



FUELWOOD VALUE CHAIN IN YOBE STATE, NIGERIA

By

ALI BULAMA

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
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DEDICATION

I would like to dedicate this work to my late Mother Hajara Aba-Ari, my late Father Sgt. Alhaji Ali Adamu (Rtd) and my late wife Safiya Mohammed Ali Bulama, I love you all, and may your souls rest in perfect peace.



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

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By

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August 2021

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High reliance on fuelwood as a source of energy for cooking in Nigeria has escalated its commercialization, and the trend is expected to increase due to the increasing poverty rate and population growth. Previous studies on fuelwood in Nigeria paid little attention to the characteristics of and sustainability practices along the fuelwood value chain. This study analyzes the structure and characteristics of fuelwood value chain in terms of its economic, environmental, and social aspects to better understand the sustainability of the fuelwood trade in Yobe, Nigeria. In this study, the economic aspect focused on profit and its distribution along the value chain. The environmental aspect emphasized the harvesting practices and preferred fuelwood tree species while the social aspect concentrate on the extent of women's participation along the value chain. Data were collected using focus group discussions, observations, and a face-to-face questionnaire survey with 150 respondents from five different groups of value chain actors in Yobe selected using purposive sampling. Data were analyzed using descriptive statistics, profitability analysis, general linear mixed model (GLMM), and thematic analysis. Two channels of supply chain formality were identified. The formal chain is marked by a division of labor (harvesting, transportation, wholesaling, retailing) steered by licensed actors while the informal chain is occupied by non-licensed actors, engaged in multiple value chain functions. In terms of the economic aspect, fuelwood value chain activities were profitable with an average value chain actor earning a monthly average profit of USD133. The profit share was skewed to transporters that reaped 66% of the total profit. GLMM analysis showed years of experience, education, marital status, and type of supply chain influence value chain actors' profit. For the environmental aspect, the result showed that respondents' harvesting practices were unsustainable and the tree species preferred for fuelwood leads to uncontrolled exploitation of the tree species contributing to species extinction. For the social aspect, the study revealed low and limited participation of women along the value chain, especially in the formal chain, due to culture, inadequate working capital, lack of awareness,

inaccessibility to financial support, among others. Based on the analysis, fuelwood value chain activities in Yobe were marked with inequalities in profits distributions, unregulated and uncontrolled exploitation of the forest resources, and lacked gender inclusiveness. To promote sustainable fuelwood value chain management, the government should address illegal activities along the value chain, implement strategic plans to encourage fuelwood tree plantations and agroforestry management, revisit the current policy and program on gender-based empowerment, promote awareness and decentralize licensing application system, inculcate integrity among forest officials to curb unethical practices and enhance collaboration with all stakeholders. This study provides a general overview of the sustainability of the fuelwood sector along the value chain in Yobe. Other sustainability issues can be incorporated such as taxation, life cycle analysis, child labor, and job safety at a larger scale to create a comprehensive policy and strategies related to sustainable fuelwood management in Nigeria

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

RANTAIAN NILAI KAYU API DI NEGERI YOBE, NIGERIA

Oleh

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Kebergantungan yang tinggi pada kayu api sebagai sumber tenaga untuk memasak di Nigeria meningkatkan pengkomersialan kayu api, dan trend ini dijangka akan meningkat berikutan daripada peningkatan kadar kemiskinan dan pertambahan penduduk. Kajian-kajian lampau mengenai kayu api di Nigeria tidak memberi perhatian kepada ciri-ciri dan amalan mampan di sepanjang rantai nilai kayu api. Kajian ini menganalisis struktur dan ciri-ciri rantai nilai kayu api dari segi aspek ekonomi, persekitaran dan sosial untuk lebih memahami kelestarian perdagangan kayu api di Yobe, Nigeria. Di dalam kajian ini, aspek ekonomi berfokuskan kepada keuntungan dan agihannya di sepanjang rantai nilai kayu api. Aspek persekitaran menekankan kepada amalan penuaian dan spesis pilihan pokok kayu api manakala aspek sosial tertumpu kepada penglibatan kaum wanita di sepanjang rantai nilai. Data dikumpul menggunakan soal selidik secara bersemuka, perbincangan kumpulan berfokus dan pemerhatian. Seramai 150 responden dari lima kumpulan pengusaha rantai nilai berlainan di Yobe dipilih menggunakan persampelan bertujuan. Data dianalisis menggunakan statistik diskriptif, analisis keberuntungan, model campuran linear am (GLMM), dan analisis tematik. Kajian ini mengenal pasti terdapat dua saluran bekalan kayu api formaliti. Rantai bekalan formal dicirikan dengan pembahagian kerja (penuaian, pengangkutan, pemborongan, peruncitan) yang dikendalikan oleh pengusaha yang berlesen, manakala rantai bekalan tidak formal dimiliki oleh pengusaha tidak berlesen yang terlibat dalam pelbagai fungsi rantai nilai. Dari segi aspek ekonomi, aktiviti rantai nilai kayu api didapati menguntungkan dengan purata rantai nilai keuntungan bulanan sebanyak USD133. Agihan keuntungan condong kepada pengangkutan yang mengaut 66% daripada jumlah keuntungan. Analisis GLMM menunjukkan jumlah tahun pengalaman, pendidikan, status perkahwinan, dan jenis bekalan rantai nilai mempengaruhi keuntungan pengusaha rantai nilai. Bagi aspek persekitaran, dapatan menunjukkan amalan penuaian oleh responden didapati tidak mampan dan pokok yang menjadi pilihan kayu api membawa kepada

eksploitasi tidak terkawal spesies pokok yang menyumbang kepada kepupusan spesies. Bagi aspek sosial pula, penyertaan wanita di sepanjang nilai rantaian adalah rendah dan terhad, terutamanya dalam rantaian formal disebabkan oleh budaya, kekurangan modal kerja, kurang kesedaran, dan kesukaran untuk mendapatkan sokong kewangan. Berdasarkan analisis tersebut, aktiviti rantaian nilai kayu api di Yobe dicirikan dengan ketidaksamaan dalam pengagihan keuntungan, eksploitasi sumber hutan yang tidak teratur dan tidak terkawal, dan kekurangan keterangkuman jantina. Untuk menggalakkan pengurusan rantaian nilai kayu api yang mampan, kerajaan perlu menangani aktiviti haram di sepanjang rantaian nilai ini, melaksanakan pelan strategik untuk menggalakkan penanaman pokok kayu api dan pengurusan perhutanan tani, menyemak semula dasar dan program berdasarkan kepada pemerksaan jantina, menggalakkan kesedaran dan mengagihkan sistem aplikasi perlesenan, menerapkan integriti di kalangan pegawai hutan untuk membendung amalan tidak beretika dan meningkatkan kerjasama di antara semua pihak berkepentingan. Kajian ini memberi gambaran umum mengenai kelestarian sektor kayu api di sepanjang rantaianya di Yobe. Isu kelestarian lain boleh digabungkan seperti percukaian, analisis kitaran hidup, buruh kanak-kanak, dan keselamatan kerja pada skala yang lebih besar untuk mewujudkan dasar dan strategi komprehensif berkaitan pengurusan kelestarian kayu api di Nigeria.

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CHAPTER 1

INTRODUCTION

1.1 Background

The significance of forests as source of livelihood and cooking energy across the globe can never be over emphasized as evidenced by the call for its sustainability and subsequent inclusion in the Sustainable Development Goals (SDGs) initiatives (UN 2017a). The World Bank report on access to clean energy revealed that about 3.04 billion people worldwide live without access to clean cooking fuel of which, 807 million are from Africa (excluding North Africa), 2,084 billion from Asia-pacific, 250 million people from North Africa, and 150 million from other parts of the world (World Bank, 2017). Therefore, these 3.04 billion populations rely on different forms of biomass such as wood fuel (charcoal and fuelwood), crop waste, solid waste, landfill gas, biogas, and ethanol; However, fuelwood has been identified to represent the most utilized biomass form of energy for cooking and heating (Cerutti et al., 2015; Sola et al., 2017; Purwestri et al., 2020).

Fuelwood is defined as a rough wood, cleaved wood, and chips obtained from forests, trees outside the forests, or waste from industry (UNEP, 2019). It is also described as any recovered woody products that retain all the essential features of wood and are used as fuel for cooking and heating. Fuelwood is obtained as logs from the trunk of trees, twigs from branches of trees, and stumps of previously felled trees (Naibbi, 2015). It is also obtained as chips, and sawdust that originate from timber industrial waste (Schure et al., 2012), and as a product of silvicultural operations in forests or plantations (salvage, thinning, pruning, and lopping activities), as well as a waste of processed timber (Shukla, Kumari, Manohar, & Chakravarty, 2018). Other sources of fuelwood include thinned diameters trees, trees from failed timber plantations and crop residues from post-harvest activities (Ghaffariyan, 2010), and trees from agroforestry farms (FAO, 2010a). Fuelwood is collected from dead woody and living trees in forested and non-forested lands, and use as a source of energy for cooking and heating (Zaku, Kabir, Tukur, & Jimento, 2013; Sepp, Sepp, and Mundhenk 2014).

Fuelwood commercialization is described as both an off-farm activity of the rural population and a lifelong occupation of urban people (Taru & Ndaghu, 2013; Zaku Kabir, Tukur, & Jimento et al., 2013). It provide a source of livelihood for more than 40 million people across the globe (UNEP, 2019). Moreover, a total of 665.57 million m³ of fuelwood is produced from forested areas covering 624.1 million ha across SSA, and a total quantity of 664,248 m³ of fuelwood valued at USD231 million m³ has been sold in 2015 across Sub-Saharan Africa (UNEP, 2019).

According to the UN (2017a) report, over 2 billion people across the world depend on wood fuel as their main cooking and heating fuel. Wood fuel, both charcoal and fuelwood, account for about 63% of the total primary energy used for cooking and heating in Africa, which is comparatively higher than the quantity of wood fuel used in Latin America and the Caribbean (16%), Asia and Oceanic (38%) and Europe (3%) (FAO, 2014; FAO, 2017a). In Africa, about 555.1 million households utilize fuelwood as the main source of cooking fuel (FAO, 2017a).

Regional data on wood fuel production, consumption, import, and export in West Africa shows that about 197.5 million m³ of wood fuel is produced, and an additional 12,744m³ is imported (UNEP, 2019). The methods employed in the production of fuelwood across the world vary and often depend on the climate conditions of an area, forest cover, level of fuelwood demand, presence or absence of policy and infrastructure, and most importantly the tenure system and land-use rights (Sylla, 2010). For instance, fuelwood is produced as a product of agricultural plantations (e.g. coconuts, palm trees) and industrial residues (Sylla, 2010). Sepp et al., (2014) identified forestry and agricultural land-use systems such as agricultural plantations, agroforestry, trees outside forests, tree plantations, secondary and primary forest management, fuelwood plantation management, and a by-product of sustainable timber production among the various mean of obtaining fuelwood.

Many countries in East Africa and Asia (e.g. Kenya, Tanzania, Peru, and India) have made significant progress in sustainable fuelwood production through agroforestry, plantation, and trust farm management (Ndegwa, 2010; Agbaeze, Uluocha, Ogechi & Shomkegh, 2016; Bennett et al., 2018). However, the population of many countries in West Africa including Nigeria, Niger Republic, and Cameroon continue to rely on the natural forests for commercial fuelwood and have continued to add pressure on the forests (Naibbi, 2015; Koirala, 2017; Obiri, Nunoo, Obeng, Owusu, & Marfo, 2014).

The increasing demand for fuelwood over the years has not only changed the pattern of its extraction in terms of sources, but also the collectors, and types of tree species that are collected as fuelwood. For instance, women and children were traditionally responsible for fuelwood extraction by collecting only dry parts of trees and shrubs from tree species outside the forests e.g. bushes and farmland (Tondoh & Degrande, 2015). However, the extraction of fuelwood has gone beyond villages' boundaries as fuelwood is now collected and commercialized by rural and urban men and women (Nelson, Udo, & Jacob, 2017; Guild & Shackleton, 2018; Shukla et al., 2018).

In Nigeria, fuelwood extraction has been extended from the collection of dry parts of trees to green parts of trees. The scope for the utilization of fuelwood has now been extended from households' cooking and heating to commercial-

related preparation of food in catering such as restaurants, bakeries, local groundnut oil milling, local breweries, local rice milling, fish smoking, beverage production, brick or chalk production, handicraft (aluminium foundries) and in the preparation of food by different public institutions (e.g. public boarding secondary schools, correctional and rehabilitation centers, public healthcare units/hospitals, training and detention camps. The extensive use of fuelwood in Nigeria is due to the unavailability, unaffordability and unreliability of alternative modern energy such as Liquefied Petroleum Gas (LPG) (Tabuti, Dhillion, & Lye, 2003; Ojo et al., 2012; Naibbi, 2015).

Despite the recognition of Nigeria among the world's oil-rich countries with a per capita income of USD2,229.9, a report on poverty and inequality by World Bank (2019) shows 50% of the population lived below the country's annual poverty threshold of N137, 400 or USD361 (Varrella, 2020). A recent report on the human poverty index (HPI) across the globe (Panchal, 2020) identified Nigeria as one of the poverty capital of the world, with a large proportion of the population (more than 40%) currently living below the UN's poverty threshold and living on less than USD1.9 per day (WHO, 2020). Thus, 80% of the population in Nigeria rely on fuelwood as a source of energy for cooking and heating due to its cheap price and easy accessibility (Onoja & Emodi, 2012; Ndiboi, & Dare, 2020). Most importantly, the increasing rate of the population of Nigeria at 2.58% per year indicates that the population could reach 401.32 million in 2050, which continue to raise concerns on the sustainability of forests and the living standard of the poor population that rely on fuelwood as a source of cooking and livelihood source (UN, 2020).

The livelihood contribution of fuelwood commercialization in Nigeria has been documented as the industry is reportedly supporting about 2 million people. Additionally, the contribution of the fuelwood industry in supporting small and medium scale industries, by providing woods that are used in producing farm implements (e.g. handles of a shovel, rake and hoes) and kitchen utensil (e.g. pestle and mortar, chopping board, kitchen stool) in sculpture industry (Larinde & Aiyelaja 2015; Ahmed, & Oruonye, 2017).

However, the pattern and practices of fuelwood extraction have been acknowledged as unsustainable and believed to impact negatively on the fragile forests ecosystem (Nwofe, 2014; Naibbi, 2015; Abdul-Hadi, 2016). Other environmental impacts linked to unsustainable exploitation of forests for fuelwood include desertification (Anierobi & Efobi, 2013), soil erosion, deforestation (Audu, 2013), bush burning (Adedayo, 2005), climatic change, and biodiversity loss (Njenga, & Mendum, 2018).

In Nigeria, fuelwood extraction and clearing of land for agricultural practices are identified as the main drivers of deforestation (FME, 2013; Naibbi, 2015). The Federal Republic of Nigeria had put in place different measures such as

the ban of felling of some tree species as fuelwood, restrictions of extracting fuelwood in specific identified forested areas, and mandating commercial fuelwood harvesters to acquire permit/license and involve in the preservation and conservation of the natural forests. However, these measures failed to effectively reduce over-exploitation of forests for fuelwood due to many factors including outdated and weak policy, corruption, policy inconsistencies, and poor funding of forestry activities (Babanyara & Saleh, 2010; FGN, 2012; Naibbi, 2015).

Furthermore, development policies, interventions, and projects along the fuelwood value chain have been rarely targeted in Nigeria. Only some parts of the value chain nodes have been targeted particularly the harvesting and transport nodes (NER, 2014). Apart from that, there has been a lack in terms of revisiting forest and fuelwood handling and commercialization policies by the state (YSG, 2019). Therefore, study of a component of a generic fuelwood value chain and neglecting others can affect the sustainability of the whole value chain structure since one component often depend on another.

1.2 Statement of the Problem

Nigeria is ranked as the third-largest producer of fuelwood in Africa after Ethiopia and the Democratic Republic of Congo in 2019 (FAO, 2020), and the prevalent consumption of fuelwood in Nigeria has continued to increase its production. For instance, about 50.92 million m³ of fuelwood was produced in 1990 compared to an estimated 66.21 million m³ of fuelwood produced in 2019, an increase of 23% (FAO, 2016a; FAO, 2020). The increasing production and consumption of fuelwood in Nigeria over the years has contributed to the depletion of the forests (Oluwagbenga & Asifat, 2015), reduced supply of non-timber forests (e.g. fruits), and change in micro-climate (Medugu, Majid, & Johar, 2010; Audu, 2013; Maurice, Umar, & Zubairu, 2015).

A study on perception of people on the impacts associated with fuelwood extraction showed deforestation topping the list with 58.83%, followed by loss of biodiversity (18.8%), loss of soil fertility, windstorm, and global warming with 5.5%, 2.7%, and 1.83%, respectively (Oluwagbenga & Asifat, 2015). Despite the negative impacts of commercial fuelwood extraction on the environment, fuelwood value chain activities also contribute significantly to socio-economic development (Adewuyi, & Olofin, 2014; Naibbi, 2015; Nelson et al., 2017); The fuelwood industry has been reportedly supporting between 1.5 and 2 million people in Nigeria, and it is believed to provide raw material to some industries e.g. sculpture industry (Larinde & Aiyeloja 2015; Ahmed & Oruonye, 2017), and its commercialization also support the growth of other industries such as transport (Adewuyi. & Olofin, 2014).

Given the positive and negative impacts of fuelwood business-related activities in Nigeria, improvements along the fuelwood value chain are significant to ensure sustainable production and extraction, transportation, and marketing that can promote economic growth and alleviate poverty. In this context, the economic, environmental, and social dimensions of the fuelwood value chain in Nigeria need to be thoroughly understood so that fuelwood business activities remain profitable, inclusive, and contribute positively to the environment.

One of the analytical tools used extensively in analyzing value chain issues that take into account the sustainability dimensions (i.e. economic, social, and environment) is the value chain analysis (European Commission, 2018; UN, 2017b). Value chain analysis has been found applicable in analyzing sustainability issues of different commodities chain such as coffee, medicinal plants, mushrooms, and dairy industries (Fitter, & Kaplinsky, 2001; Getachew, Zemedu, & A, 2016; Hishe, Asfaw, & Giday, 2016; Kiambi et al., 2020).

Value chain analysis has also been extensively applied in the study of wood fuel value chains in different countries of SSA focusing on different challenges affecting one or more aspects of sustainable development. For example, in Mozambique, large-scale and small-scale charcoal supply chains were identified, in which the large-scale supply charcoal on a large quantities compared to the small-scale suppliers. Moreover, other previous charcoal literature revealed vertical integration characteristics, a situation in which actors participate in more than one value chain to maximize profits (Ndegwa, 2010; Baumert et al., 2016; KFS, 2013; Kazimoto, 2015). Schure, Ingram, Sakho-Jimbaran, Levang, & Wiersum (2013) examined the challenges of formalization along the charcoal value chain in Central and West Africa.

In terms of fuelwood value chain, few studies have provided insight on the roles of key players, the economic contribution of some actors along the supply chain and challenges faced by some of the actors involved in fuelwood business activities Naibbi, 2017; Nelson et al., 2017; Bennett, Cronkleton, Menton, & Malhi, 2018).

Economic analysis of wood fuel (fuelwood and charcoal) along the value chain in different countries showed inequalities in the distributions of profit. For instance, In Peru, producers received the highest profit among other actors, and their success has been attributed to the sustainable approach of intensive production of the most preferred tree species for fuelwood in a plantation (Bennett et al., 2018), while in some studies, the producers were identified to earned the least share of profits compared to other value chain actors (Mwampamba, Owen, & Pigaht, 2013; Sander, Gros, Peter, 2013; Schure et al., 2013). Another study on fuelwood in Central Africa found transporters as the recipients of the highest profits (Schure, Dkamela, Goes, & McNally, 2014). In Uganda, Mozambique, and Ghana, profits from the fuelwood value chain

was skewed to traders (Naibbi, 2015), and wholesalers specifically were the chain actors that highest economic beneficiaries in Kenya, and South Africa (KFS, 2013; Guild & Shackleton, 2018).

In terms of the application of value chain analysis to the fuelwood industry that integrate the structure of the supply chain and characteristics of the value chain that focus on sustainability issues across the three aspects of sustainable development, literature remain limited even though Africa remain the continent with the highest consumption of fuelwood (FAO, 2014; UNEP, 2019). Although, in some countries such as Guinea Papua, Namibia, and Burkina Faso, the channels of fuelwood supply chain were unveiled and identified on the basis of formality status of the suppliers as formal and informal fuelwood supply chains (Mlunga, 2012; Nuberg, 2015), but information on sustainability issues along the value chain remain scanty

There are few studies that focused on fuelwood value chain, for instance, Bellù and Guilbert (2009), only focused only on the socio-economic contributions of the fuelwood and policy impact along the value chain in Burkina Faso. In same country of Burkina-Faso, a recent related study has been done by Puentes-Rodriguez et al., (2017) that analyzed selected sustainability issues in Burkina Faso that include fuelwood price (economic aspect), value chain actors preference of tree species, fuelwood quantity handled along the value chain (environment aspect), as well as education and gender along the value chain (social aspect).

In Nigeria, fuelwood value chain studies have often focused on an entity of the fuelwood value chain such as harvesting (Audu, 2013; Naibbi, 2015), transportation (Zaku et al., 2013; Adewuyi & Olofin, 2014), or only the trading node (Azeez et al., 2014; Nelson e al., 2017). Several studies analyze certain sustainability issues, however, focused on a value chain node. For example, profitability (economic aspect) in the trading node of the fuelwood value chain (Onoja & Emodi, 2012; Azeez et al., 2013; Nelson et al., 2017); forest degradations (environmental aspects) due to fuelwood harvesting (Adewuyi & Olofin, 2014; Audu, 2013; Naibbi, 2015). Most importantly no attention is given to the social aspect of fuelwood value chain in Nigeria.

Given the cluttered studies on the fuelwood value chain and sustainability issues of the fuelwood industry in Nigeria, this study used a more holistic approach to study the structure of the fuelwood value chain and analyze selected economic (profitability, profit distribution), environmental (harvesting pattern and tree species preference), and social aspect (gender equality) along the chain to better understand the sustainability of the fuelwood value chains in Yobe Nigeria. Consequently, the central question of this study: “is the fuelwood value chain activities in Yobe, Nigeria economically, environmentally, and socially sustainable?”

The outcome of this study will not only adds to the existing knowledge on fuelwood value chain analysis that incorporates the sustainability dimensions but also provides useful information for developing better policies, strategies, programs, or supports to improve the sustainability of the industry by increasing the economic contribution in terms of equal distribution of profits, minimize the environmental impact, and improve the social welfare particularly gender equality along the value chains.

1.3 Aim of the Study

The general objective of the study is to analyze the structure and characteristics (economic, environmental, and social dimensions) of fuelwood value chain to better understand the sustainability of the fuelwood trade along the value chain in Yobe, Nigeria.

1.4 Specific Objectives of the Study

The specific objectives of this study are:

1. To examine the structure of the fuelwood supply chain in Yobe
2. To analyze profit distribution and the factors influencing profit across the fuelwood supply chain.
3. To observe the fuelwood harvesting practices and identify preferred tree species for fuelwood by supply chain actors.
4. To examine the extent of women's participation along the fuelwood value chain.

1.5 Significance of the Study

The results of this study can add to the existing knowledge on fuelwood value chain analysis that incorporates the three dimensions of sustainability. The study provides information on the structure and characteristics of the supply chain that is useful to the current and prospective stakeholders for improving communication, collaborations, production (e.g., large-scale production of and commercialization of preferred tree species for fuelwood.

This study provides base-line information to policy and decision-makers on the strength and weaknesses of the current policy guiding the fuelwood business activities (NER, 2014). The study further revealed the current level of fuelwood production and methods of its transportation and marketing that can be used as a guide for developing new policy, and revisiting of the current one. Moreover, the results of the study on the current practices of fuelwood

business activities provides information for the implementation of action plans, strategies and programs to support the development of the fuelwood industry that promote sustainable fuelwood management (improve economic benefits, equal benefits sharing, protect, preserve, and conserve) (Naibbi, 2015; Abdul-Hadi, 2016; Ndiboi, & Dare, 2020).

1.6 Scope of the Study

This study is on fuelwood value chain, therefore, covered only the structure of the fuelwood value chain and some selected sustainability issues from the three dimensions of sustainable development (economic, environmental and social). Moreover, the study focused on the key actors involved in fuelwood value chain activities at both formal and informal value chains in Yobe state. Thus, the results could not be generalized to all stakeholders of the fuelwood industry in Yobe. However, the study can serve as a useful guide for future studies on the fuelwood value chain in Nigeria.

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