CHAPTER 1
INTRODUCTION

1.1 Background to the study

Over 60% of the World's population use fuel wood especially charcoal as the main cooking energy source and its demand is increasingly rising (Zulu & Richardson, 2013) . Charcoal in the few decades has been highlighted to be one of the most easily reliable source of energy that can be produced locally by the poor ruralites without multiple technological and capital investment (Tryon, 1948). Moreover, its production has no gender, age or status restriction, instead it attracts ruralites and urbanites of all walks of life (Kouami, Yaovi & Honan 2009). With the ever-increasing poor population in the world today, charcoal remains one of the main source of energy to ease cooking processes and other related necessities, income generation inclusive. Charcoal production is commonly locked up in rural settings, although the beneficiaries who also use charcoal reside in the urban centres. The Shea butter tree (Sapotaceae, Vitellaria family) is one of the hardwood tree species spotted out to provide quality charcoal and this is commonly found in most semi-arid regions of sub-Saharan Africa notably from Senegal to Uganda (Lovett et al., 2000). Charcoal production is not only shooting high due to its great usage as an energy for cooking but also as a major source of house hold income and a greater poverty reduction measure (Zulu & Richardson, 2013). All these have resulted to great pressure on the worlds tree species notably the Shea butter tree in the African continent (Mensah et al., 2022)

Globally, burning of charcoal produces an estimated 40 to 250 mega–metric tons of black carbon (BC) every year. Energy demands have worsened human dependence on natural resources. According to the United Nations' Food and Agricultural Organization (FAO), over 50% of forest worldwide is utilized for production of charcoal. 51.2 Million tons of charcoal were produced globally in 2017 alone, up from 37.0 Mt in 2000. From 1993 to 2017, the largest average amounts of charcoal were produced annually in Africa, with 57% of the global production, followed by the Americas (23%, mostly Latin America), and the Asian continent with approximately 18%. Besides, with consideration from Europe and North America, the intake of charcoal is less noticeable, but evident however. Notably,

charcoal is used extensively as leisure fuel (e.g., for barbeques) in some sections of these continents. Limited local production is made up for with imports of charcoal to meet existing demand. Indeed, 40% of the charcoal used in Europe is imported from Africa especially Nigeria, Egypt, Namibia, and South Africa, to mention but a few (Jibreel et al., 2019). The use of charcoal as a source of energy or electricity is typically concealed in some regions because it is overshadowed by other dominant sources such as coal and gas in the energy mix Charcoal consumption is often linked to lack of modern alternatives but all over the world, electrified regions are still using charcoal as an energy source. Interestingly, Mainland China also features in the world's top 10 charcoal producers despite achieving widespread access to electricity. Moreover, Germany, which has a diverse portfolio of modern energy resources is still the world's biggest importer of charcoal (Jaffé et al., 2013). In some areas like Brazil, charcoal is generated on a large scale from industries through carbonization of wood in masonry kilns with the help of human labour (Kato et al., 2005).

The shea butter tree serves a variety of ecological and biological functions, making it valued in the places across the world where it grows (Buyinza & Bosco Lamoris, 2020). The tree produces a lot of domestically useful food oil as well as items with cosmetic and medicinal purposes (Branch & Martiniello, 2018).Jibreel et al., (2019) claim that the tree is frequently used in agricultural cultivation and agroforestry practices, which offer a variety of environmental services. The primary environmental ecological systems include maintaining biological systems, sequestering carbon, regulating temperature, supplying food and shelter for living things, and giving shade, in addition to making a major contribution to the economic livelihoods of rural communities (Choungo Nguekeng et al., 2021). In addition to providing numerous environmental benefits, trees can help increase soil fertility (Hale et al., 2021).

In sub-Saharan Africa, approximately 80% of the people in town use charcoal as their prime cooking energy source, and the demand is predicted to immensely rise for several decades (Zulu & Richardson, 2013). Charcoal is the main source of income for the rural population in areas that can easily access urban markets (Mensah et al., 2022). Given the high poverty levels, almost 80% of the population has in sufficient income to use environmentally friendly energy sources especially

electricity and solar and the repercussion is that, they resort to maximum tree harvesting for charcoal production, firewood inclusive (Girard, 2002). Even in some countries with access to electricity, charcoal production is still evident, hence indispensable. This fact partly explains why large parts of Africa are reported to be "in the dark" or "without energy" (Aabeyir et al; 2016). In Egypt, for instance, more than 88% of the population has access to electricity, but the country remains among the world's top charcoal producers today and an active importer within the past decade. The ever swelling demand for charcoal in Africa the African continent compelled by the high mushrooming population and urbanization growth rates has made charcoal the major primary source of energy for most urban households for the forth coming generations, yet charcoal has been relatively ignored within across, energy, forestry, and poverty reduction policies since "woodfuel crisis" debates of the 1970s/ 1980s (Arnold et al., 2006; World Bank, 2001; Zulu, 2010). Charcoal usage in Africa is expected to increase considerably and rapid more than other regions of the world doubling by 2030 versus a 24% increase for firewood (Arnold et al., 2006). The Shea tree distribution covers about 5,000 km belt and thrives well mostly in 19 countries in Africa. Most of these countries especially Uganda have utilized this valuable woody tree specie for charcoal production, a circumstance that has led to its immense destruction (Lovett et al., 2000).

In Uganda, fuelwood and charcoal production account for 92% of the energy demand nationwide whilst the annual energy consumption growth rate is predicted to rise by 2025 (Okullo, 2016). Uganda's major capital, Kampala and other major newly created cities like Mbarara, Fort portal, Mbale, Jinja, Soroti, Arua, Gulu and Hoima , have considerable access to electricity, with more concentrated grid connections relative to other parts of the country, however, charcoal use has been on a boom (Buyinza & Bosco Lamoris, 2020). Whereas charcoal production occurs throughout the country, its consumption is more concentrated near populous urban centers with lucrative markets, such as Kampala, Jinja, and Entebbe, because demand is mainly driven by urban centers. Charcoal consumption in Uganda is still extensive alongside other biomass (e.g., firewood), taking a 92% share in the local energy-consumption mix even (Naughton et al., 2015). Therefore, the increasing demand for charcoal principally in urban areas has seen a severe rise in indiscriminate cutting

down of trees especially the Shea butter tree in Northern Uganda in districts like Abim, Kitgum, Soroti, Agago, Lira, Nakasongola, Amuru, Nebbi, Alebtong, Arua, Otuke, Amuria, Dokolo, Pader, Moyo, Gulu, Kapelebyong, Katakwi, Serere, to mention but a few (Atalla, 2015). The Shea butter tree is a good source of charcoal. And as such, it being randomly cut hence affecting its conservation and existence especially in Northern Uganda. In most parts of Abim, Agago, Kitgum and Otuke districts, this great wood tree is almost exhausted due to charcoal burning (Kato et al., 2005).

1.2 Problem Statement

The Shea butter tree is very valuable because of its high yielding edible oil for domestic use, nutritious fruit and products for cosmetic and pharmaceutical uses. It is important for the livelihoods of the rural population in Kapelebyong district and Uganda at large as it has been for centuries (Jibreel et al., 2019). The Shea butter tree has also remained a 'darling' of the charcoal industry in Kapelebyong district and the country at large and this is because, it burns with efficiency and is less susceptible to damage during transit. As such, its transportation is easy locally by use of bicycles and motorbikes; reduces losses of the producer and seller.

As a result, the rate of charcoal production in Kapelebyong district in these past years is becoming more and more alarming. The average production had grown to11 million metric tonnes by 2007 and in 2008, 40% of households in the district were recorded to be engaged in charcoal production activities (Atalla, 2015). Studies indicate that, it is one of the major supplier of charcoal to Soroti, Mbale and Kampala city. This indicates that charcoal production ranks as the district's greatest threat to local conservation of the Shea nut tree. The rate of deteoration is changing with population explosion and high demand in the urban markets. The extraction has surpassed that of the past. Despite the implementation of environmental laws to regulate the rate at which this valuable tree is utilized, the local communities still extract the shea butter tree more than before and thus, the future distribution of this great woody tree is uncertain. Although Shea has been under investigation for commercial exploitation in Uganda since the 1930s, there has been no comprehensive study to determine the distribution of Shea butter trees in relation to

the booming charcoal production. The previous studies by Okullo (2016) and Atalla (2015) concentrated on general conservation threats of the Shea butter tree, its nutrient potential but very little has been done to analyze the deteoration of the Shea butter tree due to mushrooming charcoal activity yet this is important in formulating a more modern technique required to ensure sustainable use of the shea butter tree in the area and conservation interest should shift to protection and stimulation of natural tree regeneration especially where mother trees are available which warrantees the research study. The study will focus on mapping, examining drivers of charcoal burning, predicting the future coverage of the Shea butter tree and establishing the possible mechanisms for sustainable charcoal production so as to enhance Shea butter tree conservation in Kapelebyong district.

1.2 Research questions

From the specific objectives of this research study, a number of research questions to guide the investigations are posed.

1. What is the extent of change in area coverage of the Shea butter tree between 2002 and 2022?
2. What are the underlying drivers of charcoal production in Kapelebyong district?
3. What will be the state of Shea butter tree coverage in Kapelebyong district by 2032?
4. What mechanisms can be put in place to regulate charcoal burning and ensure sustainable utilization of the Shea butter trees in Kapelebyong district?

1.4 Objectives of the study

1.4.1 General objective

The overall objective of the study is to Examine the effect of charcoal production on the deterioration of the Shea butter tree cover in Kapelebyong district.

1.4.2 Specific objectives

(i). To map the tree cover change of the Shea Nut tree between 2002 and 2022.

(ii). To examine the underlying drivers of charcoal production in Kapelebyong district.

(iii). To predict the future Shea butter tree coverage by 2032 in Kapelebyong district.

(iv). To establish mechanisms for sustainable charcoal production to enhance Shea Nut tree conservation in Kapelebyong district.

1.5 Significance of the Study.

The findings of this study will provide information to policy makers at the local and national level on the major drivers of charcoal production in the area. This will inform government on the better strategies that can be put in place to engage the local communities on other productive income generating activities to help safeguard this great woody tree.

The results of this study will provide data on the land cover change of the Shea butter trees over the past years. Understanding the past, current and future distribution spatial of the Shea butter tree is important to environmental authorities like NEMA and NFA in designing and implementing specific Shea butter tree management strategies.

The results on the land cover change of the Shea butter tree are relevant in understanding the historical, current and future distribution of the Shea butter tree and discovery of the possible alternative supplementary trees for charcoal production and other alternative sustainable energy sources.

The study may also help in identifying opportunities in sustainable charcoal business management and strengthening the operational charcoal production policies in the district and the country at large through encouraging practical implementation

of the laws and policies that govern charcoal production and the Shea butter tree utilization.

1.6 Scope of the study.

The study was conducted in Kapelebyong district, Teso sub-Region-Eastern Uganda This covers six sub-counties which include Obalanga, Okungur, Acowa, Akoromit, Kapelebyong and Kapelebyong town council. This is one of the greatest supplier of charcoal in the region and where the Shea butter tree has been degraded.

The research investigation concentrated on determining mapping how much Shea butter trees have been lost mainly due to charcoal burning, predict the future coverage of the Shea butter tree, determine the drivers of charcoal production and suggest the possible strategies aimed at sustainable utilization of the she butter tree.

In terms of the time scope, the period considered for mapping land cover change of the Shea butter tree was from 2012 to 2022. This is deemed sufficient to portray the land cover change of the Shea butter tree over the years

1.7 Conceptual Framework.

The conceptual framework in this study illustrates the links between charcoal production and the deteoration of the Shea butter tree (Figure 1.1). The determinant factors/drivers are the independent variable, and charcoal production is the dependent variable. Charcoal production in the area is mushrooming driven by multiple forces hence leading to deterioration of this great woody plant as such, the future existence of the Shea butter tree is worrying. The need to preserve it requires effective, efficient and implementable strategies by the government environmental protection bodies as well as the local community.

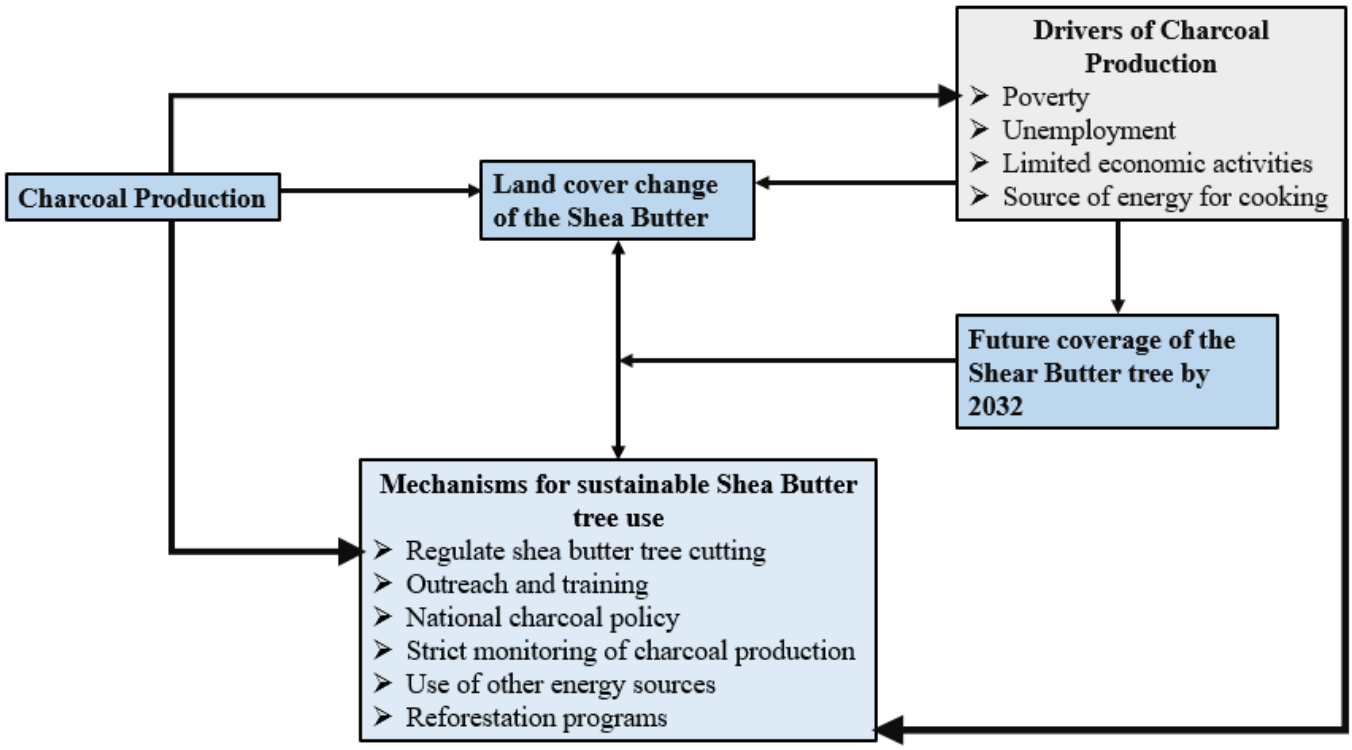

Figure 1.1: Conceptual framework (Source: Author)