THE DYNAMICS AND SOCIO-ECOLOGICAL EFFECTS OF CHARCOAL LIVELIHOODS IN THE SAVANNAH WOODLANDS OF GHANA

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EXECUTIVE SUMMARY

This research examines the dynamics and socio-ecological effects of charcoal production in the Savana woodland of Ghana. The report is based on the analysis of relevant literature and primary data collected through in-depth interviews with stakeholders, focus group discussions, field observation and a survey of 200 respondents selected from three communities in the Gonja area.

The rapid urbanisation, primarily driven by rural-urban migration and the sprawling of cities in Africa has set in motion a household energy transition from firewood to the use of charcoal for cooking. With more than half of Ghana's population now living in cities, the built environment does not support the use of firewood, which produces a lot of smoke. Thus, people are shifting to cleaner forms of energy use, such as charcoal and liquefied petroleum gas (LPG). Although LPG is considered a much cleaner form of energy compared to biomass, many urban households cannot afford LPG, hence the high reliance on charcoal for domestic energy needs. With the demand for charcoal on the rise, the resultant impact is the expansion of the charcoal production frontier in the Gonja area, which has diverse socio-economic and ecological outcomes in the Savannah woodland of Ghana.

The study shows that charcoal has a complex value chain with a wide array of actors playing varying roles. One of the leading players in the charcoal value chain in Ghana is the Sissala migrant charcoal producers. Charcoal production is the primary livelihood activity of the Sissala whose long history in the charcoal business and movement across the woodland ecology of Ghana is vital to the diffusion of the charcoal production technology and strategy. In the Gonja area, the Sissala acquire wood harvesting rights/permits from village chiefs to produce charcoal. Community liaisons facilitate concession acquisition by migrant Sissala charcoal producers and mediate any disagreements between the landowners and Sissala producers. Also crucial in the charcoal network are farmers who depend on charcoal producers to harvest trees on their lands before they plough for crop production. The clearing of vegetation for agricultural expansion in the Savannah ecology increases the availability of wood for charcoal production. Other actors in the charcoal value chain are the charcoal aggregators and transporters who are the link between the charcoal producing areas and the urban markets. The aggregators are usually Ashanti women who buy charcoal from small-scale producers in the villages, and transport to the cities. In addition to providing a market

for small-scale producers, the charcoal aggregators also pre-finance charcoal production. The large-scale charcoal producers rely on transport operators to send their charcoal to the urban markets of Accra and Kumasi. In the cities, there are large-scale charcoal distributors who buy large quantities of charcoal from the producer-wholesalers and aggregators and sell to retailers. The retailers buy a few sacks of charcoal from the major distributors and repack them into small plastic bags, which they sell, to neighbourhood consumers.

In the Gonja area, charcoal production has become an important activity supporting the livelihood of different categories of people. The charcoal business makes a significant contribution not only to the local economies, but also to the broader national economy. At the community level, village chiefs and sub-chiefs derive income from royalties paid by charcoal producers. In addition to royalties, charcoal producers also contribute to community projects such as water provision and the celebration of festivals. Income for charcoal provides the needed capital for farm expansion, housing and in meeting other household costs in the study communities. Across genders, men gain significantly higher income from charcoal than women do since the former produce charcoal on a larger scale than the latter do. Various district assemblies also derive considerable revenue from charcoal through fines and taxes that charcoal producers pay. The Forestry Commission generates revenue from charcoal in the form of the Charcoal Conveyance Certificate (CCC), which charcoal transporters pay. Far away from the production sites, in the cities, the metropolitan, municipal and district assemblies generate revenue through taxes paid by charcoal distributors in their jurisdiction. The benefits of charcoal production are not only in the form of income generated to value chain actors, but also the creation of a service economy in the production communities. At the national scale, the charcoal business is essential to meeting household energy needs in urban areas.

The findings show that charcoal production areas are a shifting frontier radiating from communities along major roads into interior settlements as the desired trees are depleted. In Langatire and Soaleppe, which are the older charcoal production belts, for instance, the charcoal output and level of activity is lower than in Kuportor, which typifies the new charcoal frontier in the Gonja area. Expansion of farms results in clearing of vegetation, which makes wood available for charcoal production. However, the extent to which charcoal production results in the destruction of the vegetation depends on the composition of trees in an area. Areas with high densities of ***dawadawa*** *(Parkia biglobosa) and* ***shea*** *(Vitellaria paradoxa),*

which are prohibited in charcoal production do not experience extensive tree loss. However, areas with high densities of ***keche*** *(Khaya senegalensis),* ***kakali*** *(Anogaises leucopus) and* ***kawul*** *(Afrormosia laxiflora) which are used in charcoal production are often depleted.*

It is further argued that the destruction of the vegetation occurs the most in areas where indigenous charcoal producers continue to produce after the large-scale Sissala producers move away. This is because once Sissala migrants exhaust matured trees; they migrate to new locations with higher tree densities. Unlike the Sissala, indigenous charcoal producers do not migrate but continue to exploit their immediate environment for charcoal and in many instances, harvest juvenile and prohibited species for charcoal thereby exacerbating the already destroyed vegetation. The clearing of land for agricultural expansion and high cattle population in the study areas are also among the main triggers of woodland degradation.

On the linkage between charcoal production and bush fires, the study shows that charcoal production rarely causes bush fires. In all instances, charcoal producers take precautions to prevent fire outbreaks since it poses the risk of destroying the grass, which is a major input, used in kilns, unprocessed logs and trees as well as the packed charcoal. Bush fires in the Gonja area are linked primarily to the activities of Fulani herdsmen and hunters. In the dry season, as grass becomes scarce for grazing, the herdsmen often set fire to the dried vegetation to induce the growth of fresh pasture for their cattle.

Charcoal production is a laborious activity with several adverse impacts on health. In all study areas, charcoal producers lack Personal Protective Equipment (PPEs) and are thus, exposed to several health risks. Some of the significant health challenges charcoal producers face include respiratory and eye problems due to exposure to smoke from the charcoal kilns, body aches, and other physical injuries due to the drudgery involved in charcoal production. Majority of the respondents do not seek medical attention for most of the injuries related to the charcoal activities but rather self-medicate.

Although charcoal production is one of the essential livelihood activities and critical for meeting domestic energy needs in Ghana, there are no clear national policy guidelines that regulate charcoal production. Although state institutions such as the Forestry Commission, the Environmental Protection Agency, and the District Assemblies are responsible for regulating charcoal production, they lack robust legal and regulatory frameworks to guide the sector. The Forestry Commission, for example, instituted the Charcoal Conveyance Certificate (CCC),

which is the tax transporters pay for moving charcoal across the country. The CCC, however, does not regulate the charcoal production process; monitor the species of trees used in charcoal production and the areas where charcoal production takes place. At the district level, the assemblies lack a uniform strategy towards regulating charcoal production. The North Gonja District has a by-law that bans charcoal production with a hefty fine as a deterrent, while the West Gonja District has no regulations on charcoal production except an ineffective outright ban. Although the West Gonja District lacks a by-law on charcoal production, the assembly in collaboration with the police arrests charcoal producers albeit rarely. In both district assemblies, the lack of policy clarity and coordination has created the space for the police and other officials to extort money from charcoal value chain actors. Charcoal generates huge revenues that makes any effective policy by institutions benefiting from these revenues highly unlikely.

Considering the critical role of charcoal production in meeting domestic energy needs and supporting the livelihoods of many people, stakeholders must rethink strategies towards regulating the charcoal sector. The current adversarial approach towards charcoal production fails to consider the increasing demand for charcoal; a situation that is envisaged to be continuing due to rapid urbanization and high cost of LPG. There is the need to consider sustainable approaches to charcoal production that takes into consideration the linkage between charcoal, agriculture, and other livelihood activities in both rural and urban areas. Any such sustainability plan must entail the deployment of improved kilns that will reduce the environmental and health impacts of charcoal production. The district assemblies and allied institutions should conduct tree audits and produce community maps to guide the allocation of concessions to provide the framework for a controlled exploitation. Tree planting programs must be implemented to enable farmers and charcoal producers replace the trees that have been harvested for charcoal production as well as reclamation of degraded lands through afforestation projects.

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CHAPTER 1: INTRODUCTION

1.1. The Background

The extraction of natural resources has the potential of engendering structural transformation of economies globally. In several developing countries, the extraction of natural resources has produced complex and sometimes counter-productive outcomes. Efficient utilisation of resources has the tendency of promoting social and economic development. On the other hand, corruption and poor management practices relating to natural resource extraction can result in adverse development outcomes such as conflicts and environmental degradation with severe consequences on poverty and food security.

A central aspect of resource extraction and development is energy. Energy resources play essential roles in societies and are inextricably linked with economic growth, poverty alleviation, social development, and environmental quality. The type and availability of energy are central to the achievement of the United Nations Sustainable Development Goals (UN SDGs). In both developed and developing countries, availability, access, and cost of energy are central to social and economic transformation.

Ghana's energy resources providing power for both domestic and industrial purposes consist of hydroelectricity (11%), hydrocarbons (28%) while biomass in the form of fuelwood and charcoal constitutes 60% with only 1% in the form of solar (Asumadu-Sarkodie & Owusu, 2016). About 90% of Ghanaian households use firewood and charcoal for cooking. Charcoal production has been on the ascendancy because of its importance in domestic use in both rural and urban areas. Compared to firewood, charcoal burns hotter, is easy to transport and last longer in storage without degradation. Additionally, fluctuating prices of hydrocarbons in the international commodities market, the initial high cost of gas stoves compared to charcoal means that most urban households will rely on charcoal. Even homes with gas stoves usually keep charcoal to augment and diversify reliance on gas.

Over the past few decades, many efforts to reduce CO_2 emission and the impacts of climate change on societies have seen the promotion of energy transition and initiatives to decarbonise society. For many developing countries, the agricultural sector is among the hardest impacted by climate change invariably exacerbating poverty. A pivotal response to decreasing agriculture output due to climate change is rural-urban migration. Rural-urban migration has a dual impact of depopulating rural areas, and loss of farm labour while increasing urban sprawl, expansion of built environment and demand for charcoal among the urban population. This study unpacks the complexity of relations involved in charcoal livelihoods in the Gonja area with respect to the economic, social, health and the environment consequences.

1.2. The objectives of the study

This study examines the dynamics, socio-economic and environmental effects of charcoal production and livelihoods in the Savannah woodland of Ghana. The following are the sub-objectives and associated research questions:

1. Examine the dynamics, structures and processes of charcoal livelihoods in rural communities.
    a. What is the history of charcoal production in the area?
    b. What structures regulate access to wood resources for charcoal burning?
    c. How is the charcoal production done in the area – practices and technology?
    d. What are the gender dynamics at play in charcoal production?
    e. How has charcoal production shaped agriculture in the woodland ecological zone of Ghana?
2. Explore the charcoal value chain highlighting the socio-economic benefits
    a. Who are the main actors in the production and distribution of charcoal?
    b. Which categories of people are the winners and losers in the charcoal value chain?
    c. What are the socio-economic impacts/consequences (beneficial and non-beneficial) of charcoal production?
    d. What are the employment effects of charcoal production in rural economies?
3. Assess the environmental impacts of charcoal production in the Savannah woodland ecological zone of Ghana.
    a. Which tree species are major targets in the production of charcoal?
    b. What are the implications of the choice of specific tree species in charcoal production on biodiversity?
    c. What is the relationship between charcoal production and bushfires in the Savannah ecological zone of Ghana?
    d. How do various actors perceive the impacts of charcoal production on the environment and what solution do they proffer for the adverse effects?
    e. In what ways is charcoal production affecting the health of people in rural communities?
4. Examine the policy and regulatory context of charcoal production and conservation of woodland-ecology.

a. What are the existing policies guiding the production and distribution of charcoal, and how relevant are the existing policies in mitigating the environmental impacts?
b. Which institutions are responsible for monitoring and regulating the production and distribution of charcoal?

1.3. Charcoal livelihoods in developing countries

The increasing demand for charcoal has created the opportunity for non-farming employment opportunity for many rural and urban households in the charcoal value chain (Jagger & Jumbe, 2016; Jones, Ryan, & Fisher, 2016). In rural Africa, charcoal production has become a vital, livelihood diversification strategy (Jones et al., 2016), especially in the context of climate variability and change with its attendant impacts on farming.

The contribution of charcoal production is complex and often underestimated (Eniola, Odebode, & Ayandele, 2018). Charcoal is not only accessible, affordable and reliable energy to nearly 80% of the African population, but it also contributes to national energy balances, supports millions of rural and urban livelihoods through income generation and reduction in dependency of poor households on energy imports (Sedano et al., 2016; Smith, Hudson, & Schreckenberg, 2017; Zulu & Richardson, 2013).

In 2012, over 30.6 million tons of charcoal valued between US$9.2 billion and US$24.5 billion was produced across Africa (Neufeldt, Langford, Fuller, Iiyama, & Dobie, 2015). Charcoal production contributes to economies through tax revenue, income for the poorest people in societies and direct and indirect employment for a large number of people along the charcoal value chain (Vos & Vis, 2010). In Tanzania, the charcoal industry for Dar es Salaam alone generates about US$ 650 million in revenue. In Malawi and Uganda, about UD$ 41 million and US$ 36 million respectively is generated from charcoal production. Charcoal production again contributes US$ 77 million to the economy of Rwanda and about US$ 1.6 billion to Kenya's economy annually (Dam, 2017; Neufeldt et al., 2015; Van der Plas, 2008; World Bank, 2010). An estimated 12 million rural and urban dwellers in Africa will derive some parts of their income from charcoal by 2030 (Mwampamba, Ghilardi, Sander, & Chaix, 2013).

Ghana ranks among the ten top global producers of charcoal (Aabeyir, Adu-Bredu, Agyare, & Weir, 2016) and the highest charcoal consuming country in West Africa (Anang, Akuriba, & Alerigesane, 2011). Charcoal is the primary energy used by urban households, accounting for about 52.6% of the total household energy consumption. The bulk of the charcoal produced in Ghana is from the Savannah woodland ecology and with the Sissala ethnic group from the Upper

West Region of Ghana as the largest producers of charcoal (Agyeman, Amponsah, Braimah, & Lurumuah, 2012). Current estimates are that about 400,000 people who support over one million dependents engage in charcoal production in the transitional forest zone and Savannah woodland ecology of Ghana (Agyeman et al., 2012). Charcoal production is the second most crucial income source for rural households in the forest transition zone of Ghana (Brobbey, Kwabena Lawrence, Hansen, Kyereh, & Pouliot, 2019). Charcoal income is also a critical seasonal income gap-filler and the safety net for several rural households (Brobbey et al., 2019).

For many District Assemblies particularly in the Savannah woodland of Ghana, levies and taxes on charcoal production is an essential source of internally generated revenue (Brobbey, Kwabena Lawrence, Asante, Sampong, Kumeh, & Nketiah, 2015). Charcoal production is a lucrative livelihood option as an improved income source for producers and distributors. More than 2.2 million families depend on charcoal for cooking and heating in Ghana with an estimated 280,000 small-scale processing activities dependent on charcoal as the primary energy source. Additionally, approximately 600,000 small-scale enterprises in commercial businesses such as eateries depend mainly on charcoal for energy (Brefo, Obiri, & Derkyi, 2012). In many urban eateries in Ghana, charcoal offers a cheaper and cleaner source of energy for cooking.

Within the charcoal value chain, direct actors involved are the producers, transporters, traders and consumers. Indirect actors whose actions either help or hinder the production and marketing process of charcoal are also important in the value chain (Kambewa, 2007). The charcoal market provides seasonal and full-time employment for various categories of people in both urban and rural areas. Zulu and Richardson (2013) identify six direct types of jobs in the charcoal value chain, which are large-scale commercial production, casual production, wholesale traders, packaging, transportation, and retail of charcoal.

The differentiation of various actors, however, is, not clear-cut because the same person can perform multiple functions in the value chain, such as the producer doing packaging themselves (Zulu & Richardson, 2013). Chiteculo et al., (2018) also identify three channels through which charcoal reaches consumers. First, the producer (farmer-dependent) sells charcoal to other producers (charcoal-dependent), this usually happens when the producer, that is the farmer-dependent has small quantities of charcoal and cannot afford transportation to the primary market. The second channel is the producer to the transporter, where the producer accumulates a significant amount of charcoal along the roadside and waits for the hauliers to buy them for further transport to bigger markets often in urban areas. The transporter then sells the charcoal to the retailers at the market; the retailers also sell the charcoal to the final consumers in smaller quantities. The last channel is the producer to consumers where the consumers buy directly from the producers in the villages.

The direct actors of charcoal production in Ghana are the producers, merchants, transporters, wholesalers, and retailers. The producers are often small and medium scale on either subsistence or purely commercial basis, and they usually use traditional technologies. Truck dealers, roadside dealers and market women typically play the role of intermediaries, and they are the leading distributors of charcoal. Supply from producers to the sellers at charcoal depots and individual sales points are in the urban centres as charcoal consumers such as schools, individual households, food processors and food vendors. However, the intermediaries sometimes supply directly to exporters and export production goes to the European markets mainly United Kingdom, Belgium, Italy, Netherlands and Germany (Agyei, Hansen, & Acheampong, 2018; Obiri, Marfo, Nutakor, Cobbinah, & Treue, 2011; Obiri, Nunoo, Obeng, Owusu, & Marfo, 2014).

CHAPTER 2: STUDY AREA AND METHODS

2.1. Profile of the Gonja area

The Gonja area covers 9,700 km^2 in the Savannah Region and has the largest kingdom and traditional area in Ghana. Known as the Ngbanye, the Gonjas speak Ngbanyato. The overlord of the Gonjas is the Yagbonwura, supported by five sub-chiefs called *Bewura*. The Wasipe-wura, in whose jurisdiction this research took place, rules the Wasipe traditional area with Daboya as both the traditional and administrative capital. The Wasipe traditional area is one of the five major divisional areas in the Gonja Kingdom (the other divisional areas are Kpembi, Bole, Kusawgu and Tuluwe). The sub-chiefs under Wasipe-wura are eighty (80) in number, with Yazori-wura, Gbengben-wura, Mun-wura, Garima-wura serving as the council of elders and advisers to the overlord (GSS, 2014c).

With a hierarchical system of governance, the chiefs are selected on a rotational basis starting from the village chief with the paramountcy rotating among five 'gates' – Wasipe, Kpembe, Bole, Tuluwe, and Kusawgu (Barker, 1986). Akulongwura – sub-chiefs are those eligible to become the paramount chief, and they are selected from seven sub-chiefs (Bewurbi). The sophisticated chieftaincy system in the Gonja area plays a central role in the organisation of livelihood activities. As will later be discussed, the complexity of chieftaincy has a direct implication on the organisation of charcoal livelihoods in the study communities. Below is the profile of the study districts.

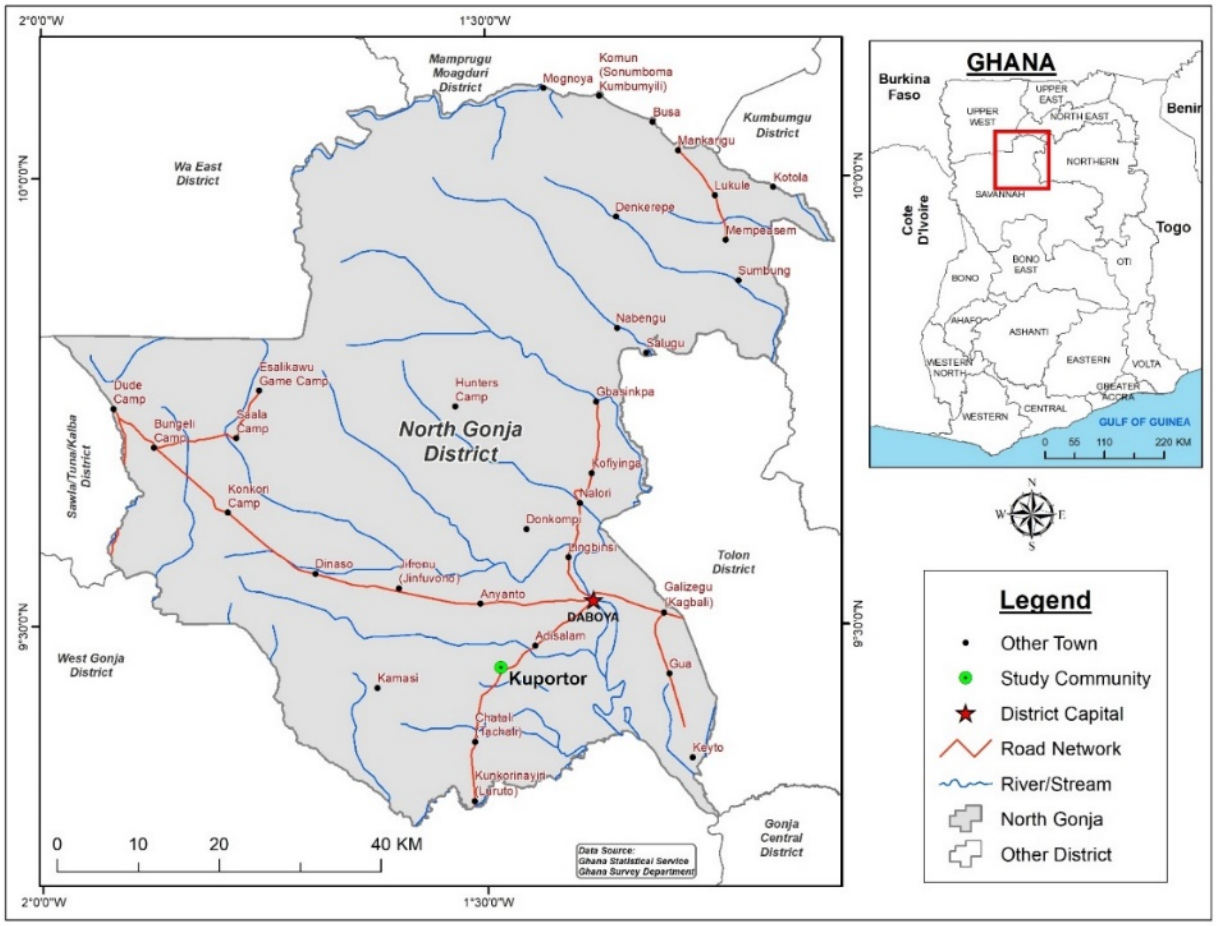
2.1.1. The North Gonja District

The North Gonja District has a population of 43,547 constituting 1.8% of the region's total population and expected to reach 56,377 by 2020 (GSS, 2014c). The men constitute 49.6% of the population, while women are 50.4% of the population. A mainly rural district, (85.0%) the fertility rate in the district is 5.3, with a crude death rate of 6 per 1000. The district has migrants from other parts of the country as well as outside the country.

The North Gonja District is on longitude 1^0 5^1 and 2^0 58^1 West and latitude 8^0 32^1 and 10^0 2^1 North. It shares boundaries with West Gonja and Wa East districts to the West, Central Gonja to the South, Tolon District to the East and Mamprugu-Moagduri and Kumbungu districts to the North. The mean annual rainfall is between 1000mm and 1500mm with highest recordings occurring from July to September. Dryness starts from October, with intensity occurring between March and April. The district has a high temperature, with mean annual temperature ranging from 27.4^{0}C to 35^{0}C. The temperature in the district is high during the dry season and low during the harmattan season (GSS, 2014c).

Like other districts in the region, the vegetation of North Gonja is Guinea Savannah. However, in recent times, the vegetation cover of the district has been greatly affected by human activities such as farmland clearance of vegetation, shifting cultivation, illegal lumbering, and charcoal production. The dominant tree species are shea nut, cashew, baobab, dawadawa, neem, and ebony. The shea nut and butter making process is a source of employment and income generator for most women who pick the nuts and process them into shea butter. Trees in the district are generally dispersed; however, the valleys have dense trees and woodlands (GSS, 2013). Some of the crops cultivated are millet, sorghum, maize and groundnuts. Yam is also highly grown in the district, especially in Bawena, Yazori, Kpulimbo and Anyanto (GSS, 2014c).

Figure 1: North Gonja District Assembly



Source: Prepared by RS/GIS Lab, Department of Geography, University of Ghana

Topographically, the North Gonja District is undulating with an altitude between 150-200 meters above sea level. The district has outcrops of weathered rocks around Daboya. The White Volta River is the major river that flows through the district although there are other streams such as Tarchali and Tari, which are essential for irrigation and fish farming (GSS, 2014c).

Agriculture is the main economic activity in the district. The arable lands in the district foster crop farming, with the grasslands serving as feeding grounds for cattle. Smock weaving and

trading is another economic activity in the district. There are also salt deposits in the district, which is usually mined in the dry season. Employment in the district is mainly informal. The private informal sector employs 98% of the economically active population. The public sector and formal private sector employ one per cent each of the employed population of the North Gonja District (GSS, 2013).

2.1.2. The West Gonja District

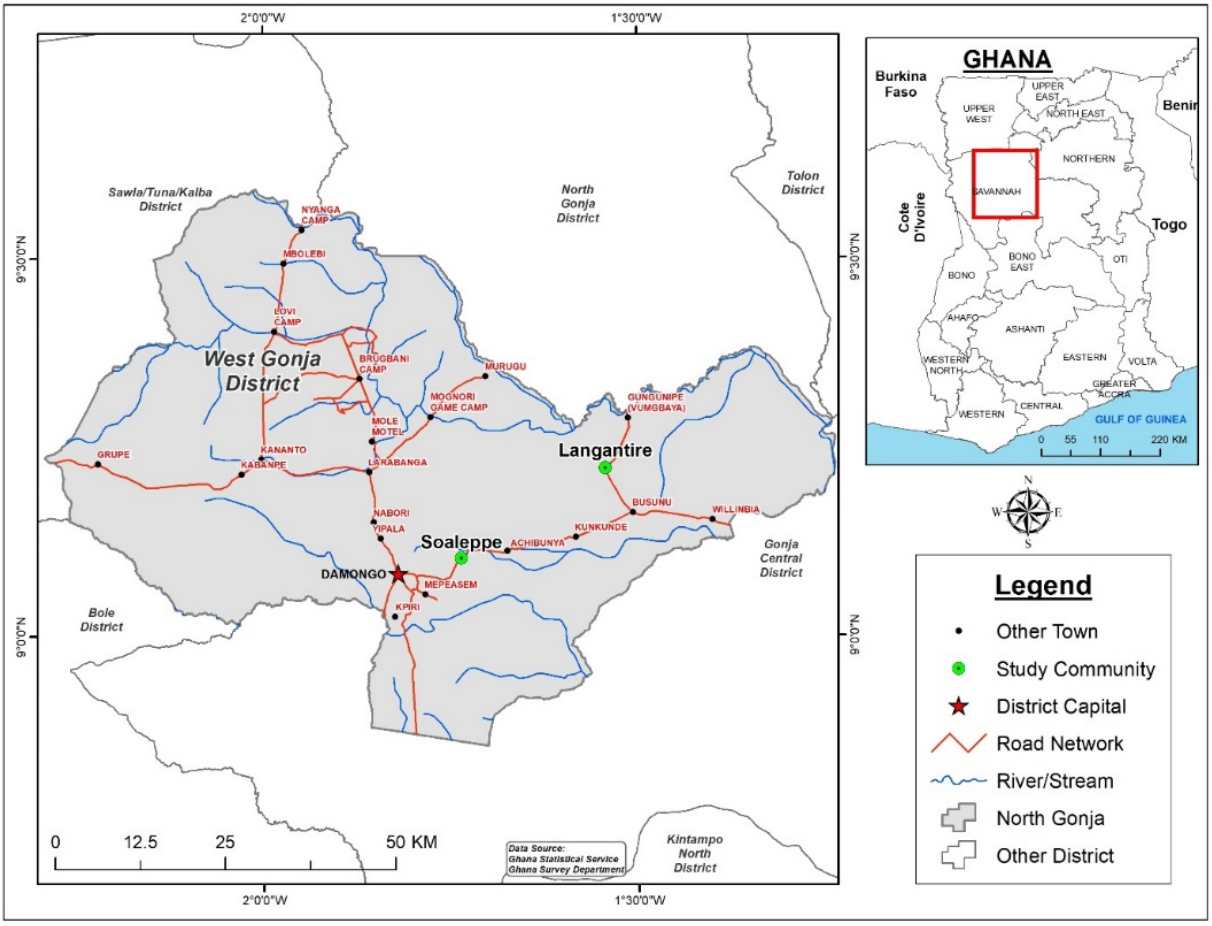
The West Gonja district, with its capital at Damongo, has a population of 41,180 (GSS, 2010), but expected to reach 52,911 by 2020. The population density in the district is 8.3 persons per km^2, below the regional population density of 25.9 persons per km^2 (GSS, 2014d). The district has a youthful population with 42.9% of the people aged below 15 years, 53% aged 15-64years and 4.1% aged 65 and above.

The urban population constitute 51.50% of the district population, mostly in Damongo and Laribanga. Nevertheless, more generally, most communities in the district are sparsely populated and are farm settlements, where people move in and out per the season (GSS, 2014d). West Gonja District is on longitude $1^0\,5^1$ and $2^0\,58^1$West and latitude $8^0\,32^1$ and $10^0\,2^1$ North and shares boundary with Tamale to the West, Central Gonja District to the South, Wa East District to the North-West, Bole and Sawla-Tuna-Kalba Districts to the West and North Gonja District to the East. The total land area of the district is 4715.9 km^2 (GSS, 2014d).

The district has an undulating topography with an altitude between 150-200 meters above sea level. The White Volta serves as the boundary at the East of the district (GSS, 2014d). Rainfall is bimodal with the average annual precipitation of 1,144mm. Like many parts of the Savannah Ecological Zone, the vegetation cover in West Gonja is Guinea Savannah. The soil type of the area highly influences this vegetation cover. However, human activities (farming, lumbering, charcoal production) is altering the nature of the vegetation in the district. Tree spices such as baobab, dawadawa, acacia, neem and ebony are dominant in the district. The district has a generally dispersed tree with some dense vegetation and woodlands in the valleys. The area is suitable for crops such as millet, sorghum, maize and groundnuts (GSS, 2014d).

West Gonja has twenty-two ethnic groups and the dominant groups in order of size are Gonja, Gruni, Dagaaba, Hanga, Kamara, Tampulma, Vogla, Dagbamba and Mamprusi. The economically active population of the district (15 years and older) make up 63.4% of the population. There is seasonal unemployment, which is associated with farming in the district (GSS, 2016). About 60.5% of the employed are engaged in agricultural activities. The major industries in the district are agriculture, forestry and fishing (60.5%), manufacturing (10.1%) and wholesale and retail, repair of motor vehicles and motorcycles (9.6%) (GSS, 2014d). Private informal sector constitutes the more significant segment (87.1%) of the economy in the district.

Figure 2: West Gonja District Assembly



Source: RS/GIS Lab, Department of Geography, University of Ghana.

2.2. Data collection

2.2.1. Pre-fieldwork activities

The pre-field related activities undertaken include the review of the existing literature, design and pre-testing of the instruments. The two main research instruments, i.e. questionnaires and interview guides, were pre-tested to determine whether they are fit for purpose. Through this process, questions were fine-tuned, while critical questions that were missing included. Based on inputs and feedback from respondents, the instruments were revised to ensure they adequately capture the spectrum of issues addressed by the objectives.

The next pre-field activity was the training of our research assistants. The first part of the training included a detailed explanation of the scope and purpose of the research to ensure that the research assistants clearly understood the research goals. The second component of the training

entailed inputting the questionnaire into the CAPI software for data collection and management. After uploading the questionnaire in the software, we trained the research assistants on how to use the software, manage the data, synchronise, and protect the data.

Before the fieldwork, the research team conducted a preliminary visit to all study communities to be acquainted with the field and to seek permission from the community chiefs, elders and opinion leaders for consent to collect data. The research team explained the purpose of the research, the type of data collected and the use of the data.

2.2.2. The main fieldwork

The three communities studied are Langatire, Soaleppe (West Gonja District) and Kuporto (North Gonja District) of the Savannah Region. These three communities are the charcoal production hotspots in the Gonja area. Located along major roads in the Savannah Region, the study communities are ideal for charcoal producers as they easily transport the charcoal to urban markets. While Langatire and Soaleppe are old charcoal producing areas, Kuportor has emerged as the new frontier for charcoal production. The fieldwork took place between January and March 2020. Interviews, focus group discussions, observations and a survey were the methods of data collection.

2.2.3. Qualitative Interviews

The interviews explored the growing importance of charcoal, environmental and health impacts of charcoal production, as well as the relationships between charcoal production, farming and herding. The key informants interviewed include chiefs and officials of the district assembly. We conducted both formal interviews (using a structured interview guide) and informal interviews (informal discussions and conversation with people in the study communities).

These informal discussions proved useful in gaining an overview of perceptions and experiences of community members regarding how charcoal production has shaped lives and social relations in the villages. The formal interviews were recorded using audio recorders with the permission of interviewees while the informal interviews were recorded in field notes. Table 1 below is a summary of the categories of actors interviewed and the issues broached.

We transcribed the interviews recorded using the voice recorders. Based on the research goals, we designed a table with the various themes of the research in different columns. The researchers then read the interview transcripts and the views of respondents placed under appropriate topics on the table.

Table 1: Categories of respondents and issues discussed

Categories of respondents	Focus
Charcoal producers	Acquisition of concession for tree harvesting, charcoal production process, benefits, and challenges
Charcoal dealers	Business strategies, networks, challenges faced
Community leaders	Land tenure and charcoal production, agriculture and environmental change, socio-economic importance of charcoal production, regulation of charcoal activities
Environmental Protection Agency	Overview of charcoal production in the study communities, environmental impacts of charcoal production, regulation, and licensing regimes
District Coordinating Director	Overview of charcoal production in the study communities, environmental impacts of charcoal production, regulation, and licensing regimes
Environmental NGO	The focus of NGOs activities, advocacy, and training

2.2.4. Focus Group Discussion (FGD)

Another essential data collection method was focus group discussion FGD, which provided the researchers with the opportunity to bring together the research participants to discuss critical issues regarding charcoal production. We organised four (4) FGDs including those for community leaders, men only, women only and mixed-gender charcoal producers.

The FGD was useful in gaining a general overview of charcoal production and perception and experiences of people. The FGDs were central in further exploring some of the issues identified in the individual interviews. The FGDs were first organised for men and women separately to create the atmosphere for the different categories of people to express their views freely. Taking into consideration, the study communities are patriarchal; separate FGDs minimised the potential power asymmetry, which can emerge between men and women in a group. By first organising separate FGDs, we ensured that women were able to express their views without any inhibition. Additionally, it allowed us to observe if the views of people on issues will remain the same if men and women are brought together.

After the men and women only exclusive FGD, a mixed FGD was also organised, bringing together men and women to discuss key issues identified. The combined group discussion provided us with the opportunity to gain an understanding of how group dynamics can shape people's views and concerns they consider essential. The mixed group interview was useful in weighing participants' view on the gendering of charcoal livelihoods, and the distribution of costs and benefits of charcoal production. Finally, we also held an FGD with the community leaders who also throw more light on land rights, conflicts, and overall reconfiguration of livelihoods because of charcoal production. The FGDs enabled respondents to contest each other's opinions and perspectives on charcoal production, ensuring the elimination of exaggerated claims and factually inaccurate assertions from the data.

2.2.5. Observations

The observation method was essential for collecting data on charcoal livelihoods in the Gonja area. The research team visited charcoal production sites to observe the charcoal production process, state of charcoal producing communities and how charcoal production is affecting vegetation. Field observation was an essential part of the research process as it provided the research team with the opportunity to connect the dots that emerged from the interviews, surveys and FGD. The research team took transect walk to have a general view of how people live and relate in the communities. We also took pictures of various activities, showed to respondents for clarification, and this aided our understanding of the issues.

A significant challenge with the observation and interactive activities was the scepticism and suspicion of community members regarding the intent of the research team. Charcoal producers face harassment from some public officials hence their doubt. There have also been increasing tensions between farmers, charcoal producers, and other actors in the community. For instance, during one of the walks in the study community, the research team met a group of people loading charcoal unto a vehicle. After interacting with some of them and got their permission, we took pictures. Still, some members of the group became aggressive despite their colleagues explaining that they permitted us to take the photo. We, therefore, deleted the pictures. They told us that they face constant harassment; hence, they do not want to deal with anyone who would take a photo of them.

2.2.6. The Survey

The survey was conducted in the three study communities. In all, 200 questionnaires were administered with 71 in Kuportor, 58 in Soaleppe and 71 in Langatire with 55.5% of the respondents being male and 45.5% being female. The distribution of the sample is proportional to the size of the village's population. A simple random sampling was used to select respondents, which include charcoal producers and non-charcoal producers. A semi-structured questionnaire was used to collect the data on respondents' sociodemographic information, livelihood activities, experiences, expectations, and effects of the charcoal business in the communities. The questionnaire was inputted into the CAPI software on tablets, which were used to record responses. The data recorded is synchronised daily and stored in the cloud. After the data collection, the responses were downloaded into SPSS, cleaned, and analysed. The survey data are presented as descriptive statistics such as tables, charts and graphs.

CHAPTER 3: FINDINGS

3.1. Sociodemographic characteristics of study communities.

In this section, we present the sociodemographic features of the population studied. Table 2 below shows the sociodemographic characteristics of the three communities.

Table 2: Sociodemographic characteristics of study areas.

Variable	Kuportor	Soaleppe	Langatire	Overall
Gender (%)				
Male	66.2	37.9	59.2	55.5
Female	33.8	62.1	40.9	44.5
Average household size	6.8	7.7	9.0	7.9
Average number of children in each household	2.7	4.2	3.7	3.5
Average number of Adults in each household	4.1	3.5	5.2	4.3
Average Length of stay in the community (Years)	10.2	20.4	24.9	18.4
Religious Affiliation (%)				
Christian	11.3	1.7	12.7	9.0
Muslim	88.7	96.6	87.3	90.5
No religion	0.0	1.7	0.0	0.5
Highest level of education completed (%)				
None	66.2	84.5	76.1	75.0
Primary	14.1	8.6	12.7	12.0
Basic	19.7	6.9	11.3	13.0
Main occupation (%)				
Farming	19.7	56.9	35.2	36.0
Trading	4.2	1.7	1.4	2.5
Charcoal business	70.4	41.4	60.6	58.5
Other specify	5.6	0.0	2.8	3.0
N	71	58	71	200

Overall, men constitute 55.5% of the respondents while the women make up 44.5%, which is not a significant departure from the district population structure, where the North Gonja District has 49.6% men and 50.4% women. In comparison, West Gonja has 50.2% men and 49.8% women based on the 2010 population census (GSS, 2014a, 2014b).

Islam is the dominant religion in the Gonja Area (GSS, 2010) and thus, not surprising that over 90% of the respondents in the study communities are Muslims. Generally, illiteracy is high in the study communities, with 75% of the respondents without any form of education. Illiteracy is high (66.2%) in Kuportor, but relatively lower than the North Gonja District level of 75.1% (GSS, 2014a). In Soaleppe and Langatire on the other hand, the illiteracy rate of 84.5% and 76.1% respectively are higher than the average for the West Gonja District which is 47.7% (see GSS, 2014b).

Concerning employment, 58.2% are in the charcoal business, 36% in farming and 5.8% in trading and other economic activities. Although agriculture remains an essential livelihood, charcoal is

gaining ground as a critical income source that complements farming. Many people in the study communities are economically active with most of them being self-employed in the informal sector. The dominance of the informal sector reflects the structure of the Ghanaian economy where most of the country's population is engaged in the informal sector either as self-employed or working in a Small and Medium Scale Enterprise (SMEs).

3.2. Sissala Migration and charcoal production in Gonjaland

The Sissala's are Gur-speaking people and part of the Grune/Grunshi ethnic group in the Upper West Region of Ghana. The Sissala hail from Tumu and Gwollu areas of the Upper West Region. A largely agrarian society, the Sissala ethnic group are the leading charcoal producers in Ghana (Agyemnag, Amponsah, Braimah, & Lurumuah, 2012).

According to Obiri et al. (2014), Sissalas are the most efficient charcoal producers in Ghana. Their production is, however, not limited to the Savannah woodland ecology but across Ghana. In the forest zone, for instance, Obiri et al. (2014) and Lurimuah (2011) observed that Sissala men dominate large-scale charcoal production sector. In the Kumasi Metropolis, Lurimuah (2011), notes that Sissala women in the timber processing enclaves rely on sawmill and carpentry wood residue to produce charcoal on a small scale for sale.

In the forest transition zone and the woodland ecology of Ghana, charcoal production makes up 80% of the Sissala livelihood. Described as 'nomadic' charcoal producers (Agyei, Hansen, & Acheampong, 2020) the Sissalas migrate and settle in small communities where they access concessions of vegetation for charcoal production. Once the trees are exhausted, they migrate to new production centres.

The migrant Sissala producers work in teams ranging from four (4) to more than fifty (50). In the Gonja area, the Sissalas constitutes the large-scale charcoal producers who migrate to different villages based on the availability and accessibility of wood for charcoal. The Sissala charcoal teams consist of family and friends, usually led by the eldest, who is also the most experienced among them. Majority of the Sissala charcoal producers in the study communities are second-generation charcoal producers who learn the trade from their parents. As a 25-year-old, Sissala charcoal producer notes:

> *'I learnt the charcoal job from my father. I use to follow him in the Ashanti Region where we produce charcoal. Once I have learnt the trade enough, I form my gang* [team], *and now we are operating here* [in the Gonja area]*.'*

Knowledge of the charcoal business is acquired through an apprenticeship where younger Sissala follow experienced members of the ethnic group across the country, producing charcoal. Following years of working with a team and acquiring relevant knowledge on the dynamics of

the charcoal trade – the negotiation of access, conflict management and developing the appropriate networks, Sissala youths start their charcoal production teams usually with friends.

Before the arrival of Sissala charcoal producers, communities in the Gonja area produce charcoal but usually on a small scale from wood gathered after clearing the land for farms. According to respondents, the Sissala producers transformed and commodified charcoal production in the communities. As a female charcoal producer noted,

> *'for the charcoal, is the Sissala who used to engage in it, so after they have packed it into sacks and left, we go there to search if at least we can get something small for the house and sometimes we do get enough and sell.'*

Previously, the women simply collect smaller pieces of charcoal that the Sissala producers leave after production. The women gather these little pieces of charcoal and sell in sacks along major roads in the district. Nevertheless, after gaining a better understanding of the economic value of charcoal production, many women have also joined the charcoal production livelihood on small-scale basis. Thus, the migration of the Sissala is key to the diffusion of charcoal production and trading.

3.3. The importance of social networks for Sissala charcoal livelihood

The movement of Sissala charcoal producers is embedded in complex systems of relations that facilitate their entry into communities and access to wood for charcoal. There exists an intricate socio-spatial relationship among charcoal producers, transporters, traders, traditional authorities, state institutions and charcoal consumers.

Although charcoal production entails the same process of harvesting and carbonisation of wood, the production process and outcomes are socio-culturally and spatially embedded. The charcoal livelihoods are embedded in political, kinship and religious institutions in the Gonja area. The organisation of the charcoal business by the Sissala in the Gonja area can be explained using three systems of exchange, i.e. reciprocity, redistribution and market exchange (Polanyi & Maclver, 1944). These systems of exchange entail rules, conventions and discourses on the species of trees that can be harvested, the prohibition on dawadawa and shea and areas where charcoal production is permitted.

The Sissala rely on social networks to identify areas with adequate trees and access for charcoal production. Granovetter (2005) argues that social networks affect economic outcomes by influencing the quality and flow of information, providing a source of reward and punishment and trust building in any economic relation. Many of the Sissala in the Gonja area rely on various forms of social networks to identify lush woodlands and negotiate access to produce charcoal.

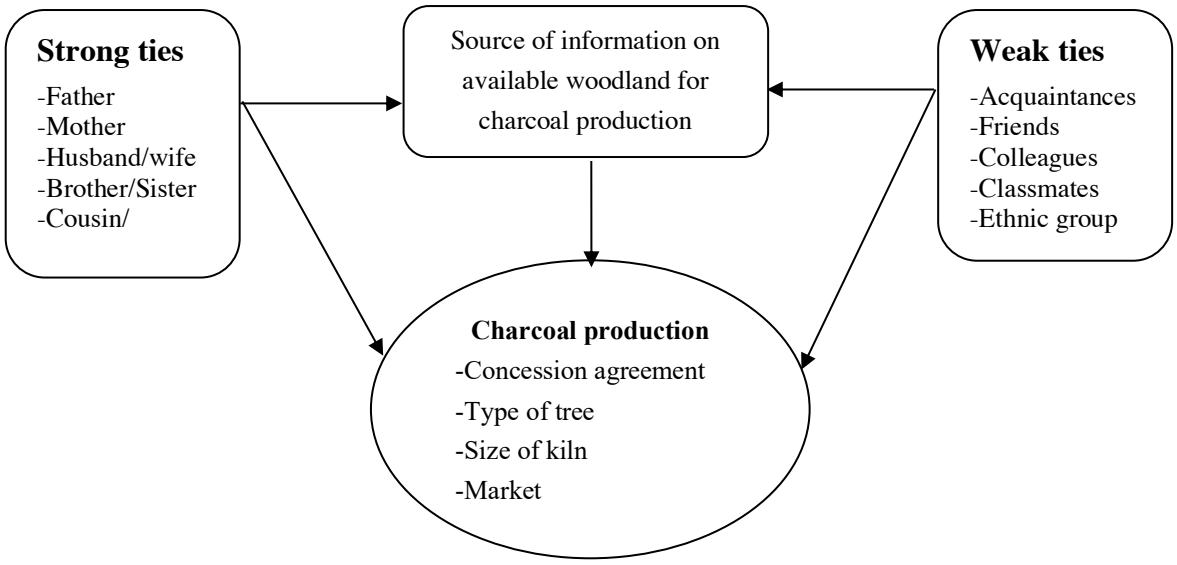


Figure 3: A Conceptual Model of Social Networks in charcoal production: Strong and Weak Ties
Source: Author's model based on Granovetter (1995)

People's network branches out from them to their close associates, to society and beyond (Prell, 2012). A person's social network may include neighbours, kin, schoolmates, work associates and members from the same ethnic group. The structure of social networks, i.e. the nature and content of links in social networks, are essential for successful participation in the charcoal value chain. The charcoal production process and distribution harness and depend upon existing patterns of social relations or social networks in the woodland ecology of Ghana.

The Sissala charcoal producers rely on their strong and weak ties in navigating the labyrinth of charcoal business. The concepts of strong and weak ties classify and analyse the strength of social networks. The weak links entail people's acquaintances or low-density network where they are less likely to be socially involved with one another than close ties such as family which constitutes their strong ties/high-density network'(Granovetter, 1983, 1985). The charcoal production teams are composed of strong ties such as family members and close relatives and friends from the same Sissala village. Working together for an extended period has fostered trust between them and clearly define the roles for each member, which makes the production process efficient. However, as migrants, the Sissalas rely on the weak ties, which are non-Sissala friends and acquaintances such as the community liaison person to secure entry into a village as well as negotiate access to wood for production. The strength of the weak ties in the social network is that they provide an essential conduit for Sissala charcoal producers to not only gain access but also cope with the complexities of land tenure and cultural differences.

> *'Before we came here, my brother contacted someone he knew in the village. This man introduced us to the chief so that we can get the trees for charcoal. Any time we have any problem in the bush, my brother tells him, so he informs the chief for us.'* ***(Sissala migrant, Kuportor).***

Indeed, the critical role of the Sissala migrants in the Gonja area also entailed training the indigenes on the production process. As participants in the FGD in Kuportor observed,

> *'We* [indigenes] *don't know much about the charcoal business; what we do is to assist the Sissala in the business. Sometimes if we want to burn charcoal, we do call them for assistance and pay them afterwards.'*
>
> *'We the Sissala created employment for the people of Kuportor.'* ***(Sissala charcoal producer, FGD)***

Some Gonjaare part of the Sissala charcoal production teams; as a result, they have gained a better understanding of the organisation of the charcoal business. For the Sissala, the presence of a Gonja on their team, especially those who hail from the villages makes it easy for them to gain access to concessions for charcoal production. The collaboration between Sissala producers and Gonjas serve the dual purpose of easy access to concessions and conflict management on the one hand, and the transfer of knowledge and team-building skills to the Gonjas on the other.

3.4. Negotiating access rights to trees for charcoal

Charcoal production is organised around a complex array of actors who play diverse roles. The categories of actors involved underpin the scale of charcoal production. The community leaders within the Gonja traditional area are the smallest and lowest level of traditional administration. Charcoal production cannot take place in a community without prior approval by the community leaders. The community leaders led by the village chiefs (Bewurbi) within the Gonja traditional set up represent the overlord at the micro-level within the hierarchical traditional governance system of the Gonjas. Royalties for charcoal produced are shared along with the chieftaincy hierarchy.

Table 3: Source of trees for charcoal production

Variable	Kuportor	Soaleppe	Langatire	Overall
% of respondents who harvest trees from				
Own land	7.0	15.5	16.9	13.0
Family land	7.0	3.5	1.4	4.0
Communal land	64.8	77.6	76.1	72.5
Purchase from others	14.1	1.7	2.8	6.5
Other specify	7.0	1.7	2.8	4.0
N	71	58	71	200

As shown in Table 3 above, most of the charcoal (72.5%) is produced from common access areas, which reflect the communal land tenure system of the Gonjas. The 13% of respondents who produce the charcoal from their lands are mainly farmers who have the user rights to parcels of either communal or family lands.

A key player in the access negotiation process for charcoal production is the community liaison persons. The liaisons are usually community members or immigrants who have settled in the community for a long time and have functional networks and relations with the community leaders. The community liaison facilitates concession acquisition process for charcoal production. Particularly for Sissala migrants, they rely on these liaisons to access trees for charcoal production. The contacts are responsible for negotiating the terms of concession access. They also function as mediators of conflicts that arise between charcoal producers and landowners.

From Table 4 below, 42% of the respondent access wood for charcoal production through community chiefs while 8% seek permission from the district assembly but must still obtain permission from the traditional leaders to produce charcoal. In Langatire, 80.3% of respondents do not pay for the wood harvested from common access areas.

With a significant proportion of the charcoal produced from communal lands, the traditional institutions play critical roles in granting access to concessions for charcoal production. According to a Sissala charcoal producer, any time they go to a new community to produce charcoal; they send '*sheep and fowls to acquire the land. The fowl is slaughtered to see whether the gods accept my request or not.'*

Table 4: Means of accessing trees for charcoal production

Variable	Kuportor	Soaleppe	Langatire	Overall
% categories of people who grant access to trees in common access areas				
Paramount Chief	23.9	0.0	1.4	9.0
Chief of community	52.1	58.6	18.3	42.0
Sub chief	1.4	0.0	1.4	1.0
Family Head	1.4	0.0	0.0	0.5
District Assembly	18.3	0.0	4.2	8.0
Other specify	25.4	1.7	11.3	13.5
% of people who do not pay for the wood harvested from common access areas for charcoal production	23.9	39.7	80.3	48.5
N	71	58	71	200

Following the performance of the necessary customary rites, they are granted the concession to exploit for trees for charcoal production. However, no payment is made before the start of charcoal production. According to the chief of Kuportor:

> *"Nothing is paid at the beginning of acquiring the land for charcoal business, and you only pay when you have your sacks of charcoal and this payment are made to Waspiewura and me. Waspiewura always has the highest amount. In addition, because of the reduction in vegetation, they now work in the other neighbourhoods. After production, the charcoal is packed in the village, and the agreed amount is paid to us when they load the trucks. Initially, they paid GH₵ 500, the Wasipei wura gets GHC 300, and we the village chiefs get GH₵ 200. But because the work is now concentrated in the neighbouring community if they come here to pack they still pay the Waspeiwura GHC 500 because he owns all the land and gives me GH₵ 100 for taking care of it".*

Charcoal producers can harvest the trees and only pay after the charcoal is ready for the market. This arrangement is useful because it reduces the production cost for the Sissala migrants. Critically, such an agreement ensures that charcoal producers avoid payment for charcoal that is damaged. For instance, in some cases, the charcoal may burn into ash, and producers lose, as such, payment to landowners is proportional to the quantity of charcoal produced.

The payment for charcoal produced from communal lands follows the chieftaincy hierarchy as outlined by a Sissala charcoal producer below.

> *"In the Ashanti lands* [Ashanti Region] *we buy the trees but here [in the Gonja area] we don't buy the tree. When you come to tell the chief of your purpose in that community, then when he agrees [for you to produce the charcoal], you only pay Asase tuo to him after each production of charcoal. When I load a Kia Rhino vehicle, I pay GH₵300 to the community chief and GH₵300 to the Daboya chief. When I pay to the chief of Daboya he gives a receipt indicating that the charcoal is produced on his land. When transporting the charcoal and I get to Buipe, and the police stop me, when I show them the Daboya chief's receipt, they allow me to go."*

In addition to payment made to the village chiefs, charcoal producers must pay several other local taxes. Local taxes include the amounts to the various Gonja chiefs following their hierarchies. The village chief receives both his charges and that of the Daboya chief (Bewura) who is a higher authority. The village chief then issues a receipt to charcoal producers on behalf of the Bewura. The receipt from the chief is needed for a charcoal producer to exit Gonjaland as they are inspected at police checkpoints in the Gonja area. According to respondents, no one without receipt from the Bewura can exit the Gonjaland with charcoal trucks.

Charcoal produced from a farmer's land does not require any negotiation with the chiefs, but the chief must know their entry into the community. The Sissalas negotiate directly with the farmers, and once the terms of production are agreed, they move in to produce. Usually, charcoal produced from farms is shared, taking into consideration production costs such as cutting of trees, packing, kiln making, and bagging of charcoal. While migrants must necessarily seek permission from the traditional leaders to produce charcoal, indigenes of the communities do not require approval to produce the charcoal. However, indigenes must pay royalties to the chiefs after production, and before they transport it from the Gonja area, a view echoed in the extract below.

> *"If you are an indigene, you don't have to seek permission because the income you generate leads to the development of the community. Nevertheless, migrants are to seek permission from the chief before cutting. Migrants have to seek consent from the chiefs. You must, first, send cola nuts for him to permit you. Afterwards, the chief would tell you the number of bags he would take from you. It may sometimes be in monetary terms say pay GHC 200 per 100 bags produced."* ***(Sissala charcoal producer, Kuportor)***.

Thus, while Gonjas have access to vegetation on communal lands for charcoal production, it is a matter of courtesy for them to inform the village chief about their activities. This is to ensure that the concessions are not awarded to Sissala producers that can result in conflicts. The access rights and negotiation processes are linked to the informal institutional structures in the production areas. As the Sissala move from one traditional area to another in the West African sub-region, they adapt to the socio-cultural context of their host communities to gain access to vegetation for charcoal production.

3.5. Charcoal production process and technology

Following the concession acquisition, the trees are harvested and packed. Earth kiln is the primary technology used in the charcoal production. After the wood is packed, it is covered with grass and soil to trap the smoke and ensure proper carbonisation. The grass also prevents soil from entering the kiln, which will extinguish the fire. The kiln is then covered with soil to prevent oxygen from entering it. They then lit a small opening where the wood is exposed which is also later covered with grass and soil once the wood is adequately lit. A charcoal producer at Kuportor described this process:

> *"During our fathers' times, they were using axes, but everyday things keep on changing so; currently, we use doman machine* [chainsaw]. *I cut the trees down and cut them into sizes I can carry, but if I think I cannot cut them then I look for some people to help me then they cut them into sizes I think I can carry."*

The charcoal production technology has not changed substantially over the years. From the extract above, the only technology that has changed is the change from the use of axes to cut trees, which is slow and tedious compared to the use of chainsaws, which makes it easy for them to harvest the wood.

Plate 1: Charcoal kiln and charcoal spread to cool

Source: Fieldwork 2020

According to a producer:

> *"The trees are cut from the farm into logs. The logs are packed with the bigger ones at the bottom and the smaller ones at the top. Leaves or grass and sand are used to cover the packed woods respectively for it to be lit. The leaves/grass are mostly dry because fresh leaves and wet sand can delay the burning or might quench the fire. A hole is created on the kiln to aid in the burning of the logs buried. This is then left for two or three weeks to burn and after it is thoroughly burnt, a stick is used to create holes in the leaves to allow the sand to penetrate which will then put out the fire completely. After that, the charcoal is then packed into sacks for sale"* ***(Charcoal producer, Langatire).***

The charcoal producers pitch camp (see Plate 4) in the bush to provide around the clock monitoring of the kiln to allow for proper carbonisation and cover up any opening in the kiln that can allow oxygen to enter the kiln and destroy the charcoal. Small kilns burn in a few days while larger kilns can take two or more weeks to burn completely.

*Plate 2**:** Packed charcoal and truck loaded for the market*

Source: Fieldwork 2020

When the wood is completely carbonised, it stops producing smoke and charcoal producers use long sticks to poke holes into the kiln. These holes allow the sand used to cover the kiln to sip into the kiln and start the process of putting out the fire. The poking of the hole is repeated until the kiln completely collapses and is filled with the soil. When they completely put off the fire, the charcoal is spread to cool. For larger kilns, the charcoal is divided in series of a grid into smaller portions while it cools. This ensures that in cases where the charcoal catches fire, it will not destroy everything but only the charcoal in the quadrant that caught fire. The charcoal is then packed into sacks and is ready for transportation to the market.

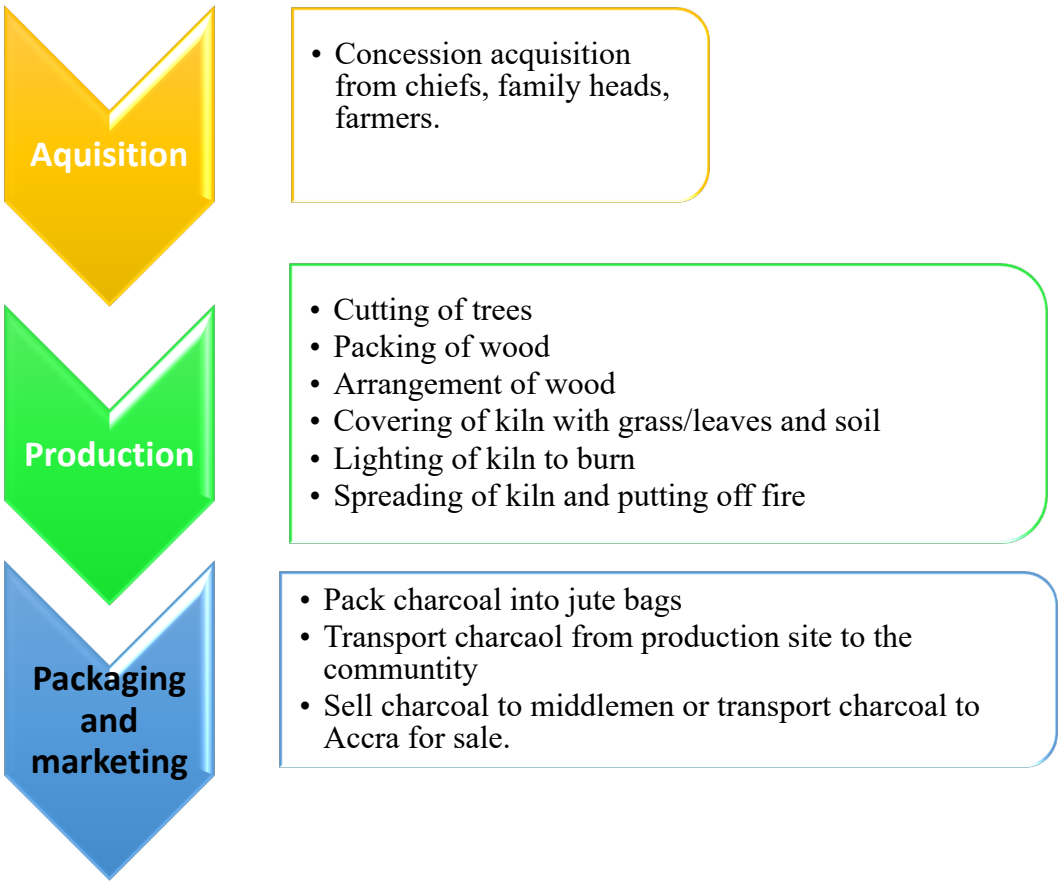


Figure 4: The charcoal production process

3.6. Charcoal production as source of livelihood and employment

Charcoal production has become a significant source of income and employment for both migrants and indigenes in the Gonja area. In this section, we examine the contribution of charcoal to the livelihoods of different socio-economic groups. From Figure 5 below, among those involved in charcoal related livelihoods, 94% are charcoal producers. There are very few people engaged exclusively in wood harvesting. The charcoal producers harvest the wood, are responsible for all production and marketing processes. The 22% who are charcoal dealers are intermediaries who purchase the charcoal from small-scale producers in the Gonja area. Majority of the intermediaries are women mainly from the Ashanti ethnic group.

The majority (68.5%) of the respondents consider themselves small -scale producers (see Table 5) because, apart from Sissala migrants who engage exclusively in charcoal production, many respondents combine charcoal production with farming and other activities and hence a large number of small scale producers.

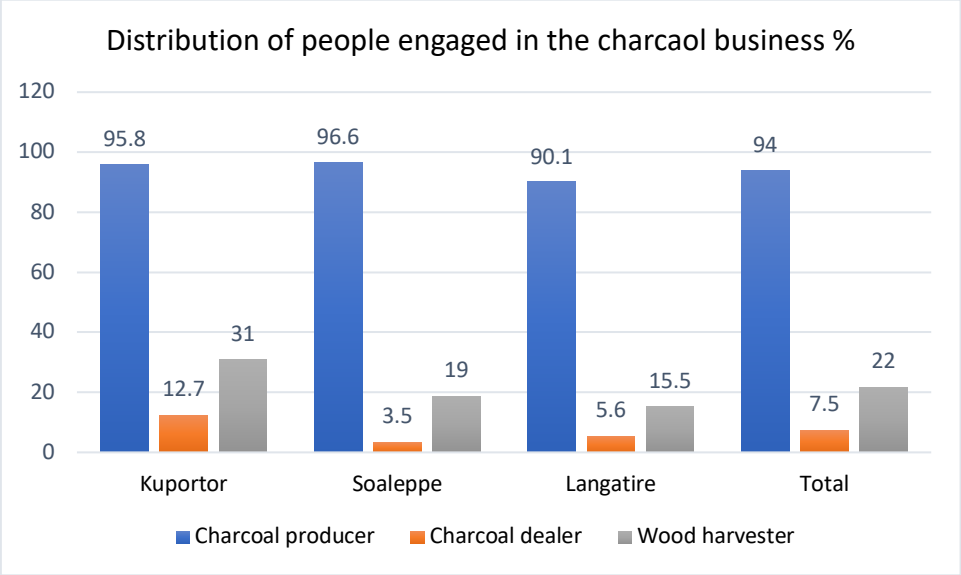


Figure 5: Distribution of people engaged in the charcoal business

The average number of sacks produced in the previous year are 931, 303 and 383.1 in Kuportor, Soaleppe and Langatire respectively. While Langatire and Soaleppe are old charcoal production communities with depleted trees, Kuportor is further into the woodlands with many more trees, albeit declining as big producers have started moving to communities. The availability of woodlands determines the movement of migrant Sissala charcoal producers. Soaleppe and Langatire were the main production areas initially, and once the preferred trees in charcoal production dwindled, the charcoal producers moved further away from these villages, a practice similar to shifting cultivators.

Table 5: Scale of production

Variable	Kuportor	Soaleppe	Langatire	Overall
The scale of charcoal production (%)				
Small scale charcoal	46.5	82.8	78.9	68.5
Medium scale charcoal	40.9	15.5	19.7	26.0
Large scale charcoal	12.7	1.7	1.4	5.5
The average number of years of experience	5.1	9.8	7.0	7.1
The average number of months per year spent on charcoal production	7.4	7.3	5.9	6.9
Average number of charcoal sacks produced last year	931.0	303.0	383.1	554.4
N	71	58	71	200

Among the three communities, Kuportor is furthest from the main Damongo road and is currently the new frontier in charcoal production. As the informants noted, once they exhaust their concession and preferred trees, they move to new communities. Even in Kuportor, respondents indicate the quantity of charcoal they produce is reducing; thus, they will soon be moving to a new village.

"Even here [Kuportor] *we started making charcoal, you do not go far to produce. Now you have to use a motorbike and go further in the bush to access the trees. Maybe we have to start looking for a new place soon"* ***(Sissala charcoal producer, Kuportor).***

While respondents in Kuportor and Soaleppe spend on average 7.4 and 7.3 months respectively in a year producing charcoal, respondents in Langatire spend on average, 5.9 months in a year producing charcoal (see Table 5). In Langatire, people spend less time producing charcoal because the community was among the first in which Sissala producers first settled and once they have exhausted the suitable woodland for charcoal and moved to other villages, only small scale producers (who are the majority of 78.9%) – indigenes and farmers remain for whom charcoal is a complementary livelihood activity.

In addition, the production process has created direct casual employment for women, the youth and the very poor of society. The women's focus groups participants expressed great appreciation to charcoal producers for providing employment for women. The charcoal producers mainly employ women to fill sacks with charcoal for a daily wage range of 10 to 15 GHC (about 2 to 3 $). In addition, the women are allowed to pick rejected pieces of charcoal to fill their own sacks for household use or for sale at much lower prices due to its poor quality. At the height of charcoal production in any community, this provides a regular source of employment to women for almost half the year. However, the employment effect reduces as the tree densities reduce and the Sissala move further inland. Nevertheless, as the Sissala move inland/in-bush, the women by then would have also learnt the skills of charcoal burning, and they begin to produce on small scale.

The youth in the area have also enjoyed both direct and indirect employment. First, they are employed in assisting in carrying felled logs, digging depressions for making of kilns and loading of trucks. However, due to the operation of production teams, called gangs, a few indigene youths are employed except where gangs are not well developed in terms of the numbers required to sustain a large production stream. The incorporation of the indigene youth into these gangs has provided some level of semi-permanent employment to hitherto seasonal farmers. Although, the gangs also load their own charcoal into the trailers and trucks, increasingly, the accumulation of wealth has led to this service being contracted to non-charcoal making youth. This is also important, as the loading process needs indigenes to allow for easy accountability to the chieftaincy in the payment of royalties.

Indirectly, charcoal production has created a huge demand for transport services in the form of tricycles that convey logs, charcoal and people into the woodlands following footpaths. The inaccessibility and poor road network in this inaccessible part of Ghana accounts for the increasing investments in tricycles with multiple income and employment effects. The two main beneficiaries are the tricycle owners and operators who create a third, who are the fuel vendors. In addition, some tractor owners have also cashed in by transporting charcoal on narrow roads, thereby allowing tractors to work all year round. An operator excitingly reported that he is busy ploughing farms when the rains come, then moves into transport of charcoal, then back to the farms to process maize, soybean and groundnuts during the harvest, then transports agricultural produce home and to markets, and back to charcoal transport just before the next farming season begins. This depicts the intensification of economic activity in the area and the disappearance of seasonality for many.

Chainsaw operation has become an important source of employment for the youth. Though initially this was mainly done by the Sissala, as they worked with indigenes and impacted this skill to them, youths have either purchased chainsaws commonly called ‘dorman’ or are employed by people with these machines to work for them. Linked to charcoal was the harvesting of rosewood, which also influenced these skills to the youth. A respondent in Kuporto reported learning how to operate a chainsaw when rosewood buyers came to the district many years ago. However, when the ban on rosewood took effect, he became unemployed but soon bounced back to business when the charcoal producers replaced the rosewood harvesters. This is an important process as skills learnt for one activity are transferred to other activities with benefits to livelihoods and employment.

This chain of multiplier employment effects also goes for food vendors who have taken advantage of the emerging monetised economy to open ‘chop bars’ (mini restaurants) providing food to the busy charcoal producers who are unable to cook a quality meal themselves due to time and tiredness. The clientele of these chop bars has increased to encompass indigenes, charcoal aggregators and visitors such as the research team who find these very convenient, cheap and of good quality.

The level of commercial activity in these charcoal producing communities is so high as to sustain so many other micro businesses, which serve as employment and wealth accumulation avenues. Charcoal revenues may become an important diversification capital for the creation of a sustained non-agricultural economy in the future, if incomes in the area do not fall. Each

of the communities has what they call the 'station' or 'bore' where vehicles stop to drop or pick up passengers. These are also considered the center of 'town' where the youth congregate for entertainment, social interactions, buy household goods, eat out and find employment. The functionality of these economic spaces forms the diamond crystal that radiates commercialisation norms throughout the community.

3.7. Importance of charcoal livelihood in the Gonja area

The significance of charcoal in the Gonja area is enormous for most of the population. From Table 6 below, 71.5% of respondents reported improved income due to charcoal production.

Table 6: Improvements in the community because of charcoal production

Variable	Kuportor	Soaleppe	Langatire	Overall
Has the income of your household increased in real terms? (%)				
Improved	77.5	63.8	71.8	71.5
Stayed the same	11.3	10.3	15.5	12.5
Got worse	11.3	25.9	12.7	16.0
Can you afford to spend or invest more? (%)				
Improved	80.3	62.1	60.6	68.0
Stayed the same	8.5	12.1	26.8	16.0
Got worse	11.3	25.9	12.7	16.0
Have the incomes of your neighbours in this village increased in real terms? (%)				
Improved	64.8	51.7	69.0	62.5
Stayed the same	7.0	5.2	7.0	6.5
Got worse	4.2	13.8	8.5	8.5
Don't Know	23.9	29.3	15.5	22.5
N	71	58	71	200

In Langatire, a respondent praised charcoal production as a lucrative venture that has enabled him to build his own house and further notes that:

"Charcoal production has helped me to purchase land in the Ashanti Region. I have sand on the land, and I intend building on it".

Indeed 68% of respondents said they could now afford to spend more or invest more due to increased income from charcoal. According to a teacher who is an indigene and a charcoal producer:

> *"You know very well that as teachers, our income is meagre. If you are not engaged in other alternatives, you will find it challenging to take care of your wife and children. Farming is an alternative, but the challenges [with farming] are one too many. Charcoal gives us a better income, and that is why I produce it."*

For many indigenes, income from charcoal production enables them to invest in modern farming, improved homes and household expenditure. Charcoal production is fast becoming an essential livelihood for the study communities as it offers them a more stable source of income when compared to farming as illustrated below.

> *"I came here because of charcoal production, but during rainy seasons, I do engage in farming for the household. I am married to three wives and have brothers whom I take care of with the income I generate from the charcoal business."* ***(migrant charcoal producer, Kuportor)***.

> *"Those people who are engaged in commercial charcoal production build houses and buy motors from charcoal proceeds. As for my family, charcoal money helps me to pay my children school fees"* ***(small-scale charcoal producer, Soaleppe)***.

> *"The job has helped me in many ways. I rented the room my wife and children are staying in Accra, and I even bought a plot of land so that I can build in future, I have sent all my children to school except three of them, I take care of my old father including his farm activities. I had all this money from charcoal production."* ***(large scale Charcoal producer, Langatire)***.

Migrant charcoal producers invest income from the charcoal business in their hometowns, major cities, and take care of their families in these cities. These investments can be the purchase of farming inputs to invest agriculture in their hometowns, housing and non-farm activities.

Table 7: Income from charcoal

Variable	Kuportor	Soaleppe	Langatire	Overall
Average income from charcoal last year (GHS)	23407.4	10321.5	6135.5	13481.0
Average income from other sources (GHS)	5804.3	1855.5	1838.2	3251.2
% households who cut the size of the meals or skip meals because it did not have enough food in the last 12 months				
All the time	1.4	0.0	0.0	0.5
Almost always	5.6	6.9	9.9	7.5
Some of the time	26.8	41.4	40.9	36.0
Seldom/rarely	5.6	12.1	11.3	9.5
Never	60.6	39.7	38.0	46.5
N	71	58	71	200

From Table 7 above, the average income from charcoal is about GH₵13,481 compared to GH₵ 3,251.2 from other sources, including farming. In the interviews, the respondents confirmed that income from charcoal is higher than from agriculture and other off-farm livelihood activities.

> *"The [charcoal] work is very profitable. At first, when I was farming, I was doing subsistence farming. The charcoal is for commercial purpose. I can now buy foodstuffs such as cassava, maize, and rice. It is also from the proceeds of charcoal I feed my parents."* ***(charcoal producer, Langatire)***.

The improved income from charcoal reflects improved access to food among households. As shown in Table 7 above, 46.5% of respondents note, their families never cut the size of their

meal nor skipped a meal due to income from charcoal. The figure is even higher for Kuportor, where 60.6% of respondents never had to cut or skipped meal, which they attribute to income from the sale of charcoal. In Kuportor, majority of the charcoal producers are Sissala migrants who usually engaged in large-scale charcoal production compared to medium to small-scale producers who often combine charcoal with farming. Thus, the large-scale migrant producers are more likely to get income that can ensure a stable supply of food throughout the year. In all, 68% of respondents said they could now afford to spend more or invest more due to increased income from charcoal.

The study further probed the linkage between the various livelihood activities and food availability for households. The responses in Table 8 below show that 80% of people engage in trading never skip a meal compared to 56.9% farmers, and 36.8% charcoal related livelihoods. Indeed, while charcoal production offers a guaranteed income, production slows down in the dry season when leaves and grasses dry up as such charcoal producers do not get the vegetation to cover the kilns. Additionally, the ground becomes too hard in the dry season; hence, charcoal producers are unable to dig the soil to cover the kilns. In this period, without income, many migrant charcoal producers are forced to skip a meal.

Table 8: Livelihood activities and food availability

		Has your household ever cut the size of meals or skip meals					
Main occupation		All the time	Almost always	Some of the time	Seldom/rarely	Never	Overall
Farming	row %	0.0	9.7	20.8	12.5	56.9	100.0
	col %	0.0	46.7	20.8	47.4	44.1	36.0
Trading	row %	0.0	20.0	0.0	0.0	80.0	100.0
	col %	0.0	6.7	0.0	0.0	4.3	2.5
Charcoal business	row %	0.9	5.1	48.7	8.6	36.8	100.0
	col %	100.0	40.0	79.2	52.6	46.2	58.5

At the community level, charcoal production and its related activities create a service economy in the villages. Key among them are food vendors, drinking bar operators and retail shops who service migrant charcoal producers. In the Gonja area, the charcoal support service is dominated by women, which is not a departure from the overall structure of the Ghanaian economy where women dominate the informal service sector.

Plate 3: Pounding yam at a chopbar at Kuportor

Source: Fieldwork 2019

In addition to the women, some youths sell fuel to charcoal producers and motorbike repair shops abound to service the numerous motobikes purchased with charcoal money. Though many large-scale producers own chainsaws, many independent chainsaw operators also provide this service to charcoal producers and farmers. Unsurprisingly, 62.5% perceive their neighbours to have an improved income, which they have attributed to charcoal-related livelihood activities. The general perception of improvements in income at the community level is due to the linkages between charcoal production and the broader local economy. Charcoal producers contribute towards community development projects such as water provision and maintenance of the community borehole. In Kuportor, for example, charcoal producers pay an amount of GH₵250 each time charcoal trucks are loaded for the market as a contribution to development projects.

Table 9 below is a cross-tabulation of respondents' wealth status with the livelihood activities and scale of charcoal production. The row percentage is the distribution of wealth for each livelihood activity, and scale of charcoal production. The column is the distribution of wealth across different livelihoods activities and different scales of charcoal production. 53.7% of the respondents classified among the richest in the communities are engaged in charcoal related

activities. Majority of the poorest are however, those involved in trading 60% and 66.7% of those in other livelihood activities.

Table 9: Asset Index and Occupation

Variable		Poorest (33.0%)	Middle (33.5%)	Richest (33.5%)	Overall
Main Occupation (%)					
Farming	Row %	18.1	41.7	40.3	100.0
	Column %	19.7	44.8	43.3	36.0
Trading	Row %	60.0	20.0	20.0	100.0
	Column %	4.6	1.5	1.5	2.5
Charcoal business	Row %	39.3	29.9	30.8	100.0
	Column %	69.7	52.2	53.7	58.5
Other	Row %	66.7	16.7	16.7	100.0
	Column %	6.1	1.5	1.5	3.0
The scale of charcoal production					
Small scale charcoal	Row %	28.47	36.5	35.04	100
	Column %	59.09	74.63	71.64	68.5
Medium-scale charcoal	Row %	40.38	26.92	32.69	100
	Column %	31.82	20.9	25.37	26
Large scale charcoal	Row %	54.55	27.27	18.18	100
	Column %	9.09	4.48	2.99	5.5
N		67	67	66	200

Concerning the scale of charcoal production, those classified as richest asset holders in the community (71.64%) are small-scale producers. The large-scale producers are, however, the poorest asset holders (54.55%) as shown in Table 9 above because while many small-scale producers are indigenes who own assets in the communities, the large-scale charcoal producers do not invest their income in the villages. Many large-scale charcoal producers live in small shacks in the bush; without access to facilities and suitable housing. Thus, the investment of charcoal income by large-scale producers is usually in assets situated in their hometowns and major cities where their families reside. One of the Sissala large-scale producers, for instance, lives in a shack in the bush where he produces the charcoal with no assets in the village but owns a house in Accra where his family lives. The charcoal he produces is sent to his wife, who sells it in Accra.

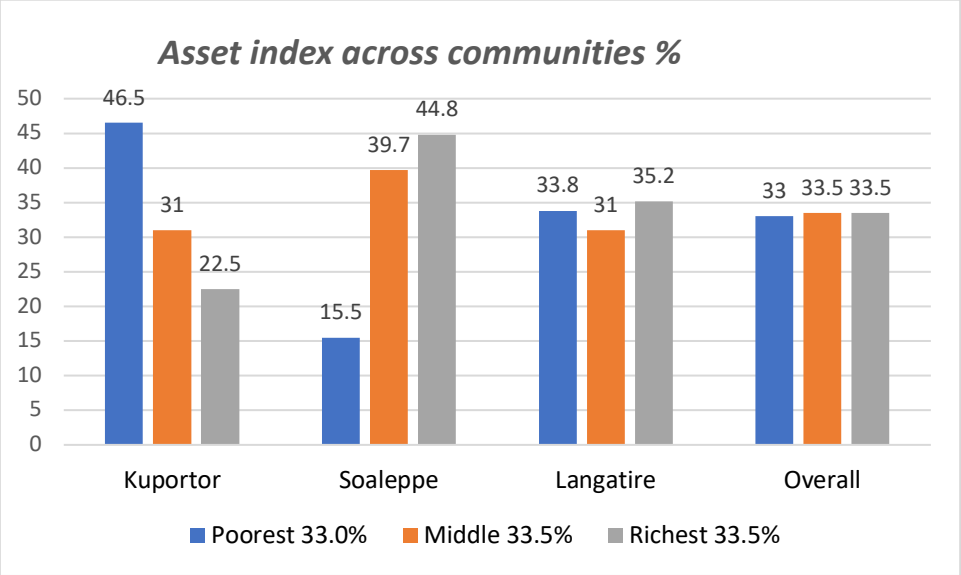


Figure 6: Asset index across communities

Figure 6 shows the wealth distribution across study communities. In Kuportor, the current charcoal frontier, people have new entrants into charcoal production and are still beginning to build assets; hence the high percentage of the poorest (46.5%). Soaleppe, one of the older and depleted charcoal production zones, has a high proportion of the wealthiest people (44.8%) in the study area because accumulation was done in the past. With charcoal production estimated to have peaked about five years ago, there are large numbers of people who accumulated assets, reinvested in other businesses by way of diversification and expanded farming. Thus, over time, the proportion of wealthy people in Kuportor may go up while the poor reduce. Hence, the economic impacts of charcoal activities should not only be limited to short-term analysis but also observed over time as the investment of charcoal income in assets and diversified activities create improved livelihoods.

When the asset index is compared across genders (Figure 7), more than 61% of men are among the richest compared to 38.8% of women. There are equally poorer men (56%) than poorer women (43.9%) are. Many of the women in the study communities have a much more diversified livelihood activities compared to men. In addition to charcoal production and farming, women also engage in petty trading, picking and processing of shea which gives them a more diversified income source with a little over 50% of them classified with middle-level asset index.

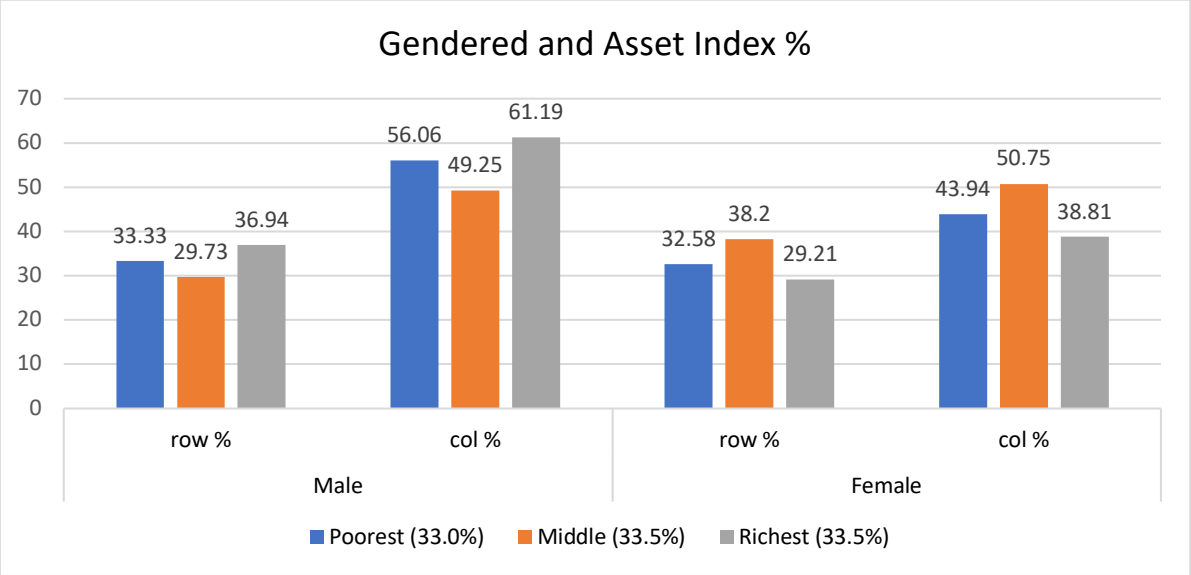


Figure 7: Gender and wealth distribution

The distribution income from charcoal, however, varies among men and women. As shown in Table 10 below, men earn more from charcoal production than women do. This is because many of the large-scale charcoal producers are men, while women engage in small-scale production.

Table 10: Variations in income

Indicator	Income from Charcoal	Income from other sources	Average Income
Gender			
Male	17764.05	3935.82	21699.87
Female	8139.157	2397.337	10536.49
Main occupation			
Farming	5201.806	3411.597	8613.402
Trading	2580	530	3110
Charcoal business	19725.33	3423.539	23148.87
Other specify	150	233.3333	383.3333

Across different livelihood activities, the average income from the charcoal business is over 91% higher than income from farming. Charcoal production provides an essential income source to not only rural communities but also to urban retailers. As a key livelihood activity, charcoal production is intricately linked to diverse sectors not least, agriculture. This section shows that the significance of charcoal production is not only limited to the income people derive, but the inter-sectoral linkage between charcoal production and local and national economies.

3.8. The changing frontiers of charcoal production and the major drivers

The frontiers of charcoal production in the Gonja area is in perpetual flux. The charcoal production frontiers change as migrant Sissala produce move across the Savannah in search of suitable vegetation for charcoal production. Several factors underlie the increase in charcoal production and the changing frontiers of charcoal production in the Gonja area. The main factors driving the trend of charcoal production in the study area are high demand driven by rapid urbanisation and the household energy transition; dwindling farm output due to climate variability and the destruction of crops by Fulani herdsmen; and guaranteed income from charcoal.

3.8.1. Urbanisation

The rise in demand for charcoal is a primary reason given by respondents for increased charcoal production as most of the charcoal produced is sold in urban areas, especially Accra and Kumasi. Rapid urbanisation and changing urban housing structure are triggers of the transition in the household energy mix in urban areas. Several urban dwellers are changing from dependence on firewood to charcoal especially as the initial cost of LPG is relatively high hampering its uptake, particularly among the urban poor (Gyamfi, Diawuo, Kumi, Sika, & Modjinou, 2018). These factors will continue to drive the demand for charcoal with an increasing number of people in the Savannah woodland ecology likely to engage in charcoal production to meet the demand.

Additionally, the increase in demand for charcoal is also motivating the movement of Sissala producers across Ghana and beyond the West African sub-region. As the desired tree species for charcoal production are exhausted, producers move to new areas with available wood. Current production patterns in the Gonja area start from communities located along major roads such as Soaleppe and Langatire and extends further as they seek new production areas such as Kuportor.

3.8.2. Dwindling agriculture output

The second driver for the increasing production of charcoal is the dwindling agriculture output, especially for peasant farmers. Climate variability, pest infestation, and destruction of crops by cattle are accelerating a growing number of Gonjas into charcoal production.

> *"I must say hardship compelled me to join charcoal production. I felt I could not cater for my wife and children if I did not enter charcoal production. Income from farming is meagre. In addition, proceeds from charcoal are used to complement agriculture. Last year, for instance, I financed my* [cashew] *plantation with charcoal money"* ***(Small-scale charcoal producer, Langatire)***.

Among the factors affecting agriculture, output is the destruction of crops by cattle which is the most common reason given by respondents as illustrated in the extracts below.

"There are a lot of destructions in our farmlands. For the past two years, I cultivated, but the Fulani sent their cattle to my farm, and they destroyed everything because of that I decided not to farm this year." ***(Small-scale charcoal producer, Kuportor).***

"I came here to farm. Until recently that, the farm work stalled, and we joined charcoal production, because of the activities of Fulani herdsmen. They destroy our farms with their cattle. And even when you confront them, they will tell you they are not responsible for the destruction." ***(A migrant farmer turn charcoal producer, Soaleppe).***

*"I do not do any livelihood activities aside charcoal production because the Fulani herdsmen destroyed my farm, which discouraged me from farming again," (**charcoal producer, Kuportor**).*

Additionally, the inability or lack of interest from the traditional authorities and police concerning crops destroyed by cattle is cited as a cause of the worsening situation. Many respondents argue that lack of support from the traditional leaders in ensuring that crops destroyed are paid for by the Fulani means that farmers do not receive compensation when cattle ruin their crops. According to a teacher who doubles as a charcoal producer:

"Incidents of cattle invasions are quite rampant in this community, and the chief is also on the side of the Fulani herdsmen".

Informal discussion with some Fulani herdsmen in Kuportor revealed that it has become increasingly difficult for them to get grazing areas for their cattle, especially in the dry season. While they denied intentionally allowing their animals to feed in people's farms, they acknowledged the fact that sometimes their animals escape and eat people's crops. The late onset of rain for fresh grass to grow for the cattle is pushing the Fulani herdsmen ever closer to farming areas, which often leads to the destruction of crops and conflicts.

Thus, the increase in demand for charcoal in the urban areas of Ghana, climate variability and low agriculture output has resulted in many people diverting from or complementing farming livelihoods with charcoal production.

3.8.3. Guaranteed Income

The fact that charcoal production guarantees source of income is key to the expansion of the charcoal production frontier. Charcoal production, unlike farming, provides insurance to producers when crops fail, but most importantly, profit from charcoal is invested in farm expansion and non-farm activities.

"I will say the [charcoal] work is very beneficial. It is from the charcoal proceeds that we feed after every farming season. When the farming season is over, charcoal production becomes our next resort. We buy food, ingredients, and take care of all other expenses, including fees, pencils, books, pens, among others, using charcoal money." ***(farmer/charcoal producer, Soaleppe)****.*

"I am engaged in groundnut farming. So, when the farming season is over, you resort to alternative livelihood strategies like charcoal burning to support and keep life moving." ***(farmer/charcoal producer, Langatire).***

With only one rainfall maxima and lack of irrigation schemes, farmers in the Gonja area are only able to produce during the raining season. Charcoal production is therefore, carried out in the dry season when they do not engage in any farming activity. The dry season charcoal production therefore, serves as a complementary income source. Additionally, there is no variability in charcoal production compared to farming, which is rain fed and affected by climate change and fluctuating prices for food crops. Charcoal prices have an upward trend without any fluctuations, thereby making it a livelihood that does not fail people.

3.9. The challenges associated with charcoal livelihoods

The charcoal producers face several challenges in their activities, which are summarised in Table 11 below. The major challenge charcoal producers face is the reduction in available woodlands for production. It is a challenge emanating from the increasing number of people who are engaged in charcoal production. This increase in number of producers therefore, leads to the rapid depletion of vegetation thereby forcing producers to travel further to be able to access wood.

In Soaleppe and Langatire, the loss of woodland means charcoal producers must travel further away from the village to produce charcoal. Because the charcoal is produced far from the town, their production costs increase as they spend more to transport the charcoal from the bush to the roadside for loading unto bigger trucks or sale to dealers.

Table 11: Challenges confronting charcoal producers

Variable	Kuportor	Soaleppe	Langatire	Overall
Major problems charcoal dealers face (%)				
Harassment from the District Assembly	29.6	-	-	16.0
Harassment from the community members	25.4	-	-	14.5
Travelling long distance to get the woodlot	-	32.8	31.0	26.0
Destruction of charcoal by Animals (Livestock)	-	39.7	29.6	30.0
N	71	58	71	200

Additionally, after the kilns are spread, and the fire quenched, the charcoal is left to cool before they are packed into jute bags. During this period, any herd of cattle moving can walk over the charcoal, breaking them into pieces, which reduce its value.

Land access and rights in Africa are complex and often conflict-ridden, and charcoal production is not different. The conflicts are not unique to the Gonja area but are regular challenges the charcoal producers face in their work across the country. Often land access negotiations are done between traditional leaders in common access areas and family lands respectively. While these

negotiations may be legitimate, in some instances, community or family members may not support charcoal production resulting in conflicts. Some drastic actions against charcoal producers include the burning of packed wood and campsite of charcoal producers. In some communities, the conflict is related to the lack of youth involvement in the charcoal business. In Langatire, for instance, the dominance of Sissala charcoal producers and the exclusion of the youth has resulted in conflict. A respondent describes one of these situations in:

> *"There was a time we had a group of Sissala people dominating charcoal burning in this community. The youth of this community became aggrieved, sort permission from authorities and expelled them from this community. They moved to Yazori a community in North Gonja."* ***(Indigenous charcoal producer, Langatire)***.

In the case above, an individual granted access to Sissala charcoal producers without authority from the traditional leaders. The chief supported the community youth to sack the Sissala producers. The further away charcoal production camps are from the villages, the more likelihood of producers not having the appropriate authorisation to harvest wood.

In Kuportor, the community members as resentment increased against the perceived huge incomes made by migrant charcoal producers are part of the cycle of charcoal production. Initially, as chiefs receive gifts to let in producers who also employ locals, there is peaceful and harmonious relations within the community. But as truckloads of charcoal begin leaving the community, and producers buy new motorbikes and engage in local spending showing that they are now better than the indigenes, then the youth groups under the pretext of saving the environment often attack migrants and their production machinery. Boga, who is among the first to settle in Kupotor narrates their ordeal in the hands of the youth who attacked their homes burning down houses, chain saws and also packed wood and kilns. However, over time the youth learn skills in charcoal production and join the income flows working with the Sissala migrants who have established networks nationwide.

The current approach of state agencies such as forestry commission, the EPA, and the district assemblies is that charcoal production is detrimental to the environment; hence, it must be banned. Nevertheless, while the district assemblies have been unsuccessful in enforcing the ban on charcoal production, their officials instead use the threat of arrest to extort money from charcoal producers. Thus, some district assemblies tax the charcoal producers while others issue punitive fines as a measure to curtail their activities to protect the environment in addition to extortion by the assembly officials.

Plate 4: Destruction of Sissala campsite and packed wood for charcoal

Source: Fieldwork 2020. Courtesy Jaksally Development Organisation

Women charcoal producers face systematic barriers towards their entry into the charcoal business. The differential access to resources and gender roles practiced over the years has resulted in women having low capital and labour to invest much into the production process. In all study communities, there are consequently no women in large-scale charcoal production. In Langatire, for instance, a small-scale charcoal producer notes: *"today charcoal burning is the preserve of females in this community with few males involved."* The view above relates to the fact that women only gained access to the woodland for charcoal after the large-scale producers have exhausted the concessions and moved on to new areas. Thus, during the peak period of charcoal production in Langatire, women were mainly labourers working for the large-scale producers and learning the skills. However, once the large-scale producers are no more there, women are then forage the remaining woodland for charcoal production. In addition, the fact that migrant men normally go to the chief for concessions, which are then worked on by teams including their wives, is a limitation to female ownership of the processes. The entrenchment of male access routes to natural resources especially when it comes to seeing chiefs is a major patriarchal hurdle limiting women's access to productive resources.

3.10. The reciprocal relations between charcoal production and agriculture

While the dwindling farm output by farmers is identified as one of the triggers of increasing charcoal production in the Gonja area, there is simultaneously a synergistic relationship between farming and charcoal production. Due to the low population densities and therefore, availability of land for extensification of agricultural production, capital from charcoal for investing in farming is vital. For many Gonjas, charcoal production is done in addition to farming. At the end of the farming season, farmers shift their focus to charcoal production, particularly during the dry season when there are no farming activities. Thus, though the trend of charcoal production

is on the rise, it is not entirely replacing farming as an essential livelihood. With charcoal becoming an important complementary activity to agriculture, the study found a reciprocal relationship between farming and charcoal production, and this takes several forms.

Firstly, farm expansions require the clearing of vegetation to make it easy to plough the land. As farmers move further away from their villages into new areas to farm, they rely on charcoal producers to clear the trees on the land. The reciprocity is underlined by the fact that by clearing the land, charcoal producers have abundant trees for production. Many charcoal producers consider this arrangement convenient, as they do not need to negotiate for trees from higher levels. Several views by respondents on this mutually beneficial relationship between charcoal production and farming are outlined below.

> *"Some farmers do collaborate with charcoal burners. Perhaps you have some trees on your farm and call on your friend to use them for charcoal burning."* ***(elder Langatire)****.*
>
> *"There is the positive relationship [between charcoal production and farming] because if a dry tree is found on the farmland, we call a charcoal burner and sell it to them and invest the money in our farm."* ***(farmer, Soaleppe).***
>
> *"I have uprooted many trees for my groundnut farm so I will collect them for charcoal production."* ***(farmer/charcoal producer, Kuportor****).*

By allowing charcoal producers to harvest trees on their land, farmers reduce their production cost when it comes to clearing the land and may receive a portion of the income from the producer. Where the number of trees on the farm is not many, farmers, especially women, engage the services of charcoal producers to harvest the trees, which the farmers use to produce the charcoal. According to a charcoal producer in Kuportor, some women pay for fuel for the machine and provide food for the person cutting the trees. Payment can also be made with charcoal after production.

Apart from clearing the land, charcoal production also provides extra income to farmers, especially women. According to some of the respondents, women often take charge of the charcoal produced from the farm. This income is saved in informal savings institutions known as 'susu' that they can later withdraw when needed.

> *"Charcoal can be helpful in two respects. In the farming season, when you clear your land, you can collect the trees for charcoal and use the proceeds to pay tractors operators who ploughed your land for you. Also, women in the community use proceeds from charcoal production for 'susu' contribution."* ***(farmer/charcoal producer, Kuportor)****.*

Furthermore, many charcoal producers, especially indigenes of the study communities, use the income from charcoal to support and expand their farms.

"Charcoal production helps my family in many respects. We use charcoal money to start farming every season. Our mothers also buy ingredients and food supplements using proceeds from charcoal." ***(farmer/charcoal producer, Soaleppe)***.

"I do use the charcoal income to support farming through the hiring of tractors and also use the same income to buy fertilisers for my farm." ***(farmer/charcoal producer, Langatire)***.

By producing charcoal in the dry season, farmers have enough income that is invested in their farms to increase output through the hiring of tractors to clear the land, purchase inputs such as seeds, pesticides, and fertilisers. In addition, they are also able to hire labour to weed the farms.

3.11. Actors and social relations in the charcoal value chain

Charcoal production involves many actors who play different but complementary roles in the organisation of charcoal value chain. The various actors are traditional leaders, community liaisons, farmers, migrant Sissala producers, charcoal aggregators, transport operators, the district assembly, urban distributors, retailers and consumers (see figure 8).

The chiefs and elders of the communities are the custodians of the land and they grant user access. The traditional authority grants access to the charcoal producers as well as regulate their activities. Central to the negotiation of access to trees for charcoal production is what we described as the community liaison persons. Usually, they are community members or immigrants who have settled in the community for a long time and have functional networks and relations with the community leaders. Particularly for Sissala migrants, they rely on this liaison to access trees for charcoal production.

The next group of actors who play a central role in charcoal production are farmers in the study communities. In all three communities, farmers diversify their farming livelihoods with charcoal production. During the preparation of farmlands, the wood is often harvested for charcoal production. The landowners engage the services of owners of 'dorman' chainsaw machine – usually owned by the large-scale charcoal producers or by operatives. The farmer either pays for the cost of petrol for the wood harvesting machine in cash or pays with charcoal. Where they pay with charcoal, the machine operator waits for the farmer to produce the charcoal after which it is divided and a portion given to the machine operator as payment. The farmers are usually the small-scale producers as the charcoal is primarily produced from the wood harvested when preparing the farmland for cultivation or as an off-season activity to complement income.

In the Gonja area, Sissala migrants from the Upper West Region are the leading players in the charcoal production business. They move from community to community across the Savannah woodland, harvesting wood and producing charcoal. Working in teams, the Sissalas often move to a new community through their intricate networks of family and friends resident in the host

communities. These networks facilitate their entry into the communities and play the liaison role in linking the Sissala and the community leaders. Teams of Sissala producers settle in the villages produce the charcoal in and around the communities and migrate once they exhaust the vegetation.

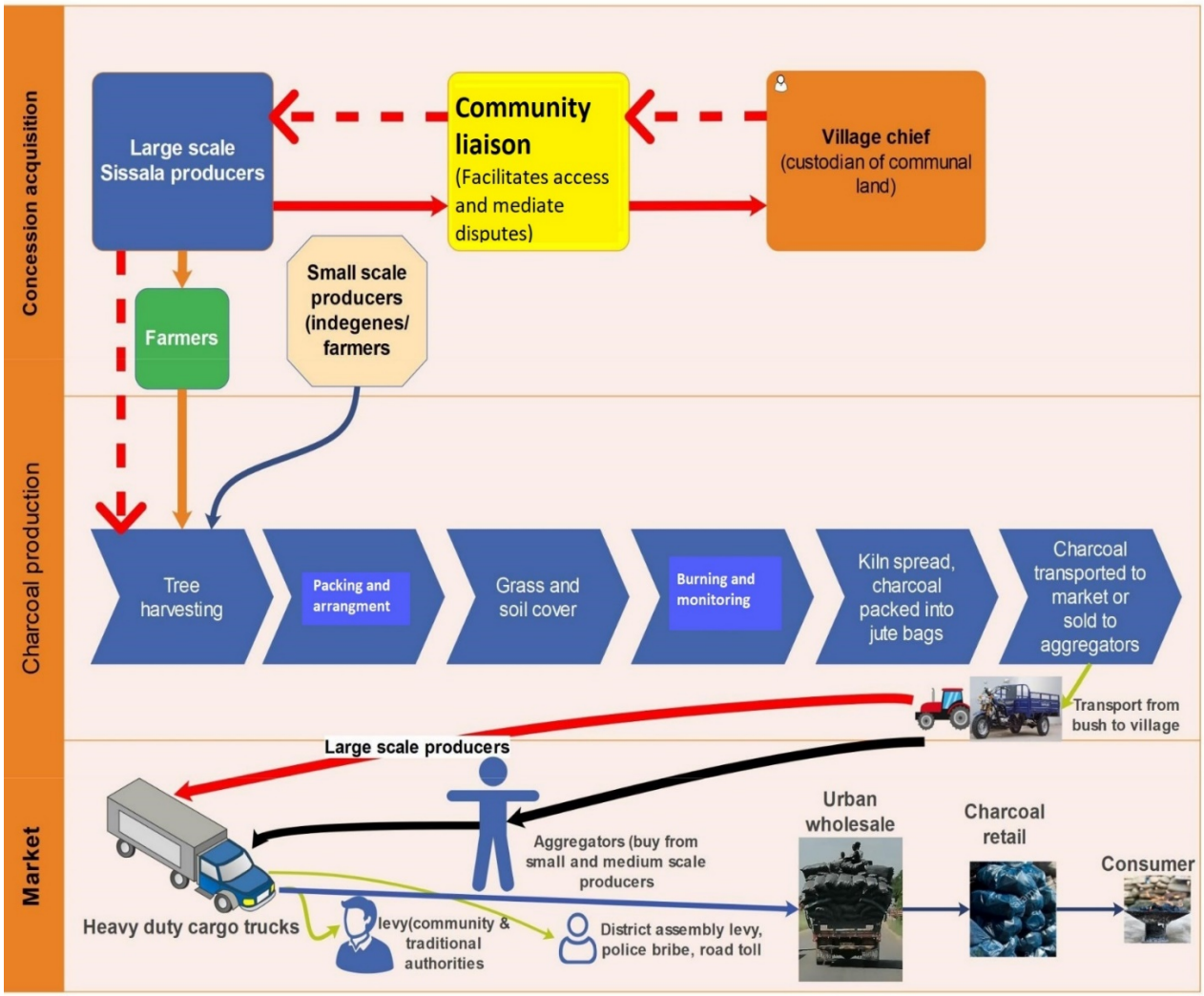


Figure 8: Value chain actors for charcoal production

Also, prominent in the charcoal value chain are the aggregators. These are usually Ashanti women, who move from village to village in the Gonja area and aggregate the charcoal from small-scale producers such as farmers and women. For many small-scale producers, they do not produce the amount of charcoal needed to fill a haulage truck and do not also have networks for marketing in cities; as a result, they rely on aggregators. The aggregators buy the charcoal from the small-scale producers in the villages, and once they have the quantity they need, they invite the truck that moves from village to village to load the charcoal for the market. The aggregators also play the added role of financial facilitators. Many Sissala production teams require financial support to produce and depend on the aggregators for such support.

"The charcoal buyers also help when I am hard up, so I go for financial assistance so that when I produce the charcoal, then the person comes to buy and deduct the money I owe her. My wife also helps by selling the charcoal I send to her in Accra." ***(Sissala charcoal producer, Kuportor)***.

Charcoal aggregators, therefore, benefit more from pre-financing arrangements. As the director of Jaksally Development Organisation notes:

"The local people do not derive any significant benefit from charcoal. The Sissala charcoal producers and Ashanti charcoal buyers [aggregators] *are the people who benefit most. A Kia Rhino load of charcoal is worth GHC20, 000. However, the village chief gets only GHC300. There is not much benefit for charcoal to the communities."*

Central to the charcoal business in Gonjaland is the transport operators. The transport sector is the nerve centre of the charcoal business linking producers, aggregators and consumers in the cities. At the smallest level is the tricycle operators whose services are often used by small-scale charcoal producers such as farmers to transport the charcoal from the bush/farms to the main road or village. Due to its ability to operate in hard to reach areas, the tricycle is vital for small-scale producers who cannot afford a tractor or large trucks to haul the charcoal. Then there is the medium to heavy-duty trucks that haul the charcoal from the communities to the urban markets. The transport operators provide a vital link between the producers and urban distributors. Thus, when charcoal is produced, the transporters are informed who come and haul the charcoal to the cities.

In the cities, the major distributors receive large quantities of charcoal from specific aggregators and producer-wholesalers, which are sold to retailers. The urban distributors are usually women, some of whom are wives of large-scale charcoal producers. As previously intimated, many Sissala migrants live in shacks in the bush to produce charcoal. Their incomes are invested in houses in the cities where their families reside. Many of their wives are traders, including wholesale distributors of charcoal. It is a common sight to see large trucks load of charcoal unloading to major distributors in the neighbourhoods of Accra. The large-scale urban distributors sell the charcoal to retailers, often, poor women traders in the cities. The retailers purchase a few bags of charcoal from the distributors and re-package them in smaller plastic bags, which are sold to consumers in the neighbourhood.

The consumers of charcoal in big cities transcend all social groups with the poorest relying mainly on charcoal while the richest have specific uses such as grilling meat or fish and preparing maize-based meals using rounded pots. Poverty is a major reason for the reliance on charcoal, as the poor cannot afford to buy LPG or use electricity. The initial cost of procuring cylinders also plays a role in the preference for charcoal, which is sold in different quantities using free plastic bags. Charcoal retailers are ubiquitous across Ghanaian cities, thereby making the product available within walking distance from consumers' homes. Each of the actors in the charcoal

production network plays varied but complementary roles that are critical to the charcoal value chain.

Finally, various state agencies (district assemblies, EPA, forestry commission, Ghana police service) play the role of 'regulators', but this is done on a limited scale. The primary function these institutions perform entails taxation and issuance of penalty to charcoal producers without any clear regulatory efforts.

3.12. Charcoal production and devegetation

Many actors, including governments, NGOs and local authorities, oppose charcoal production citing its damaging environmental impacts. In the Gonja area, all community members, including farmers and charcoal producers, allude to the fact that charcoal production provides income stability that supports agricultural development and self-help community projects. However, harvesting wood for charcoal production negatively affects the environment and is a significant driver of devegetation.

As can be seen from figure 9, the preferred tree species for charcoal production have become scarce in all study communities. According to Sissala charcoal producers, many of them were producing charcoal in the Ashanti, Bono and Ahafo Regions but left because the trees became scarce. Their movement across the woodland ecology of Ghana harvesting wood for charcoal causes vegetation loss.

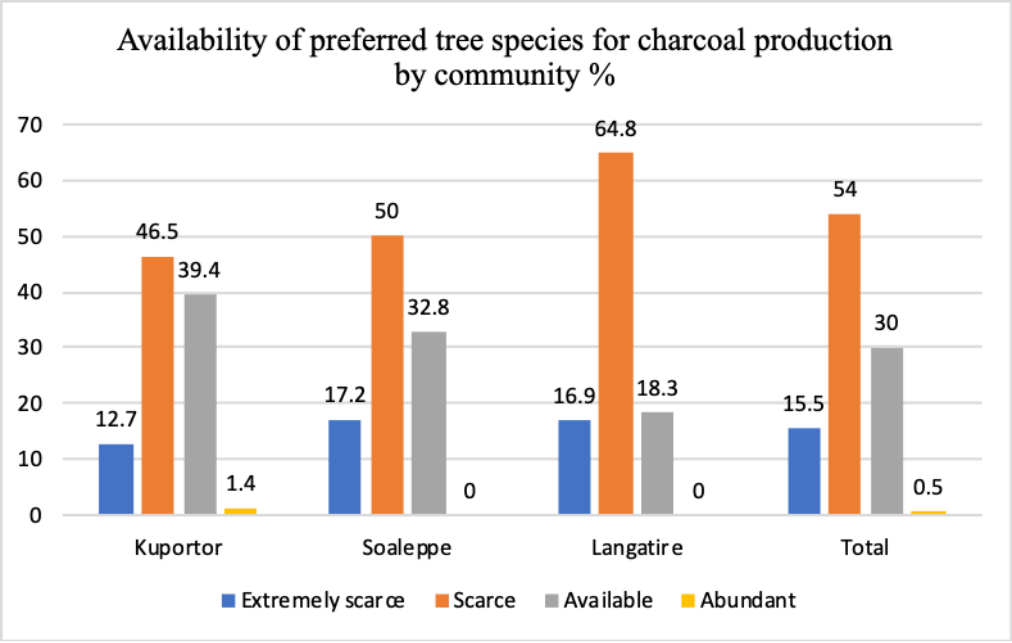


Figure 9: Availability of preferred tree species for charcoal production

In Figure 9 below, 54% of respondents are of the view that preferred tree species for charcoal production have become scarce. This proportion should be seen in perspective since it represents the perception according to access, with access varying according to people's ability to move into the bush for these trees. Indeed, all respondents agree these trees are no longer found closer to their villages as in the past.

The danger with the migration of Sissala charcoal production is that it contributes significantly to vegetation loss as they search for more lush woodlands for charcoal production. It is, however, worth noting that the extent of vegetation loss is dependent on the tree species. Across the Savannah woodland, certain tree species such as dawadawa, shea and mango are not harvested for charcoal. The implication is that in areas where these prohibited tree species dominate, charcoal production may not lead to substantial vegetation loss. In our field visits to charcoal production sites in Kuportor, for instance, we observed that the charcoal producers did not harvest the prohibited tree species and several others not considered good for high-grade charcoal. The places with a broader tree diversity do not experience severe degradation except for the extinction of the preferred tree species for charcoal. However, where the preferred species for charcoal production dominate the landscape, then considerable deforestation results. The FDG shows that one-third of all trees in Kuportor and for many communities are suitable for charcoal. We, therefore, expect a reduction in vegetation by 30 to 35% in the area.

From Table 12 below, few charcoal producers harvest economic trees such as shea and dawadawa, which are essential food trees and indispensable in the local economy. The shea fruit is consumed fresh, the oil used for cooking and a significant proportion of the nut processed for export for use in the cosmetic industry. As such, it is illegal in the Gonja area to harvest shea. Even for respondents who reported harvesting shea and dawadawa for charcoal, these are usually dead shea trees. In places where chiefs and locals are not able to prevent the use of economic trees such as dawadawa and shea from being cut for charcoal, then the percentage of devegetation could be higher. In all the three communities, the local institutions responsible for enforcing the no cutting of economic trees were effective. They, therefore, protected these trees from being cut except for farming where a few are taken off.

The Director of Jaksally Development Organisation, an environmental NGO operating in the woodland Savannah however argues that there is an increasing trend of use of shea and dawadawa for charcoal production. According to him, as other tree species are exhausted due to charcoal production and lumbering, many people are harvesting the prohibited species for charcoal. As he notes:

> *"The charcoal is produced away from the village. The chiefs and elders are not there to tell the trees that have been used for the charcoal. Once the charcoal is produced, it is difficult for an untrained eye to tell which tree specise was used. We have several records of dawadawa and shea being harvested for charcoal."*

Table 12: Use of prohibited trees and harvesting in game reserves

Variable	Kuportor	Soaleppe	Langatire	Overall
% of charcoal dealers who sometimes harvest shea tree for charcoal production	4.2	13.8	8.5	8.5
% of charcoal dealers who think other charcoal producers sometimes use shea tree in charcoal making	5.6	13.8	14.1	11.0
% of charcoal dealers who sometimes harvest dawadawa tree for charcoal production	0.0	0.0	4.2	1.5
% of charcoal dealers who think other charcoal producers sometimes harvest dawadawa tree for charcoal production	0.0	0.0	7.0	2.5
% of charcoal dealers who sometimes harvest wood from the game reserve for charcoal production	0.0	0.0	0.0	0.0
% of charcoal dealers who think other charcoal producers sometimes harvest wood from the game reserve for charcoal production	7.0	0.0	0.0	2.5
N	71	58	71	200

In places where preferred species such as *keche (Khaya senegalensis), kakali (Anogaises leucopus) and kawul (Afrormosia laxiflora)* used for charcoal production dominate, these areas will experience significant devegetation.

Plate 5: Harvested shea trees for charcoal

Source: Fieldwork, 2020. Courtesy Jaksally Development Organisation

In effect, charcoal production could lead to the extinction of the three main preferred tree species for charcoal production in the Gonja area. In Table 13, 89.5% of respondents are of the view that charcoal production has reduced tree density. According to the director of Jaksally Development Organisation,

"Charcoal producers are sweeping the forest and harvesting almost every tree, including economic ones like shea and dawadawa. A Kia Rhino can take up to 450 bags of charcoal. This is equivalent to 25 matured shea trees and destroys 50 to 70 other shrubs and trees in the ecology."

Table 13: Respondents perception of devegetation in the Gonja area

Variable	Kuportor	Soaleppe	Langatire	Overall
% of people who think charcoal production has reduced tree density in the community	81.7	94.8	93.0	89.5
The average number of tree species that have been lost over the last 15 years	1.9	1.8	2.1	2.0
% charcoal burning sometimes contributes to bush fires in the area	9.9	50.0	47.9	35.0
% charcoal production contributed to the loss of animal species	33.8	32.8	35.2	34.0
People's rating on woodland degradation in the town over the last 15 years (%)				
Moderate	43.7	20.7	26.8	31.0
Bad	33.8	51.7	49.3	44.5
Worse	22.5	27.6	23.9	24.5
N	71	58	71	200

Also, as the Sissala producers harvest the preferred species and move on to more lush woodlands, the indigenes resort to harvesting less favourite species, and smaller preferred tree species, thereby exacerbating environmental degradation. It was observed that in Langatire and Soaleppe, apart from the reduction for charcoal produced, more and more small trees are being harvested for charcoal production. These small producers are more dangerous to the environment as the young trees and other tree species considered less preferred for charcoal constitute their main source of raw material for charcoal. The possibility of re-vegetation is lower with indigene invasion of the charcoal business. However, the Sissalas are the major cause of the reduction of the Savannah woodlands into a degraded Savannah.

In the FGD, respondents were of the view that farming and grazing are worse causes of woodland degradation than charcoal. Agriculture requires the removal of trees and shrubs for tractors to plough. As previously intimated, many farmers contract charcoal producers to clear the trees on their lands to make it easy for ploughing and photosynthesis by crops.

The Fulani herdsmen are an integral part of the landscape in the West Africa sub-region. For the herdsmen, the unreliable rainfall affects the availability of grass for their cattle. One of the strategies to boost grass growth is to set fire to the vegetation. By so doing, the Fulanis clear the dead vegetation forcing fresh grass to grow for the cattle to graze. The yearly ritual of burning grass and the high number of livestock leads to overgrazing and trampling of younger trees, thereby preventing the sustainability of the woodlands.

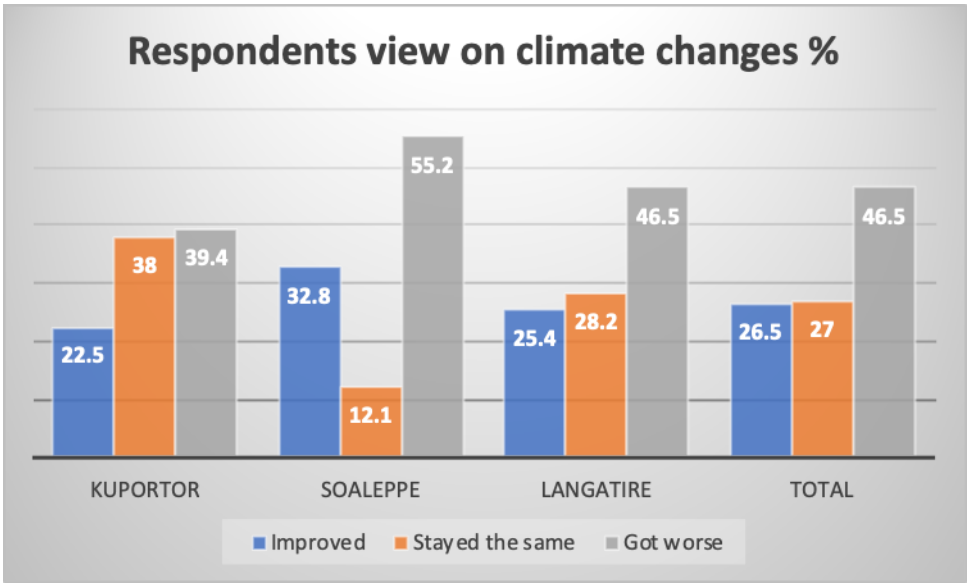


Figure 10: Respondents views on changing climate

The practice by Fulanis burning the vegetation to allow fresh growth is the primary cause of bush fires in the study communities as some of the fires go out of control, destroying surrounding vegetation and farmlands.

> *"As we speak, this time was mostly a period for hunting, but today the forest is devastated for which reason we cannot hunt for game. The youth in this community used to enjoy hunting very well. The sound of the chain saw and activities of Fulani herdsmen have driven the animals far into the wild. It is rare to see a grass cutter off late. The community was deeply forested before the chain saw operations cleared the vegetation."* ***(Community leader, Langatire)***.

From Table 13 above, only 35% of respondents believe charcoal production contributes to bush fires. The charcoal production is organised such that its potential to cause bush fires is limited. The main reason why charcoal producers do not cause bushfires is that grass constitutes the primary raw material for making charcoal after wood. That is why, at certain times in the year, charcoal processing cannot take place due to the lack of grass to be used in lining the wood before the earth covering. Fire poses a significant risk to charcoal as it can destroy charcoal burning it into ashes. This is the reason why many Sissala gangs pitch a tent in the bush and keep a close watch on the charcoal kilns to ensure the fire is totally quenched; the charcoal packed and bagged before they return home. Even where the charcoal is packed, producers face the threat of uncontrolled bush fire destroying their charcoal. The charcoal producers are therefore careful to ensure that their activities do not result in bush fires.

3.13. The human cost of charcoal production – health

In addition to the environmental impacts of charcoal production, the study also explored the effects of the charcoal business on human health. Overall, 70.5% of respondents believed that charcoal production affects their health. The primary health hazard experienced by the charcoal

producers is smoke inhalation, which causes cough, nasal congestion, difficulty in breathing and headaches.

Others health problems are bodily pains due to the amount of physical energy exerted in charcoal production; there are also other physical injuries such as cuts and burns as well as dust and smoke in the eyes. Below is the respondent's description of the health issues faced in charcoal production.

> *"I suffer from headache sometimes which emanates from the heat. Usually, when you take in drugs, you will feel no relief. Digging the ground can lead to a heart attack. The packing can also harm you."* ***(charcoal producer, Langatire)***.

> *"The work is somehow dangerous. There is dust, heat, smoke and packing of the trees poses a danger as well to our health. Nevertheless, in a situation that you do not have other options, you are compelled to harm your body small. When you pack them, snakes and scorpion can go inside posing a danger, but you have nothing to worry about because the fire will consume them. But in the case of dry trees, if care is not taken, you can be stung by a scorpion or snake."* ***(Charcoal producer, Kuportor)***.

Some respondents are of the view that smoke from the charcoal kiln has some medicinal benefits, and as such, they expose themselves to the smoke instead of taking precautions to prevent smoke inhalation. For many respondents, personal health, safety, and environmental (HSE) issues are not essential for them. Thus, while respondents acknowledge the risks charcoal production poses to their health, little is done to minimise this risk. Unless the injury or health-related problem is so severe that they cannot work, many respondents simply take off-the-counter painkillers and continue working without seeking medical attention from any health facility.

3.14. The Policy and regulatory context of charcoal production

3.14.1. Formal institutional regulations

Although there is no clear regulatory framework guiding charcoal production in Ghana, both formal and informal institutions have rules and policies that guide aspects of the charcoal business. The decentralised system of governance in Ghana provides the structure within which charcoal regulation should operate. The Environmental Protection Agency (EPA), the Forestry Commission (FC), and the various district assemblies are the primary formal regulators. Both the EPA and FC operate a decentralised system where their district offices are responsible for regulating activities in the woodland Savannah.

The study found no clear policy framework guiding charcoal production. The district assemblies, for instance, deploy different approaches in regulating charcoal production. The North Gonja

district has a by-law that bans charcoal production. An official, however, notes that they are currently unable to enforce the law due to the large number of people who depend on charcoal for their livelihood. According to him, the sheer volume of people engaged in charcoal production and the involvement of the traditional authorities makes it impractical to enforce the ban on charcoal production. The District task force set up through the by-law to implement the prohibition goes to the villages to educate the people on the need not to harvest shea and dawadawa for charcoal production. The only part of the by-law that they enforce albeit in a modified form is the fine imposed on charcoal producers. Per the assembly's regulation, anyone caught producing charcoal will pay a fine of not less than GHC7, 500. The district assembly has reduced the penalty to GHC500 for a Kia Rhino and up to GHC 2000 for heavy-duty trucks in a tax-like undertaking. These fines are received when the charcoal is loaded in the communities. The planning officer notes that:

> *'Fines from charcoal production in the assembly is our main source of the internally generated funds.'*

As such, it will not be possible even for the assemblies to ban charcoal production completely. A challenge he notes is the situation where members of the taskforce who collect the fines in the village under-report the amounts received. Until these local governments have viable economies that can contribute substantial volumes of taxable income from non-natural resource activities, charcoal burning and other forms of logging are likely to continue. In addition, effective policies against the trend are not likely to be crafted except for adhoc measures in dealing with specific dimensions.

In West Gonja District, officials note that there are no by-laws regulating charcoal production. The assembly in consultation with the traditional authorities banned charcoal production. According to the official, anyone caught with charcoal is reported to the police. The major challenge is the situation where the police take bribes from arrested charcoal producers and release them. An official with one of the environmental NGOs notes that some officials of the assemblies are also complicit in the charcoal production. Members of the assembly taskforce collude with the charcoal producers and the police to allow production to continue even in areas that charcoal production is banned. Additionally, he notes some assemblies also tax the charcoal produced because of their inability to stop the process, as observed in the case of North Gonja.

The Forestry Commission has also introduced the Charcoal Conveyance Certificate (CCC) since 2015. The CCC is used to regulate the transportation of charcoal within the country. The CCC is the precursor to the implementation of a permit regime for charcoal production. It is expected that the CCC will provide the FC necessary data on charcoal production in Ghana and form the basis for which the commission will develop the framework for regulating charcoal production. The current system requires trucks loaded with charcoal to obtain CCC from district offices of the FC or at their checkpoints on major roads. The CCC for a small Kia truck is GH¢150.00 while that of a big Kia Rhino trucks is GH¢250.00. All these monetary policies have little impacts on stopping the devegetation processes and paving the way for a realistic, sustainable charcoal production agenda.

3.14.2. Informal institutional regulations

Informal regulation of charcoal production is more effective in the Gonja area. The traditional authority is the primary regulator in the various communities. The chiefs determine the type of trees and the areas where charcoal can be produced. Generally, in all study communities, the use of dawadawa and shea for charcoal production is prohibited. Instances where people are caught harvesting such economic trees for charcoal, they are fined and sacked from the concession. In Kuportor, for example, due to the stringent enforcement of the regulation on tree species we observed that even in areas where charcoal has been produced, there are still large numbers of shea and dawadawa trees.

Interviews with NGOs, however, point to the practice of shea and dawadawa being used for charcoal production further away from the villages. The further the charcoal production site, the less likelihood for the traditional authorities to be able to enforce the rules of exclusion. This is particularly so because once the charcoal is produced, it is impossible to tell the tree species used. Another loophole in the traditional regulation that is exploited is the permission given to the charcoal producers to use dead shea and dawadawa trees for charcoal. In all communities, all stakeholders note charcoal producers can harvest dead shea and dawadawa trees to produce charcoal. The director of one of the NGOs interviewed observed that:

> *"Some charcoal producers are using important economic trees to produce charcoal, although it is illegal. Those whose production sites are far from the village use these trees for charcoal, and no one can tell the distinction when they come to the village. We have also observed the practice of tree poisoning."*

In his view, because dead shea and dawadawa trees can be used for charcoal production, some producers poison these trees, and once they are dead, they can harvest them. According to him,

during their field visits, they have observed several cases where large numbers of prohibited trees were poisoned to die and subsequently used for charcoal production.

The current policy framework, whether formal or informal, has no sustainability approach towards charcoal production. In both cases, charcoal production is either banned, poorly enforced or allowed to flourish.

CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

The role and impacts of charcoal in African economies are complex and embedded in the socio-cultural systems and economics. In many African cities, rapid urbanisation driven by rural-urban migration has also set in motion energy transitions at the household level. While the current debate on energy transition, particularly in Europe focuses on decarbonising society, within an African context, this transition is a shift from one form of biomass to another. Additionally, many African governments are encouraging the use of liquefied petroleum gas (LPG), although its uptake is low and mostly in urban areas.

In rural communities, the open-air kitchen design makes the use of firewood and other biomass possible as the smoke freely escapes. However, the rapid urbanisation and changing housing design in urban areas makes it unsuitable to use firewood; hence, charcoal is a preferred domestic energy source. Until the African government puts in more investment such as subsidising the cost of stoves, cylinders and gas, charcoal will remain essential household energy in African cities. The demand for charcoal may increase in correspondence with rapid urbanisation, which will require increased charcoal production.

At the core of the charcoal business are the activities of migrant Sissala charcoal producers. As the largest charcoal producers in Ghana, the Sissala migrate across the country in search of wood for charcoal production. Their activities are core to the diffusion of charcoal production technology and business strategy across Ghana. The Sissala producers greatly influence the nature of charcoal livelihood in the Gonja area.

An essential part of the charcoal business is woodland availability and acquisition. In the Gonja area, most of the charcoal is produced on communal lands acquired from the chiefs. Individual farmers also release their lands for charcoal production or produce charcoal themselves. The concession acquisition for charcoal production is rooted in the land tenure and chieftaincy system of the Gonjas. The village chiefs are responsible for granting access to land on behalf of the next highest chief in the hierarchy. As the custodian of the land, the Bewurbi negotiates access rights with charcoal producers at the community level.

The organisation of charcoal production produces winners and losers based on the dynamics of power and the positionality of actors in the value chain. At the community level, the distribution of income from charcoal production follows the traditional set-up – the village chiefs receive payment directly from the producers based on the terms agreed. The charcoal producers also pay tax to the paramount chief (Bewura) within whose jurisdiction the charcoal village is located. For instance, Sissala charcoal producers in Kuportor pay royalties to the village chief and the

paramount chief in Daboya. Additional taxes are paid towards community development projects and festival celebration. The activities of migrant charcoal producers create a service economy of retailers, many of whom are indigenes. During transit, charcoal transporters pay tax to every Gonja chief through whose jurisdiction the charcoal passes. Charcoal dealers also pay monies to the police who usually visit the charcoal loading sites as well as at various police checkpoints on the road to the cities. Various district assemblies benefit from the charcoal business through penalties and taxes that the charcoal producers pay.

Community members benefit directly by engaging in charcoal livelihoods as producers or labourers or indirectly from the taxes paid for community development projects. Community members who are employed directly in the charcoal business invest their income in housing, health care, education, and agriculture. As discussed previously, there is a mutually beneficial relationship between charcoal production and agriculture. Income from charcoal is being invested in farm expansion while the clearing of vegetation for farm increases the availability of wood for charcoal production.

The charcoal aggregators are important actors in the charcoal value chain. The aggregators buy charcoal from small and medium-scale producers. Their activities are critical because many small and medium-scale producers cannot afford to transport the charcoal to the cities. Some aggregators also pre-finance charcoal production, and by so doing, they have a better bargaining position in comparison to charcoal producers. This relationship allows aggregators to negotiate the price down to the disadvantage of the charcoal producers. Because many charcoal producers are cash-stressed, when they negotiate conditions of pre-financing with aggregators, they have a much weaker bargaining position.

We contend that urbanisation will continue to drive demand for charcoal in Ghana. An increasing number of people producing charcoal in rural Ghana meets this demand. The charcoal livelihood is complex and intricately linked with agriculture in the Gonja area. The rise in demand for charcoal in cities, reduction in farm output for peasant farmers and general crop loss to cattle grazing has driven farmers to venture into charcoal production. Thus, in addition to the Sissala migrants, many Gonjas also produce charcoal to supplement their income from agriculture. Charcoal production offers a more stable income to people characterised by complex distribution streams. Thus, government policies and interventions which are mostly aimed at curtailing charcoal production is unrealistic given the local economic situation of the people and the district assemblies who are the executors of policy at that level. In addition, due to corruption, the agencies responsible for enforcing rules and regulations selectively do so in a minimal fashion, thereby allowing the charcoal trade to flourish.

The role of charcoal production in the degradation of the savannah woodlands is undoubted. This study, however, shows that the extent of vegetation loss from charcoal is dependent on tree

composition in a particular place. In areas with high numbers of preferred trees such as *keche, kakali and kawul*, devegetation is high as most of the trees are removed. Where there are many non-preferred trees and protected economic trees, then there is low devegetation. A third of trees in Gonjaland are preferred trees given us a deforestation rate of 35% plus a few illegal cuttings of economic trees. Whatever the case, the ecology of the area is changing leading to the loss of animal species and disappearances of thick woodlands. Unlike migrant Sissala charcoal producers who move to new areas once they exhaust the desired tree, indigenes unwilling to migrate harvest younger trees for charcoal and contribute significantly to the extinction of species as the possibility for natural re-vegetation is lost. The expansion of medium to large scale farms in the Savannah woodland and the influx of Fulani herdsmen with considerable financial muscles complicates the scenario by accelerating the devegetation processes.

4.2. Recommendations

The study has shown that charcoal production is a vital livelihood activity and a significant contributor to the Ghanaian economy. There is, therefore, the need for a comprehensive national policy and dialogue on sustainable charcoal production. Tree resources are critical in human survival and must be managed sustainably to ensure both current and future use. Considering the large number of people involved in charcoal production, and its significance to local and district economies, an outright ban on charcoal production will be counterproductive. The following recommendations are proposed:

1. Develop a comprehensive policy that promotes sustainable charcoal production
2. Encourage afforestation through the free distribution of tree seedling to landowners and migrant charcoal producers in exchange for permits
3. The FC and the district assemblies should support and grant permission the traditional authorities to grant access to trees for charcoal only in communities that have tree replacement policies.
4. Tree audits should be conducted with community maps produced to guide the allocation of concessions. This will enable communities to know what they have and when they must stop production once, they deplete their inherited natural capital. They should then be encouraged to build these again for future generations.
5. Charcoal producers must be trained on improved kiln technologies to reduce the amount wastage involved in the use of current technologies, which they inherited back from Tumu several decades ago. These new technologies will also help reduce CO_2 from

charcoal production. The improved kiln will also reduce the adverse health effects of charcoal production.

6. Streamlining charcoal production and legitimising it will reduce the corruption along the entire value chain, which encourages unsustainable production circuits.
7. Since land is the single abundant resource in Gonjaland, the establishment of tree plantations with fast-growing varieties would produce an economically viable industry.
8. Livelihood diversification programs to encourage the investment of charcoal incomes to limit or move people away from charcoal is essential. These could be done through skill training into the service sector and the agro-processing.
9. Modern agriculture is within reach of farmers in this area, but currently awaits the right agricultural policies and support systems along the entire food systems chain. The state needs to revamp agriculture by using a food systems policy framework instead of the input-subsidy policies being pursued now.
10. Solutions are needed to integrate livestock rearing with farming synergistically to avoid the current conflictual situation. The right bylaws and strict enforcements on livestock rearing in addition to introducing herders to new ways of animal husbandry are in the right direction.

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