic values It outlines the theoretical and practical contributions, acknowledges the limitations, and provides recommendations for future research.

5.1 Major threats facing the shea nut tree and how to overcome them in Ajan Sub-County.

The survey was intended to identify the major threats facing the shea nut tree (Vitellaria Paradoxa) in Ajan Sub-County. The findings revealed a range of interconnected threats, both anthropogenic and natural, that collectively endanger the sustainability of shea trees in the area. These threats include over-cutting of shea nut trees, annual bushfires, weak law enforcement, population pressure, emerging land uses, pests and diseases, climate change effects, and the negative attitudes of people and farmers.

Over-cutting of shea trees emerged as a major threat from the research findings. This practice is largely driven by the demand for fuel wood, charcoal production, and agricultural expansion. Despite the ecological and economic importance of shea trees, particularly for rural livelihoods and the shea butter industry, local communities continue to cut them down due to lack of alternatives and limited awareness of long-term consequences. The loss of mature shea trees significantly reduces nut production and undermines the ecological stability of the region.

The study revealed that illegal over cutting of the shea nut trees despite the ban by the government and local leaders in the area is a threat to shea nut tree species. The firewood and charcoal from shea nut trees burn with stronger heat that last longer that is why their demand is high to households in the area, in urban neighboring urban areas and in schools where school feeding programme is practiced. According to Augusseau et al (2006) and Brandt et al (2018) the undiscriminating cutting down of shea trees for timber, firewood and charcoal threaten the sustainability of the shea nut tree species listed as vulnerable.

In line with the found challenge, UNDRR (2016) portrays that in Northern Ghana, the shea trees are not only destroyed through bush fires, some are cut down and burnt for charcoal, while others

are used for firewood. Some farmers also clear the shea trees to make way for the planting of other horticultural plants such as mangoes and cashew. The three regions in the north, comprising Upper East, Upper West and Northern, account for less than four per cent of the total national consumption of Liquefied Petroleum Gas (LPG). This simply implies that most of the people in these regions mainly rely on charcoal and firewood, which are mostly made from the shea trees, to cook.

According to The Independent Uganda (2021), shea nut trees are among the traditional tree species known for medicinal, food value, economic, and cultural significance in Acholi sub- region. However, shea nut trees which are also known to make quality coal have come under threat in the wake of a growing demand for charcoal as an alternative source of fuel. Environmentalists are worried that the alarming destruction of shea nut trees may see the trees extinct, regardless of the stringent policies put in place by both the central government and the district local governments. For instance, in 2018, the government through the Ministry of Water and Environment banned the cutting, transportation and sale of shea nut and Afzelia Africana tree logs and their products. The region had witnessed a surge in the destruction of the tree species owing to the lucrative market Afzelia Africana trees were fetching at the time.

Annual bushfires were also identified as a persistent and destructive force. These fires, often set deliberately for hunting, farming and land clearing, damage young shea seedlings and mature trees alike. Repeated fires weaken tree regeneration and reduce overall vegetation cover, exacerbating land degradation. The seasonal nature of these fires coincides with dry periods, increasing the intensity and spread of fires across the landscape.

The study found out that the shea nut trees suffer from annual bush fires (bush burning) practices by the local population. Annually in the dry season that range from December to February in Acholi sub region bush fires are common phenomena as people set fire to get rid of dry grasses to open up land for farming, security reasons, during hunting of wild animals to uncover them from their hiding bushes and to give room for fresh fodder for animals for grazing. As a result, ecosystems and organisms including shea nut trees are destroyed in the processes. During these practices wild seedlings and trees growing are burnt to death thus interfering with the regeneration of the shoots from cut shea nut trees and restoration of the trees in depleted areas. The bush fires

also interfere with proper growth of the shea trees and their fruiting during the fruiting seasons when the bush fires are in their peak seasons especially between December and February. According to Ky-Dembele (2021), the shea tree is rather largely at risk from human practices, including annual crop cultivation, collection of nuts, bush fires, use of the tree species for firewood and charcoal and others.

A report from Pader District Local Government, (2016), indicates that bushfires occur yearly throughout the district. The major cause is due hunting as fire is always set by hunters during the dry season to open hunting for wild edible rats commonly known as “anyeri” much as sometimes is bush fire occurs accidentally and spread to large areas when already in uncontrolled state by the locals to stop it.

UNDRR (2016), asserts that in Ghana bush fires continue to destroy lives and property in the country. Their effects on the environment, health and socio-economic life of the people in the affected areas are incalculable. Bush fires have rendered many green vegetative and forest covers bare where even grasses struggle to survive. The menace has become a yearly feature in many parts of the country, particularly in the savannah ecological zones, during dry seasons. Many sources, including activities of smokers, game hunters and arsonists have been identified as some of the causes of bush fires in the country. Although it is scientifically proven that trees including shea trees” play a vital role in human survival by giving oxygen, some people do not see the need to allow these trees to keep their green leaves; they set them on fire. However, unlike cocoa, cashew, rubber and mangoes, many shea trees are being destroyed through bush fires with impunity in most parts of the savannah ecological zones without any efforts to tackle the menace.

Ekua (2021) argues that the West African savanna experiences a prolonged dry season with Harmattan winds which facilitate large and persistent biomass burning from November to April. The fires are mostly caused by humans, mainly in pursuit of the day-to-day livelihood activities.

Another key finding was the weak enforcement of environmental laws and by-laws. Although regulations exist to protect shea trees, their implementation is often hindered by limited institutional capacity, corruption, and lack of political will. This creates an environment where destructive practices go unpunished, further encouraging unsustainable exploitation.

The research revealed that there is weak implementation of laws by the government and community authorities in Ajan Sub-County in Pader District. This is attributed to reduced motivation due to little facilitation and human resource to carry out implementation frequently and effectively. However, the attempt for enforcement of the existing laws in Uganda are confronted with the challenges of inadequate staff numbers, high staff turnover and poor road infrastructure (NEMA 2008, Shively et al. 2010). Consequently, there has been a shift from charcoal production licenses towards loading fees and transportation licenses which, though less demanding in terms of time and human resources, are also less effective in regulating the use of preferred charcoal tree species (Turyahabwe et al, 2007). It is also argued that the use of district ordinances and by-laws which prevent the cutting of shea nut trees are counterproductive to tree planting and tree management on farm land (Turyahabwe et al. 2007).

The Independent (2021), reports that John Peko Lugai II, the Palwo clan chief says his chiefdom has started forming a structure within all the sub-county levels to help in monitoring shea nut tree cutting. He says that his team will liaise with the district committee on land and natural resources to ensure a strong coordination to fight deforestation. Agago Resident District Commissioner Andrew Onyuk however blames some of the district by-laws on charcoal which allow for payment of fines and revenue charges on culprits found in illegal possession of forest products. For instance, Onyuk says charcoal traders freely exit the district after paying 500,000 Shillings and another 500,000 Shillings at the district as revenue, a decision he says has legitimized the charcoal trade. Onyuk says his office is taking a firm stand on abolishing commercial charcoal production to save the environment. He notes that several suspects have been arrested recently in operations conducted by the police and remanded over environmental destruction charges. In 2019, the Joint Acholi Sub-Regional Leaders-Forum drafted a charcoal policy for Acholi sub-region seeking to curb the cutting of endangered tree species and giving solutions for alternative sustainable charcoal production in the region. But nearly two years after drafting the bill titled “The Acholi Sustainable Charcoal Production and Marketing Bill, 2019,” only Kitgum district local government council has passed the bill into law.

The research findings revealed that population pressure was intensifying the competition for land and natural resources. As the human population grows, so does the need for food, shelter, and fuel.

This has led to the conversion of shea parklands into farmland, settlements, and infrastructure, thereby reducing the natural habitat of shea trees. Closely related is the issue of emerging land uses, such as commercial agriculture and infrastructure development, which are reshaping land use patterns and further fragmenting shea-growing areas.

The study found out that population increase greatly affects the shea nut trees because normally areas where the shea nut trees sprout is very fertile. The high demand for food and agricultural land give rise to the high demand for more land hence clearing off shea nut trees in such areas to give room for agricultural land. In Pader district there has been a population increase of 62159 people and an annual growth rate of 5% as reported by UBOS in the National Population and housing census report of 2024.

The study found out the challenge of emerging land use patterns in the area. In addition to the small holder farms for subsistence farming purposes commercial farming is rising in the area by individuals and companies in parts of Achwa ranch. The prison farm in Achwa range has contributed to the clearing of large portion of land that was covered with shea nut trees and other natural indigenous trees in the area. Other land use patterns include road construction from the former village paths and urban development along the high way roads.

Lassen et al (2016) in line with the above states that Parklands across the Sahel-Savanna eco-zones are significantly threatened by extended land-use change. Millions of shea and other native trees are being cleared to make way for modernized farming, urbanization, mining, and fuel wood extraction (Lovett and Phillips 2018). In addition, fallows, which are vital for wood fuel production and the natural regeneration of indigenous tree species of the savanna woodland system, are shrinking or disappearing, while at the same time, herbicide use is increasing. It is known that pesticides, coupled with habitat and fodder loss, reduce insect populations. Notably, honey/stingless bees are the main vectors for pollination, resulting in lower shea fruit yields and fewer resources available for migratory bird populations.

Pests and diseases were reported as a growing concern, especially among farmers. Although detailed entomological and pathological assessments were not part of this study, local observations

suggest that infestation by insects and fungal infections affects nut yield and tree health. These biological threats, if unchecked, could significantly reduce shea productivity.

The study found out that the shea nut trees are affected negatively by pests and diseases during flowering and fruiting seasons. The Cirina butyrospermi, caterpillar (larva) eats the leaves of the trees during the time of its fruiting. Dossou et al., (2022) on this challenge report that the prevalence of shea butter tree attack by the African mistletoe and stem borers is very high in the Bohicon shea parklands of Benin in which the overall prevalence of pest attack in shea butter trees was 28.7%, with a prevalence of African mistletoe of 24.8% and stem borers had attacked 6.2%. The prevalence of shea trees infestation by the African mistletoes was 24.80 %. This infestation rate, whatever the habitat, is not negligible, especially for shea trees in the Sudanian regions.

Agbesi et al (2023) confirm she challenge in their argument that in Ghana the leaf spot disease, associated with Fusarium moniliforme, Pestalotia guepini, and Phomasorghina is one of the most important yield-limiting factors of the shea tree. It affects the tree crop at any stage of growth. As a foliar disease, it causes lesions on the leaves, reducing the surface area of leaves, and hence affecting the photosynthetic ability of the plants, transcending directly on the overall yield.

The shea tree hosts several organisms with diverse roles in shea parklands across the Sahel-Savanna eco-zones these organisms include species (plants, fungi and insects) that attack the tree and affect productivity (Dwomoh, 2003). Shea parklands across the Sahel-Savanna eco-zones have a great socio-economic, cultural and ecological interest but suffer pest attack, which is among the major causes for their deterioration in Africa. The defoliator Cirinaforda (Westwood) and the stemborer Neoplocaedaerus are the two most damaging insect species occurring on shea trees (Kouami et al, 2012)

As with many other fungi foliar diseases, the pestilential leaf spot causes infection and leads to various forms of losses in shea production. The significant yield reduction in yield is on youngest disease-infected shea trees. The negative impact of the disease on yield could be due to the fact that leaf spot diseases reduce the number of leaves, or the surface area of leaves, reducing the photosynthetic capacity of the related trees. In expense, this means that severely infected leaves

contribute little to nothing to the overall chlorophyll production of the plant, which could translate to a poor contribution to the general development and production of the trees (Akpatsu, 2024**).** The parklands across the Sahel-Savanna eco-zones are rapidly and widely degrading with ageing trees, which are also attacked by pests and parasites (Augusseau et al 2006, Brandt et al 2018, and Wardell 2022b).

Climate change effects including erratic rainfall patterns, prolonged droughts, and extreme temperatures pose long-term challenges to shea tree survival. Climate variability affects flowering, fruiting cycles, and seed germination. Moreover, drought stress weakens trees, making them more vulnerable to pests, diseases, and fire.

The study found out that climate change is a challenge to the proper growth of the shea nut tree species in the study area. This is because the changes in the climate have effect on the fruiting of the trees, growth of new branches and resistance to prolonged drought conditions. In support of the argument Akpatsu (2024), argues that in southern Burkina Faso, many women depend on the harvesting and processing of shea nuts, a raw material for food but also for many care products. However, the habitat of the shea trees is rapidly deteriorating. Climate change and pressure on land due to the use of pesticides and overgrazing have affected the shea tree landscape. But the processing of shea nuts by local women also has an impact on the environment. In particular, cooking the nuts on a traditional “three stone fire” means that a lot of wood is used. Soils have become less fertile and more susceptible to erosion from disappearing trees. All this has major consequences. The people who live there see their harvests, from agriculture but also from shea nuts and other crops, declining. For the migratory birds that arrive in this area after a long journey, this means that there is little to eat. There are fewer insects in the impoverished landscape. Insects are not only needed as food for the millions of migratory birds, but also for pollination of the shea trees.

Okot (2022), reports that Northern Uganda's revered shea trees are under threat from climate change and illegal loggers who turn the wood into charcoal and sell the fuel for use in cooking. Trees are being felled illegally for lucrative charcoal, Extreme weather in Northern Uganda is also causing damage and Communities cracking down on loggers and raising awareness.

Finally, the negative attitude of people and farmers toward shea conservation presents a social and behavioral challenge. Despite some awareness of the importance of shea trees, many community members prioritize short-term economic benefits over long-term sustainability. The lack of incentives for shea tree conservation, coupled with limited education and outreach programs, contributes to apathy and neglect.

The study also revealed negative attitude of people to conserve shea nut trees as reported by 13% of the respondents. The study revealed that people in Ajan especially farmers view shea nut trees as a quick source of money without replanting and conserving the existing ones for sustainable use. The shea nut tree species also take so long to mature which makes the farmers develop negative attitude in integrating it in their farming activities.

Buyinza et al, (2015), in this line state that land and tree tenure system is also one of the factors discouraging local people from planting shea trees on farms. Nakasongola district faces persistent problems of absentee landlords, while a lot of the agricultural production is on land that is informally accessed leaving crop farmers and tree planters with limited security of land tenure. The local people here have continued to live in relative insecurity and fear of what decision the largely absentee landlords would take and the consequences to them if the land was sold or reclaimed. Currently, Nakasongola district is facing a drastic change in land management where formally communal grazing lands are being fenced off and turned into private lands. This has the consequence of limiting grazing areas, yet farmers have inadequate knowledge on agroforestry practices capable of renewing and regenerating natural vegetation including shea trees.

Overall, these findings highlight that the threats to shea nut trees in Ajan are multifaceted and require a holistic approach. Effective interventions must address both the direct causes, such as tree cutting and bushfires, and the underlying socio-economic and institutional factors, such as poverty, lack of enforcement, and limited community engagement. Promoting alternative livelihoods, strengthening local governance, enforcing environmental regulations, and raising awareness among stakeholders are critical steps toward the sustainable management of shea resources in the region.

5.2 Examination of the current conservation practices of the Shea nut tree in Ajan Sub County.

The findings of this study revealed that shea nut tree (Vitellaria paradoxa) is a vital socio-economic and ecological resource in Ajan Sub-County and Northern region in general. For its conservation multiple complementary approaches are currently employed including mass sensitisation, enforcement of by-laws, community involvement, adoption of climate-smart agriculture, and the use of cultural taboos which reflect both modern and traditional strategies aimed at sustainable environmental stewardship.

The research findings indicate that mass sensitisation emerged as a critical practice in raising awareness about the ecological and economic importance of shea trees. This strategy is implemented through local council 1 village community meetings, radio programs and school debates which plays a key role in altering destructive behaviors such as indiscriminate tree felling and bush burning. Sensitisation efforts have contributed to increasing public consciousness on the long-term benefits of conserving shea trees, particularly among younger generations whose future depend on shea nut tree.

In this regard according to Gwali et al (2011), shea tree conservation can be traced back to the value system and traditional practices which can be broken down into seven broad levels: (i) the use of taboos, (ii) folklore and legends, (iii) local bye-laws, (iv) the sanctity of the elders, (v) the authority of traditional chiefs, (vi) traditional songs, and (vii) depth of integration into tradition, culture and custom.

NEMA (2014) supports this by emphasizing that training and sensitization of communities on appropriate management practices should be enforced. Such appropriate management practices are protection of shea trees from fire, weed control, soiling (addition of more soils to cover the exposed roots of the shea trees), and removal of other trees that shade the shea trees to improving aeration, light penetration and reducing above ground/ below ground competition. Controlled burning in August- September/early October and digging around the tree (spot weeding) can also be used to enhance regeneration and fruit production of shea trees.,

In support of the practice Turyahabwe et al (2007) lament that throughout the shea belt region of Uganda, local governments and civil society organizations (CSOs) alike, have sought for ways to conserve the shea nut tree. While local governments tend to be financially constrained and so focus on experimenting with various regulatory approaches, international donors and CSOs often resort to financial incentive measures that try to strike a balance between conservation and livelihood.

Okullo (2016), as well highlighted that the Government of Uganda has listed the Shea tree as endangered, and through local government councils, its various bye-laws banning the cutting of Shea trees for charcoal have been passed. Although the enforcement of these bye-laws is still weak, it is welcomed by some local community members who reported that it reminds them of their old traditional sacred beliefs, which prohibit cutting Shea trees.

The research findings reveal that enforcement of local by-laws has also proven to be an effective regulatory measure. These by-laws, often developed through collaboration between local leaders and government authorities, prohibit harmful practices such as cutting live trees, or setting fires during the dry season. The study found that these laws are more effective when backed by strong local leadership and supported by traditional councils, indicating the importance of institutional structures in conservation efforts. As demonstrated by the Customary Laws of the Acholi people (www.roccopaco.org), penalty for cutting or selling important indigenous trees such as shea nut trees for charcoal will be a fine of a cow or an amount set at that time by the Acholi Cultural institution (Ker KalKwaro Acholi). Meanwhile, the involvement of sub-county leadership in regulating charcoal production has been attempted by some districts, though without much success due to lack of institutional structures and incentives (Shively et al. 2010).

Okot (2022), agrees in a quotation from his research that since 2016, Justine Tooyero a local clan leader in Agago district has teamed up with local chiefs, district authorities and a network of citizens to protect the trees. In his agreement Justine Tooyero is quoted as saying "we are working with four chiefdoms and 100 informants who also work with the police to arrest illegal charcoal dealers in hotspot areas," Tooyero said that more than 200 arrests have been made so far this year, with about 35 dealers jailed, he added. The group is also trying to teach people about the economic value and environmental importance of the endangered species - whose numbers are dwindling not just in Uganda but across the so-called "shea belt" stretching from Senegal to South Sudan.

Community involvement was found to be a cornerstone of successful conservation from the research findings. Active participation of community members in decision-making processes, monitoring, and enforcement fosters a sense of ownership and responsibility. The study highlights that communities with more inclusive practices tend to have better compliance and more sustainable conservation outcomes. This aligns with other studies that emphasize the role of participatory approaches in natural resource management. Community involvement was found out by the study of being used to conserve the shea nut trees in the sub county. The community is collaborating with cultural institution, civil society organisations and government agents in the county to plan, implement, monitor and report tree felling in their areas, reporting of massive charcoal burning, confiscation of sacks of charcoal and heaps of shea nut tree logs for firewood and charcoal.

To support this intervention according to Gwali et al (2011), shea trees have therefore been protected through participatory management involving a complex mix of traditions and customs involving the traditional knowledge of management and conservation practices that are used in local conservation of shea trees which are specifically documented and used to propose guidelines for the conservation of shea trees in form of a market-based community conservation framework. The documentation of local conservation practices and development of conservation guidelines contributes to conservation policy decision making and foster a linkage between contemporary conservation and the local communities whose livelihoods are largely met by shea tree products and services. The conservation framework is therefore used in the design of the shea conservation interventions. Schramski and Larubi (2025) in support reported, that in Northern Uganda's Pader district, a women-led cooperative is leading efforts to replant shea trees, restore deforested land and improve local livelihoods through the processing and sale of shea products. The Pader Shea Nut and Agro-processing Society, which started with just six members in 2004, has grown to more than 1,400 members. Through agroforestry techniques and Indigenous knowledge, the group has restored more than 500 hectares (1,240 acres) of degraded land, planting shea and other native tree species. Their efforts face challenges from charcoal production, land grabbing and climate change, but the women remain determined to preserve their natural heritage for future generations. As part of a larger effort to restore Uganda's shea parklands, the cooperative has successfully rehabilitated

more than 500 hectares (1,240 acres) of degraded land, integrating shea trees (*Vitellaria paradoxa*) and other native species with maize and sunflower crops.

ESAFF Uganda (2025), strongly believes that a multi-stakeholder approach, incorporating government agencies, civil society organizations, and local communities, is crucial to addressing the challenges surrounding shea nut tree conservation and sustainable land use. We advocate for the implementation of community-led conservation programs that integrate sustainable shea nut harvesting with secure land tenure. Recognizing collective customary land tenure rights is essential for empowering communities to take an active role in conservation and sustainable land use. In addition, strengthening legal frameworks for tree protection, including expediting the enforcement of the by-laws and ordinances, is vital to regulate the exploitation of shea nut trees and ensure their long-term survival.

The adoption of climate-smart agricultural practices such as agroforestry, mulching, and integrated farming systems was also reported as beneficial to shea tree conservation. These practices not only improve resilience to climate change but also reduce the pressure on shea parklands by promoting sustainable land use. Farmers in Ajan Sub-County are increasingly recognizing the value of integrating shea trees into their farming systems for soil fertility, shade, and diversified income sources. The study found out that the local community in Ajan-Pader is adopting climate smart agriculture such as agro forestry in which crops are grown in gardens with shea nut trees together benefiting from shea nut trees in form of shades provided during weeding and harvesting season, fruits and addition of nutrients in the soil from decaying leaves of the shea nut trees. Shea nut trees are integral to climate-smart agriculture, offering both environmental and economic benefits. These trees are carbon sinks, sequestering CO2, and their presence contributes to climate resilience by providing shade and modifying microclimates. They are also a valuable resource, supporting livelihoods through the shea butter industry and promoting sustainable land management practices. This is indicated by 40 (14%) of the respondents.

To support this, Pariesa (2024), argues that several grantees in West Africa are planting shea nut trees to combat climate change and enhance agricultural resilience. The shea nut trees play a crucial role in absorbing carbon dioxide, mitigating climate change and supporting biodiversity by providing habitats for different plants and animals. They also help prevent soil erosion, regulate

the water cycle and improve air quality by filtering pollutants. In Nigeria; grain processor Adefunke Desh has encouraged its supplier farms to plant trees to protect their crops.

NEMA (2014), reports that farmers in Acholi sub region and Lango sub region perceived that good tree management practices such as use of appropriate cultivation techniques could be adopted in the shea parklands of Uganda to promote domestication, marketing, increased value of the crop, on farm conservation and protection from overexploitation of the threatened shea trees.

In research finding of Okullo (2016), most farmers in the northern region of Uganda cited several advantages of having fruiting shea trees on farm compared to in the wild. The most commonly reported advantage was production of large nuts and prolific fruiting, protecting the trees from fires, production of sweet fruits, ease of fruit collection, production of very soft fruits, no loss of fruits to pest and wild animals, and the shea trees being able to get enough nutrients (large fruits, protection of trees from fire, production of very sweet fruits, easy collection of fruits and protection of fruits against pests and diseases). Special tending skills and conservation strategies that can be adopted for the shea tree include weeding, thinning, pruning, coppicing, pollarding, spraying against pests and diseases

Lastly, the use of cultural taboos remains a significant traditional mechanism for protecting shea trees. Taboos that prohibit cutting shea trees are still respected in the community of Ajan Sub-County. These unwritten rules, rooted in indigenous knowledge and belief systems, serve as a social control mechanism that complements formal regulations. However, their effectiveness is declining due to eroding of cultural values due to modernization, emerging foreign religious denominations and urban influence.

The study found out that the community is using cultural taboos/beliefs to conserve shea nut trees. The Acholi cultural belief attaches values to the shea nut tree as a secret tree that must not be cut because it is a source of food to the community. In recognition of these functions, harvesting of shea trees in Uganda is highly discouraged both traditionally through taboos and other prohibitions and legally through community bye-laws. For this the Paramount Chief of the Acholi has instructed all his chiefs to issue a ban on the cutting of the shea tree in order to protect the cultural heritage associated with it (ALCODE, 2007).

Overall, the integration of traditional and modern conservation practices provides a holistic approach to shea tree conservation in Ajan Sub-County. However, the sustainability of these practices depends on continuous community engagement, capacity building, and policy support right from the village level. It is recommended that future conservation efforts build on existing local knowledge while strengthening institutional frameworks to ensure long-term impact.

5.3 Assessment of the economic benefits derived from Shea nut tree products among households in Ajan Sub-County.

The study sought to assess the economic benefits derived from shea nut tree products among households in Ajan Sub-County. The findings reveal that the shea nut tree contributes significantly to household livelihoods, with direct impacts on income generation, education, household consumption, and overall standards of living.

The research found out that community members benefit from shea nut trees in form of increased income as a result of dealing in shea nut tree products including shea butter oil, fruits, fire wood, charcoal and medicines. This is because the other sources of income (table 8) do not provide enough income for the households. Shea butter/oil has been the main vegetable oil used for frying food and also sold in local markets to generate income for the households (Ferris et al, 2004). According to Tanzile (2023), globally there is an increasing demand for shea products (shea nuts and shea butter) due to their economic and medicinal value and thus contributes to women's income.

In line with the above Rousseau et al (2015), report that in Ghana, earnings from shea butter products in 2015 reached US$64 million, a 23 percent growth from US$52 million in 2014; while in Burkina Faso, the sector contributed CFA 10 billion (US$17 million) through nut sales in 2012. Nguekeng et al (2021) in support state that in 2020, the Global Shea Alliance revealed that 4 million women are involved in the export value chain, with US$200 million generated as yearly income from shea products to producing communities (Nguekeng et al., 2021). A study in Burkina Faso revealed that collecting and processing shea nuts and kernels contributed to as much as 12 percent of total household income of the poorest households and 7 percent of total household income of the well-off households (Pouliot & Treue, 2013). Recently, commercialization of shea

products contributed about 66 percent to household income in Burkina Faso while in Cote d'Ivoire, a shea butter producer earned between US$156 and US$183 in the shea season.

The study found out that dealing in shea nut products benefited people enabling them to pay school fees for their children in primary and secondary schools within the county using money got from dealing in shea nut products. A school fee for primary contribution is 50,000 and for secondary is 200,000 affordable as a result of obtaining income to pay the fees. More benefit reported include purchase of household items like sugar, salt, utensils and mattresses amongst others with the money got from sale of shea nut products and improved standard of living as a result of dealing in shea nut products and businesses.

Dr. Hunter (2025), in support of this report that the money generated from shea butter production is desperately needed. It pays for food, clothing, child school fees and the like; therefore, fair trade compensation equates survival. But have no doubt; the women recognize based on its many uses throughout the generations that shea butter is a precious substance. They, as Dr. Hunter stressed just lack the resources to produce a superior product on their own that can be traded on the world market.

Shea is an important non-timber forest product in Burkina Faso because of its medicinal properties, nutritional uses and income-generating potential. It contributes to export earnings – it is the third most exported product – creates income for women, especially in rural areas, and shea butter groups enable women to acquire new skills, receive support from other women and promote women's agency and collective action. Approximately 3 million women are employed in the shea sector in West Africa and the industry generates between USD 90 million and USD 200 million per year in sales of shea nuts and exports of shea butter. This illustrates that shea has considerable potential in terms of contributing to the economic empowerment of women through the creation of enterprises and jobs, particularly through interventions in the development of the value chain. At the macro level, the industry stimulates other parts of the economy: a study by USAID (2010) suggested that USD 1 000 in household income associated with the collection of shea generates USD 1 580 in economic activity in the community (Food and Agricultural Organisation report 2017)

5.3.1 Other benefits of shea nut trees

The study further revealed that shea nut trees are a source of energy for cooking in form of firewood, charcoal and briquettes. The shea nut trees fuel wood and charcoal are on high demand because of the high temperature and long-lasting heat produced during combustion which eases cooking by the users.

The study revealed that shea nut trees products are used for making cosmetics (smearing oil for the skin relaxation and medicated soap). The shea butter oil is locally used to bathe infants and massaging their bodies for bone alignment and relaxation of the body. Alidu (2014), in support of this, argues that the shea trees are truly multi-purpose and are of high impact value not only for the socio-economic and dietary value of the cooking oil, but also for the fruit pulp, bark, roots and leaves, which are used in traditional medicines and the wood and charcoal, used for building and cooking fuel respectively. In line with this Faussata et al (2021), report that shea butter is highly prized for its therapeutic and cosmetic virtues and for its nutritional potential. Industrially, shea butter is used in biscuits, pastry making and chocolate making as a substitute for cocoa butter. In Europe, the annual consumption of shea butter generally fluctuates between 40,000 tons and 60,000 tons mainly used by the chocolate industry. Badini et al (2011), support this that the quantities exported to Japan, United States or Switzerland are mainly intended for cosmetic or pharmacological use. Saussey (2011), confirms this that in Northern Côte d'Ivoire, shea is the fourth largest source of foreign currency, after cotton, cattle breeding, and cashew nuts and 90% of its production is ensured by women who are illiterate.

Amdu (2025), states that with its wide range of uses in the food, cosmetic, and pharmaceutical industries, shea butter has become a lucrative and sustainable source of income for rural communities, particularly for women who make up the majority of the shea butter producers. The economic benefits of shea butter in the Northern Region are undeniable, and it's crucial for the government to pay attention to this sector for sustainable economic growth and poverty alleviation Firstly, the shea butter industry provides substantial economic opportunities for rural communities in the Northern Region. Shea butter production is often a source of income for women in these communities who engage in the labor-intensive process of collecting shea nuts, cracking them open, roasting, grinding, and finally extracting the precious shea butter. This labor-intensive

process provides employment and income-generating opportunities for women who are often marginalized in rural communities. The income earned from shea butter production helps to improve their livelihoods, supports their families, and provides access to education and healthcare, ultimately contributing to poverty alleviation.

Buheji (2024), maintains that shea butter production significantly contributes to women's economic empowerment, providing them with a vital source of income, enhancing their financial independence, and elevating their social status within the community. However, Abu (2025), states that women do not engage in only shea nut production activities alone as a source of livelihood. However, majority (93.7%) participated in the shea value chain as a main source of livelihood strategy. The remaining 6.3% were engaged in the shea nut enterprise but it was not their main source of livelihood activity. The shea business as a rural livelihood activity provides them with income, food, medicine and employment which are strategies for poverty alleviation among the rural folks.

The shea value chain, including production, transformation and marketing, provides employment and business opportunities to communities, not only in the shea belt of Africa but also outside Africa. Shea constitutes an important tree crop for women and youth, the main shea collectors, bringing 12-32 % of household income with a mean gross income of USD 75 per woman (Bockel et al 2020). According to Global Shea Alliance, shea nut collection and processing into shea butter provides about 16 million women with income in the shea distribution countries (USAID 2016). These amounts are substantial for households in the rural areas that shea is considered as “women green gold” in West Africa (Pouliot 2012, Naughton et al 2017).

Entrepreneurship is growing at a promising pace in the shea sector in West Africa, especially in Ghana, Burkina Faso, and Mali. Many enterprises or mini-enterprises are established in all shea-producing countries to process shea nuts or make various products, including butter and cosmetics (soaps, moisturizers, lotions and lipsticks) and caterpillars, commercialized within local, regional and worldwide markets (Lovett 2015, Tammy 2017).

Globally, there is an increasing demand for shea products (shea nuts and shea butter) due to their economic and medicinal value and thus contributes to women’s income (Hatskevich et al., 2011;

Nguekeng et al., 2021). The shea sector is dominated by women and it is estimated that about 16 million women, half of them in West Africa, work in shea-related activities (Nguekeng et al., 2021). In Ghana, earnings from shea butter products in 2015 reached US$64 million, a 23 percent growth from US$52 million in 2014; while in Burkina Faso, the sector contributed CFA 10 billion (US$17 million) through nut sales in 2012 (Rousseau et al., 2015). In 2020, the Global Shea Alliance revealed that 4 million women are Ghana Journal of Development Studies, Vol. 20 (1), 2023 199 involved in the export value chain, with US$200 million generated as yearly income from shea products to producing communities (Nguekeng et al., 2021).

The study found out that shea nut trees are a source of income as reported by respondents who testified that shea nut trees products including fruit pulps, shea nuts, shea butter oil, firewood and charcoal bring in a lot of money to those dealing in it. In line with this Dr.Aoife (2012), stresses that shea nut tree splay a special economic role in Burkina Faso. Its fruits are generally harvested and sold by women in rural areas and generate an income that is particularly linked to funding children's education, bringing wider societal benefits. The fruits ripen at a time of year when both food and money are scarcest, helping to tide families over. The Shea nut business serves as a source of seasonal employment for young girls and women in the Savelugu/Naton District. The industry generates income for large number of women as it is traditionally seen as women's business. The Shea nut industry employs many individuals who are involved in all of its value chain processes. Most women either work individually near their homes or are organized into small business cooperatives.

Abu (2025), on the contrary states that while the Shea butter sector holds significant promise for community empowerment and economic development, it is confronted by numerous factors that impact its growth and sustainability. These factors include issues of gender, environmental problems, and market barriers among others. women are often excluded from decision making processes and opportunities that could lead to greater economic empowerment. Addressing this requires implementing gender-responsive policies that not only enhance women's roles within the value chain but also provide them with access to resources, training, and technologies that could increase productivity and income.

The residue got after extraction of shea butter oil is used as manure in back yard gardening around their homes for food security and livelihood of women. The study found out that the residue got after extraction of shea butter oil is used as manure in back yard gardening around their homes for food security and livelihood of women. Abagale et al (2020), support this argument in which they argue that **s**hea waste slurry is used as an organic soil amendment of tropical soils in the Tamale Metropolis, Northern Ghana. Soil organic amendments such as manures and plant residues are a significant source of organic compost to the soil.

GIZ report (2020) shows that after pressing, the left-over shea cake, the residue that remains after the extraction of shea butter, is removed serves as excellent fuel. It is also good ingredient for livestock feed formulation as well as for the treatment of skin diseases. The cake is also ideal for use as manure and fertilizer production. For every metric ton shea nut processed, 450-600 kg of shea nut cake is produced.

Shea nut trees provide employment to community members engaged in businesses of shea nut tree products including firewood, charcoal, briquettes, fruit pulps and shea butter oil. This has improved on their income levels, livelihood and standard of living. Bockel et al (2020), in support of this report that the Shea nut business serves as a source of seasonal employment for young girls and women in the Savelugu/Naton District of Ghana. The industry generates income for large number of women as it is traditionally seen as women's business. The Shea nut industry employs many individuals who are involved in all of its value chain processes. Alidu (2014) in support of this writes that the shea value chain, including production, transformation and marketing, provides employment and business opportunities to communities, not only in the shea belt of Africa but also outside Africa.

5.3.2 Nutritional benefits

The study revealed that shea nut trees are a source of food to people especially the fresh fruit pulps locally known as "*oduu yaa*" among the Acholi people which they collect and eat as a source of vitamin to both children and adults. From the fruit a locally sun-dried cake known as "poki" is made and eaten as snack and can be stored for longer time. This is in line with Akihisaet al (2010), who state that the fruit pulp is an important local nutritional resource, widely eaten by adults and

children and it is rich in vitamins and minerals (ascorbic acid, iron and calcium) and constitutes a source of protein and carbohydrates during the annual 'hungry season'.

Agyekwena (2011) further explains this more by stressing that the pulp is also used to make jam as it is a rich source of some micro nutrients including ascorbic acid (196.1mg/100g), in comparison with an orange, which contains only 50mg/100g shea nuts contain 1.93mg/100g of iron and 36.4mg/100g of calcium. The pulp also contains a high sugar content made up of glucose, fructose and sucrose equally distributed and constitute up about 3 to 6 percent. Even the flowers of the shea nut tree are consumed by some ethnic groups that make them into edible fritters. As stated by kletter (2002), picking of shea fruits coincides with the hunger period in Northern Nigeria, therefore, pickers sell the commodity immediately to purchase much needed food to fight hunger.

The study found out that the shea nut trees are as a source of the popular and traditionally cherished shea butter oil used for cooking and as appetizer to local dishes prepared from legumes like pigeon peas, beans and cow peas. Ferris et al (2004) support this use in their argument in which they say that shea butter/oil has been the main vegetable oil used for frying food and also sold in local markets to generate income for the households in West Africa.

5.3.2 Ecological benefits

The research findings indicate that shea nut tree is a habitat to organisms. According to Heliyon (2022), shea nut trees are habitat to African mistletoes and stem borers that live in the trees and are parasites to the shea nut trees. Shea nut trees, especially in the Sahel region of Africa, provide habitat and food sources for various bird species. Migratory birds, for example, overwinter in areas where shea trees grow, and many bird species feed on the insects that are attracted to the shea trees. Additionally, the shea trees themselves rely on insects for pollination, which can benefit migratory birds. The shea trees provide a diverse range of habitats for various bird species, from the flowers and leaves to the trunks and branches. Millions of migratory birds fly each year from the Netherlands to West Africa where they spend the winter. Insects, including bees, pollinate the shea trees, which are essential for the production of shea nuts and the trees' overall survival. Insects that are attracted to the shea trees provide a food source for various bird species, including

migratory birds. Many birds travel long distances to the Sahel region where shea trees are located, using them as a wintering ground.

The survey findings revealed that shea nut tree is a source of food to people, birds, insects, bats and animals feeding on the fruits and leaves. In support of this Dr Aoife (2012), states that *n*utritionally, shea provides essential nutrients and fats that are in short supply during the dry season, and safe-guarding the shea crop in the long-term is important for food security. Supporting pollinators and diverse plant communities in shea parklands also has secondary benefits as the majority of the trees and shrubs there benefit from pollination, including other fruit crops and species that are important for maintaining soil fertility." Aoife (2012) further argues that another food product provided by the shea tree is the protein-rich caterpillar, *Cirina butyrospermii*, produced in many parts of the shea belt of West Africa. These caterpillars, feeding on shea leaves, are a source of food with high protein and moderate lipid content. These caterpillars are eaten across the West African region, harvested at the larva stage, caterpillars are an important source of nutrition and income for many subsistence farming households in the region. Like shea butter, demand for shea caterpillars is also increasing within shea distribution areas (Dabire et al 2018, Payne et al 2020), adding value to the shea sector while improving nutritional security as well as income generation, which is beneficial for the most vulnerable women and youth.

The research found out that shea nut trees as a source of pollen grains for the production of honey with very nice aroma by bees during the flowering season. With this bee keepers place their local bee hives in the branches of shea nut trees. Shea tree is an important source of honey, assuring a good supply of nectar and pollen. With this bee keepers place their local bee hives in the branches of shea nut trees. Shea tree is an important source of honey, assuring a good supply of nectar and pollen (Lassenet al 2016). Shea trees benefit from bees moving pollen between their flowers to produce fruit, but the new study just published in the "*Journal of Applied Ecology*" found that in sites with low tree and shrub diversity, fruit production was severely limited by a lack of pollination. In higher-diversity sites, more honeybees were observed, and other bees visited flowers in greater numbers, boosting pollination services **(**Stout et al 2020**).** Shea tree is an important source of honey, assuring a good supply of nectar and pollen (Lassen et al 2016).

The study revealed that shea nut forests contribute to microclimate modification. Conversely, shea is relatively resilient to the changing climate and is beneficial to the overall resilience of the ecosystem and communities. This is through maintaining soil fertility (soil carbon) and biodiversity of flora and fauna, improving microclimate, improving water infiltration, and reducing wind and water erosion, and consequently mitigating climate change (Bayala et al 2014, Bockel et al 2020). Shea trees have an enormous potential to mitigate climate change effects in West Africa, with an estimated production of 1.5 million tons of CO_2 every year. It is then assumed that every ton of shea kernels produced has a negative carbon footprint of 1.04 tons of CO_2 (Bockel et al 2020). The carbon sequestered by shea trees above ground and in the soil leads to a whole range of ecosystem services, including protecting the land against degradation, regulating runoff and the micro-climate, and conserving biodiversity. Within the parklands, the associated annual crops growing under them are likewise less exposed to excessive temperatures while benefiting from the ecosystem impact of shea trees (Allal et al 2013, Bayala et al 2006, 2014, and Félix et al 2018).

The study found out that shea nut trees are responsible for maintaining soil fertility (soil carbon) and biodiversity of flora and fauna through nutrients addition in the soil as a result of decaying shea nut tree leaves which are shaded off during dry seasons. The dry leaves also act as soil cover to reduce soil erosion and keeping moisture in the soil around the trees. Amdu (2025), also adds that the shea tree, which is the source of shea butter, is a natural resource that grows in the wild and is well adapted to the semi-arid regions of Africa. Shea trees provide environmental benefits such as preventing soil erosion, improving soil fertility, and promoting biodiversity. Sustainable shea butter production practices, such as agroforestry and organic farming, can help protect the shea tree population and promote environmental conservation. Shea butter processing residues, particularly the liquid waste slurry, can be effectively used as an organic manure or soil amendment. This waste is rich in nutrients and can improve soil properties, making it a viable alternative to synthetic fertilizers. Studies have shown that applying shea waste slurry (SWS) increases the levels of primary and secondary plant nutrients, improves soil pH, organic matter content, and carbon content.

Shea trees are known to play important roles in microclimate modification, nutrient cycling and soil fertility, especially in crop gardens of the parkland agroforestry systems (Bayala et al. 2006;

Traore et al. 2002). The shallow root system of shea trees also stabilises soil structure against soil erosion and acts as a wind break (Hall et al. 1996). Shea trees are known to play important roles in microclimate modification, nutrient cycling and soil fertility, especially in crop gardens of the parkland agroforestry systems (Bayala et al. 2006; Traore et al. 2002). The shallow root system of shea trees also stabilises soil structure against soil erosion and acts as a wind break (Hall et al. 1996).

5.3.3 Medicinal benefits

The study findings reveal that shea nut tree has a number of medicinal uses in the local settings. The white sap from the leaves and bark was found out to be used for treating wounds locally. The roots when crushed and mixed with some water are used to treat stomach ailments and the leaves when crushed and mixed with some water are used to treat wounds and Ulcers. The shea butter oil is also used to treat open wounds. These are in line with Bayala et al (2002), who argue that the organs of shea trees, and important parts of the tree such as the trunk, are used to produce raw materials for modern medicine.

Agyekwena (2011), in line with the above states that all parts of the tree have one or more uses. The leaves of the shea tree contain saponin which makes it lather in water and hence is used in washing. In Northern Ghana the leaves are used in medicine for the treatment of stomach ache especially in children. The leaves are also used in a mixture with other leaves in a traditional mixture to produce a vapor which is used to bath persons for the treatment of fevers and headaches. The leaves when soaked in water turns to a soapy and frothy liquid which is used to bath the head of persons suffering from fever. İn cases of eye problems a leaf decoction can be used as treatment.

Agyekwena (2011) further argues that in the production of the “dawadawa”, the most common and widely used local spice in Northern Ghana, the leaves of the shea tree are used as a preservative. The roots of the shea tree are used by locals in Northern Nigeria as chewing sticks for cleaning the teeth. The roots are also combined in mixture with the bark in traditional medicine for the treatment of jaundice, diarrhea and stomach pain. The root bark is boiled and pounded and used for treating chronic sores in horses. The bark of the shea tree is boiled and taken as a beverage which is claimed to be able cure diabetes in some communities in Ghana. In some West African countries including Senegal and Guinea, infusions of the bark which are crushed together with the bark of Ceibapentandra and salted are used to treat worm infestations in livestock. In Guinea

Bissau a range of sicknesses ranging from diarrhea and dysentery to gastric problems and even leprosy have been treated with bark infusions. In the Ivory Coast, child delivery is eased by the use of a bark decoction in baths during labour. This decoction is also believed to boost the flow of milk and hence is drunk by lactating mothers. A bark infusion is used as an eye wash against venom of the spitting cobra because it has the capacity to neutralize the venom. It is used as foot bath to extract jiggers in Ghana.

According to Malachi (2013), shea butter has great healing properties. It is often used as a base in medicinal ointments due to its anti-inflammatory properties. Due to the presence of several fatty acids and plant sterols such oleic, palmitic, stearic and linoleic acids shea butter is known to possess some healing properties. These oil-soluble components do not undergo saponification or convert into soap on coming in contact with alkali. Shea butter is more non saponifiable than other nut oils and fats, thus imparting it a great healing potential for the skin. Raw, unrefined shea butter is effective in curing skin rashes, skin peeling after tanning, scars, stretch marks, frost bites, burns, athlete's foot, insect bites and stings, arthritis, and muscle fatigue. Also, due to its high content of vitamin A, it is effective in promoting healing and disinfection, and soothes skin allergies like poison ivy and insect bites. Shea butter contains Vitamin F which has the ability to act as a rejuvenator for soothing and healing rough and chapped skin.

On the same note Nahm (2011), points out that shea butter is a good sun screening agent. Sun-screening agents act by absorbing or reflecting some of the ultraviolet (UV) radiation from the sun and prevent it from reaching the skin. This helps to protect the skin from sunburn, preventing erythema and also reducing further risk of skin cancer induced by the sun's rays. According to (Velasco, 2008), photo carcinogenesis is mainly caused by UVB radiation between the ranges of 290 and 320nm. İt interacts with the DNA directly thereby forming cyclobutene pyrimidine. Cinnamate esters of triterpene alcohol are the main constituent of Shea butter's unsaponifiable fraction; these esters have been reported to have strong ability to absorb UV radiation of the wavelength range 250-300 nm. This therefore makes the addition of Shea butter's unsaponifiable components into sunscreens increase the absorption of UVB radiation by providing synergistic sun-protection.

According to O'Lenick, (2009), shea nut butter oil is used as an emollient and skin moisturizer. Shea butter contains vitamins A and E, this makes it a good moisturizer for hair. Also, shea butter has semi-solid characteristics and buttery consistency, this makes it a good emollient and moisturizer for the scalp and skin as well (Nahm, 2011). When shea butter is fractionated, its olein fraction especially can be formulated into creams or surfactant-based products such as bath products and shampoos. This formulation provides more moisture for the skin, scalp, and hair. As indicated by (Malachi, 2013) shea butter is solid at room temperature but melts at body temperature. It acts as a "refatting" agent. İt is easily absorbed into the skin and has good water-binding properties hence it is useful for skin care. Shea butter has the ability to repair dry inflamed skin caused by dermatitis and can be used as a night time moisturizer for hands and feet (Sheperd, 2012).

AS skin relaxer MaKeish (2012), reports that for many the morning bathing ritual goes like this. Cleanse, deodorize, and moisturize. In many commercials for beauty products the main focus is healthier, more radiant and moisturized skin. Shea butter and the properties found in the product are in many of the products that are currently being advertised to consumers worldwide. The properties of the tree are stearic acid, which promotes and protects skin barrier health (Fowler, 2008) and various ingredients such as triterpene alcohols, known to reduce inflammation; cinnamic acid esters, that have limited capacity to absorb ultraviolet (UV) radiation; and lupeol, this property prevents the effects of skin aging by blocking the action or function of enzymes that degrade skin proteins. Shea butter also protects skin by stimulating production of structural proteins by specialized skin cells.

5.3.4 Cultural benefits

The research findings indicate that shea nut tree with its products are associated with a number of cultural benefits to the local people ranging from cultural dishes to cultural rituals for societal wellbeing.

Okello (2015), supports this use by saying that during the celebration of twins' birth ritual, the people involved in the ceremony smear the necks and the bellies of the mother and her twins with moo yaa (oil form the shea tree). The reasons for performing twin rituals among the Acholi people therefore were found out to include: to appease the ancestral spirits, to appease the gods (*jok*) since

it was believed that twins are the gift from gods, to show happiness for producing two children at a go, it is the initiation ceremony to introduce the children into the worldly challenges and to unite families of people in the community through eating and celebrating the birth of the new born babies.

According to Kylian (2024), the African Karite Tree, also known as the shea tree, stands as a symbol of resilience and nourishment across the African savanna. From its roots to its fruit, the karite tree offers a wealth of benefits, deeply intertwined with the lives and traditions of communities across the continent. Discover the wonders of this remarkable tree, from its rich history and cultural significance to the modern-day applications of its precious shea butter

5.4 Shea nut collectors

The study revealed that collection of shea nuts is done by children who account for 35 % and women 47% who majorly collect the shea nuts for the nuts that they extract shea butter oil from when dry and men contribute to 18%.

In line with shea nuts collection Fousséyni (2012), states that in West African shea-producing regions, women are predominantly involved in all stages of shea butter processing, from collecting shea nuts to processing the nuts into butter. This includes picking nuts, shelling kernels, drying them, and cooking them into butter. In addition to individual women, women's groups, cooperatives, and small and medium-sized enterprises (SMEs) are also involved in the processing and distribution of shea butter. Rural women who are the people most affected by poverty lead the efforts to process shea nuts into shea butter. When women sell shea butter in the marketplace, the income allows them to support their families. As detailed in the script, these women would greatly benefit if they had machinery such as a mill because it would help them transform the shea nut into a softer paste. Machinery would also help make the processing quicker and less tiring than processing by hand.

Similarly, Deanna (2021), states that the collection of shea nut pulps and subsequent processing to extract shea butter is primarily done by women and children in rural areas, particularly in West Africa. Women often play a central role in the entire value chain, from harvesting the shea fruit to

processing it into butter. While men may be involved in the wholesale of shea kernels, women traditionally dominate the collection and primary production of shea butter.

The survey found out that the sale of shea nut products, particularly shea butter oil and dry shea nuts provides a reliable source of income for many households, especially women with limited formal employment. The seasonal nature of shea production also offers a timely financial boost during periods when other agricultural incomes are low. These findings align with existing literature that positions non-timber forest products like shea as vital components of rural economies in West Africa.

The study found out that proceeds from sales of shea nut tree products are commonly used for the payment of school fees. This demonstrates the important role the shea value chain plays in supporting access to education. In households where shea production is a major economic activity, income from the trade directly contributes to reducing school dropout rates and enabling continued education, particularly for girls who often benefit from women's economic empowerment through shea processing.

The research also revealed that the purchase of household items such as food, clothing, and basic appliances is frequently made possible through earnings from shea products. This indicates that income from shea is not only used for investment in education or farming inputs but also supports day-to-day consumption and household welfare. It reflects the flexibility of shea income in meeting both planned and unplanned financial needs.

Furthermore, the cumulative effect of these benefits contributes to better nutrition and improved standards of living among households engaged in shea-related activities. These improvements suggest that shea nut production plays a key role in poverty alleviation and rural development.

However, despite these benefits, some limitations were observed. The income from shea is often seasonal and subject to fluctuations in market prices and climatic conditions, which can affect the stability of these economic benefits. Additionally, limited access to improved processing technologies and organized markets remains a challenge for many producers, reducing their profit margins and potential for scale.

In summary, the findings confirm that the shea nut tree is a valuable economic asset for households in the Ajan Sub-County. It contributes not only to income generation but also to broader aspects of household welfare. Strengthening support for the shea industry through better market access, processing infrastructure and financial services could enhance these benefits and contribute further to sustainable rural livelihoods.

5.4 Conclusion

This study set out to examine the current conservation practices, assess the economic benefits of shea nut tree products among households, and identify the major threats facing shea nut trees in Ajan Sub-County in Pader district Northern Uganda. The findings reveal that while shea nut trees remain an important economic and ecological resource for the community, they are under increasing pressure due to a range of human and environmental factors.

The current conservation practices in Ajan Sub-County are limited and largely informal, with minimal institutional support. Although some community members recognize the value of protecting shea nut trees, practices such as uncontrolled tree cutting, bush burning, and land clearing continue, often due to weak enforcement of environmental regulations and limited awareness.

Economically, the shea nut tree contributes significantly to household income, particularly among women who engage in the collection, processing, and sale of shea nuts and shea butter. The industry provides both subsistence and commercial value, helping to support livelihoods in a largely agrarian economy. However, the full potential of the shea sector remains underutilized due to challenges like poor access to markets, limited processing technology, fluctuating prices and seasonal supply of products especially the fruits and nuts.

The study also identified several major threats to the sustainability of shea trees in the area. These include over-cutting of trees, annual bushfires, population pressure, climate change, pests and diseases, emerging land use changes, weak law enforcement, and negative community attitudes

toward conservation. These threats are deeply interconnected and, if left unaddressed, may lead to the gradual decline of shea tree populations in Ajan Sub-County.

In conclusion, while the shea nut tree holds great economic promise and environmental importance, its future in Ajan Sub-County is uncertain without coordinated efforts to strengthen conservation, enhance community awareness, improve enforcement of regulations, and support sustainable economic use. Addressing these challenges holistically will be essential for ensuring the long-term viability of the shea sector and the well-being of the communities that depend on it.

5.6 Recommendations

Based on the findings of this study, which identified over-cutting of shea trees, annual bushfires, weak law enforcement, population pressure, emerging land uses, pests and diseases, effects of climate change, and negative farmer attitudes as major threats, the following recommendations are proposed to support the sustainable management and conservation of shea nut trees in Ajan Sub-County.

1. Strengthening of enforcement and policy implementation. The local, cultural and national authorities need to enhance the enforcement of environmental and forestry regulations to protect shea nut trees by applying penalties for illegal cutting, enforcing fire bans during dry seasons, and supporting traditional by-laws that promote conservation.

2. Promote Community-Based Conservation Initiatives by empowering local communities through education, training, and incentives to foster greater ownership of conservation efforts. Community-based natural resource management (CBNRM) programs are very important and as such should be introduced to promote the sustainable use of shea resources.

3. Intensification of existing and new public education and awareness campaigns targeting farmers, youth, and local leaders to change negative attitudes toward shea nut tree conservation. With this emphasizing the long-term economic and ecological value of the shea nut tree can help foster a conservation mindset.

4. Introduce alternative livelihoods and energy sources. To reduce reliance on shea trees for fuel wood and income, alternative livelihood options such as beekeeping, agroforestry, and non-timber forest product enterprises should be promoted. Similarly, the adoption of improved energy saving cooking stoves and alternative energy sources can reduce the need for firewood hence reduce pressure on shea nut trees for charcoal and firewood.

5. Establish bushfire prevention and control measures by creating and maintaining fire breaks around shea tree parklands, creating buffer zones and controlled burning to prevent shea parklands from the effects of major uncontrolled fires. The controlled burning can be done by conducting prescribed burns under controlled conditions to reduce dry grass and fuel near farm land.

6. Integrate Shea Conservation into current land use planning in the area. Emerging land uses such as commercial agriculture and infrastructure development should be carefully managed through participatory land use planning that prioritizes the conservation of shea parklands.

7. Support of research and monitoring of pests, diseases, and climate change impacts. There is a need for further research into the pests and diseases affecting shea trees, as well as the impacts of climate change on shea nut tree growth and productivity. Extension services should be strengthened to support farmers with early detection and management strategies.

8. Promote shea tree planting and regeneration programs. Efforts should be made to encourage the planting and regeneration of shea trees, particularly in degraded areas. Government and NGOs can support nursery beds making and seedling distribution programs and integrate shea into agroforestry systems to ensure long-term sustainability.

9. Support women's shea processing groups. Provide training, processing equipment and market linkages to empower women, incentives and advising them to protect shea trees for sustainable harvesting.

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Appendix 2: Research questionnaire used

Respondent No:……..

SECTION A: BACKGROUND INFORMATION OF THE RESPONDENT

1. L.C 1 Zone:…… Parish:……
2. **What is your gender? Please tick ( ) the option that is most appropriate for you.**
   Male ☐Female ☐
3. **How old are you? (Age bracket)**
   - 20 – 25 Yrs☐
   - 26 – 30 Yrs☐
   - 31 – 35 Yrs☐
   - 36 – 40 Yrs☐
   - 41 – 45 Yrs☐
   - 46 Years and Above ☐

4. **What is your highest education level?**
   (a) Primary ☐
   (b) Secondary (O'Level) ☐
   (c) Secondary (A'Level) ☐
   (d) Certificate ☐
   (e) Diploma ☐
   (f) Degree☐

5. **Profession**
   a) Peasant farmer ☐
   b) Teacher ☐
   c) House wife ☐
   d) Government worker ☐
   e) NGO worker ☐
   f) Business man/woman ☐
   g) Transport (boda boda) ☐

6. **What else do you do to get money?**
   (a) Sale of produce
   (b) Sale of fruits
   (c) Brewing local alcohol (waragi)
   (d) Charcoal burning

(e) Construction
(f) Pottery

SECTION B: CURRENT CONSERVATION INTERVENTION METHODS

7. What are the conservation methods and practices being applied to conserve Shea nut tree species in Ajan?

…… ……
…… ……
…… …….

8. Are there by-laws in place for conserving shea nut trees in your area? Yes ☐ No ☐

(a) If yes, what does the law state?
……
……

(b) If yes, who set the law?.....

(c) Who are the implementers of the law?
…….

(d) Are they effective in implementing the law? Yes ☐ No ☐

(e) Why do you say so?
……..

(f) Are there education/ sensitisation drives to conserve shea nut trees and environment by;

- ✓ Government Yes☐No☐ (state government sector)……
- ✓ Local community Yes ☐ No ☐ (mention) e.g Ker kalkwaro
- ✓ NGOs and CBOsYes☐ No ☐ (mention the NGOs and CBOs you know)

……

9. Give examples of the conservation drives by government and NGOs & COBs and local communities to conserve shea nut trees in your community.
   (a) Mass education Yes ☐ No ☐
   (b) Implementation of laws on tree cutting Yes ☐ No ☐
   (c) Encouraging climate smart agricultural practices Yes ☐ No ☐
   (d) Monitoring mechanisms through sub county employees Yes ☐ No ☐
   (e) Fines and imprisonment of law breakers Yes ☐ No ☐

10. What challenges are faced in implementing strategies to conserve shea tree species in your community?

…….. ……
…….. ……
…….. ……
…….. ……

11. What do you suggest to be done to conserve shea nut tree species?

……..
……..
……..
……..
……..
……..

SECTION C: ASSESSMENT OF THE ECONOMIC BENEFITS OF SHEANUT TREE SPECIES

12. Are shea nut trees useful in the following ways in your community? (Please tick)

- ✓ Food (fruits) Yes ☐ No ☐
- ✓ Cooking oil Yes ☐ No ☐
- ✓ Smearing oil Yes ☐ No ☐
- ✓ Source of money Yes ☐ No ☐
- ✓ fuel (charcoal, wood & briquettes) Yes ☐ No ☐
- ✓ Manure from residue Yes ☐ No ☐
- ✓ Employment of people Yes ☐ No ☐

13. Who are the people involved in collecting shea nuts and processing shea butter oil?

……. ……..
……. ……..

14. Have you or other people benefited from dealing in shea nut products in the following ways?

a) Increased income Yes ☐ No ☐
b) Paid school fees Yes ☐ No ☐
c) Bought household items(sugar, salt, utensils) Yes ☐ No ☐
d) Improved standard of living (paying medical bills, clothes and shoes, bicycle, motor cycle, mattresses)

15. What are the shea nut tree values to government? (Please tick)

- ✓ Revenue from market dues Yes ☐ No ☐
- ✓ Tax from sale of oil and oil products Yes ☐ No ☐
- ✓ Employment of people Yes ☐ No ☐

Ecological uses of shea nut trees

16. Does the shea nut tree species provide the follow services to the environment?

a) Habitat for insects, birds and animals? Yes ☐No ☐which ones?……
b) Food (fruits) for people, <u>animals</u> and birds? Yes ☐No ☐Which ones (bats, doves, pigeons, squirrels, humans, nectar for bees and insects? (please tick the animals and birds)

c) Source of pollen grains for honey Yes ☐ No ☐
d) Relief rainfall formation Yes ☐ No ☐
e) Nutrients addition in the soil from decomposing leaves Yes ☐ No ☐

Medicinal uses

17. Medicinal uses Yes ☐ No ☐(which diseases are treated using medicines got from the;
Roots.....
Bark.....
Leaves ……

Cultural uses of shea nut trees and their products

18. What are the cultural attachments to shea nut tree species in your community?
……
..……
……

SECTION D: CHALLENGES FACING SHE NUT TREES

19. What are the challenges facing shea nut tree species in your area?

a) Diseases Yes ☐ No ☐
b) Over cutting for charcoal and firewood Yes ☐ No ☐
c) Expansion of land for farming Yes ☐ No ☐
d) Land use pattern e.g grazing, farmland Yes ☐ No ☐
e) Poor implementation of by-laws to conserve them Yes ☐ No ☐
f) Negative attitude of people to conserve shea nut trees Yes ☐ No ☐

20. Which age group is most active in cutting down shea nut trees in your area?

- 20 – 25 Yrs☐
- 26 – 30 Yrs☐
- 31 – 35 Yrs☐
- 36 – 40 Yrs☐
- 41 – 45 Yrs☐
- 46 Years and Above ☐

Thank you very much for participation and for your time and responses

Appendix 3: Observation checklist

L.C 1 Zone: …… Parish: ……

SN	Evidences	Yes / No
1)	Agricultural farm practices	
2)	Land uses	
3)	Bush burning	
4)	Pests and diseases on shea tree	
5)	Deforestation evidences	
6)	Climate regulation and Climate change mitigation	
7)	Charcoal and firewood for sale	
8)	Shea nut fruits	
9)	Shea butter oil in the market	
10)	Shea nursery beds	
11)	Shea butter processing and residues	
12)	Cultural services (including spiritual, religious, and aesthetic values, recreation and ecotourism)	
13)	Biodiversity conservation	

Appendix 5: Focused Group Discussion (FGD) guide

L.C 1 Zone:…… Parish:……

Group No: …… Number of males:…… Number of females:……

1. Introduction and context
   - For the time you have lived in this area, what have you noticed about the number of shea trees?
   - What are the main traditional uses of the shea nut tree in this community?
2. Economic value and livelihoods
   - How does the collection and processing of shea nuts/butter contribute to households' income and well-being?
   - What are the major challenges in processing and marketing shea products (e.g., equipment, access to markets)?
   - How has the income from shea changed over the past 10 years? (improved because of security after LRA war)
3. Conservation status and threats
   - What do you see as the biggest threats to shea nut trees in this area (e.g., charcoal burning, logging, farming)?
   - What are the local rules, taboos, or bylaws that protect shea trees? If so, how effective are they?
   - How has the availability of shea fruit for gathering changed over the last decade?
4. Sustainability and future directions
   - What initiatives are currently being used to regenerate or protect shea trees?
   - What, in your opinion, is needed to ensure the shea resource is available for future generations?
   - If incentives were provided, would you plant new shea trees, and what would help you do so?

Appendix 6: Respondents consent form

CONSENT TO PARTICIPATE IN RESEARCH

Study Title: Assessment of the conservation of shea nut tree species and its economic benefits to households in Ajan Sub County, Aruu North County- Pader District.

Principal Investigator: Okello Francis, Student of Master of Science in Natural Resource Management

Institution: School of Science (SCOS) Nkumba University

1. Purpose of the Study

You are invited to take part in a research study. The objectives of the research are;

i. To evaluate the **major threats facing the shea nut tree** in Ajan Sub-County and how to overcome them.
ii. To examine the current conservation practices of the Shea nut tree in Ajan Sub-County.
iii. To assess the economic benefits derived from Shea nut tree products among households in Ajan Sub-County.

You are asked to participate because you fit the study group of key informants who are knowledgeable of the information regarding the area of study and shea nut tree species.

2. Procedure

If you agree to be in this study, you will fill a questionnaire given to you or participate in oral interview and or focus group discussion.

The survey includes questions about threats facing shea nut trees and how to overcome them, conservation practices and benefits derived shea nut tree species in your area.

It will take about 20 minutes to finish.

3. Voluntary participation

Your participation in this survey is completely voluntary. You do not have to answer any question you do not wish to answer. You can stop or exit the survey at any time without any penalty or loss of benefits.

4. Risks and discomfort

There are no known physical risks to taking part in this study beyond those of normal daily life. Some questions may make you feel uncomfortable. If a question makes you uneasy, you may skip it or stop the survey completely.

5. Benefits

You will not receive any direct payment or material reward for joining this study. However, your answers will help researchers better understand state of shea nut trees, threats and how best to conserve them for sustainable benefits in farms in your area.

6. Confidentiality and data Protection

Your responses will be kept private. You will not be required to give your name or other direct identifiers unless you choose to provide them. All data will be stored on a password-protected, secure computer file accessible only to the research team. Results will be reported only as group summaries.

7. Contact information

If you have any questions about this research project, please contact me directly face to face for immediate satisfactory feedback.

8. Agreement to participate

You have been approached because you fit the research respondents' category. You can participate if,

You are at least 18 years oldand above.

You have read and understood this information sheet.

You freely agree to take part in this research survey.

If you agree to participate please give your consent as below by signing

Sign:…… Date:…….

Name …… (optional)

Appendix 7: Photos taken from the field

Bush burning effects on shea nut trees in Ajan Sub County



Shea nut trees in Ajan Sub County



SHEA nut tree shoots in Ajan Sub County



Shea charcoal and firewood in Ajan Sub County







Shea nuts






Shea butter oil for sale in Ajan Sub County






Shea butter oil processing in Ajan Sub County





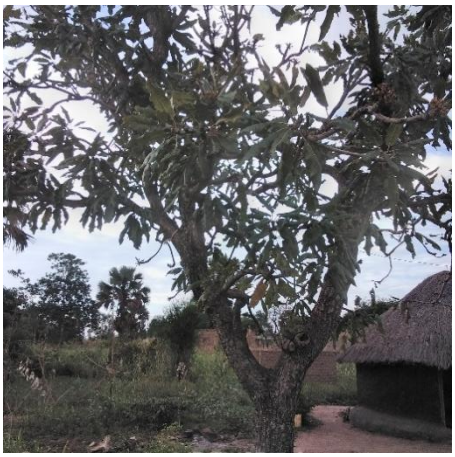



Shea tree in agroforestry gardens in Ajan Sub County

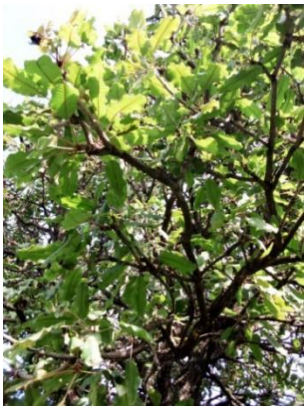



Shea tree back in a home stead in Ajan Sub County





Fresh shea nut tree leaves sprouting after dry season



Shea nut tree flowering for fruiting